BACTERIA POLLUTION CONTROL PLAN

CARPENTER CREEK (WBID 676)

Escambia County MS4 Permit

Permit Number FLS000019-003

Co-Permittees:

Escambia County

Florida Department of Transportation, District Three

Town of Century

City of Pensacola

2016 STATUS REPORT

EXECUTIVE SUMMARY

The Carpenter Creek watershed (WBID 676) is approximately 6,760 acres in size and flows into Bayou Texar (WBID 738). The Bayou Texar watershed is approximately 5,266 acres in size. Both Carpenter Creek and Bayou Texar have been verified as impaired for fecal coliform bacteria. In 2012 FDEP adopted a fecal coliform TMDL for both of the waterbodies. Fecal coliform reductions assigned to the waterways are 49 % for Bayou Texar 28 % for Carpenter Creek. As part of the requirements of Escambia County's NPDES/MS4 permit Escambia County prepared a "TMDL Prioritization Report". This report names the Carpenter Creek fecal coliform TMDL as the top priority TMDL to be addressed in the County's and co-permittees NPDES/MS4 permit. The Bayou Texar fecal coliform TMDL is ranked number two. The NPDES/MS4 permit requires that a Bacteria Pollution Control Plan (BPCP) be prepared and implemented to achieve fecal coliform load reductions allocated in the TMDL.

FDEP formally approved the County and its co-permittees Carpenter Creek BPCP on June 15, 2016. The 2016 NPDES/MS4 Annual Report includes the approved BPCP and the first year's data collected under the Carpenter Creek BPCP.

The 2016 data confirms that Carpenter Creek is indeed impaired for the fresh surface water bacteriological criteria *Escherichia coli* (*E. coli*). All of the five stations monitored exceeded the 410 MPN/100mL *E. coli* ten percent threshold value (TPTV). The worst water quality was at Davis Blvd. with 91 a percent exceedance of the TPTV. The two upstream sites (Burgess and Olive) had 25 percent greater than the TPTV. The two sites downstream of Davis (Brent and Ninth) had 42 percent samples greater than the TPTV. As a whole the 2016 data set exceeded the TPTV 43 percent of the time. The geometric mean for the 60, 2016 *E. coli* data points is 368 MPN/100 mL with the Davis Blvd. station over twice that value, 784 MPN/100mL.

STATUS REPORT

FDEP formally approved the County and its co-permittees Carpenter Creek BPCP on June 15, 2016. This is the first status report for the Carpenter Creek bacteria pollution control plan (BPCP). The proposed implementation schedule is on schedule for the most part. Monthly sampling of the five proposed stations began on time in January 2016. Data collected this year constitutes most of this first status report. A Carpenter Creek stakeholder's kick-off meeting was proposed for February 2017, that meeting has been rescheduled for March 2017.

WATER QUALITY DISCUSSION

Figure 1 is a map of the Carpenter Creek basin identified as water body ID (WBID) 676. Carpenter Creek is the contributing freshwater source to Bayou Texar (WBID 738). For management purposes the dividing line between Carpenter Creek (WBID 676) and Bayou Texar (738) is the 12th Avenue Bridge. All five of the sites monitored in this BPCP are upstream of the 12th Ave. Bridge, Figure 2. Station descriptions are located in Table 1.
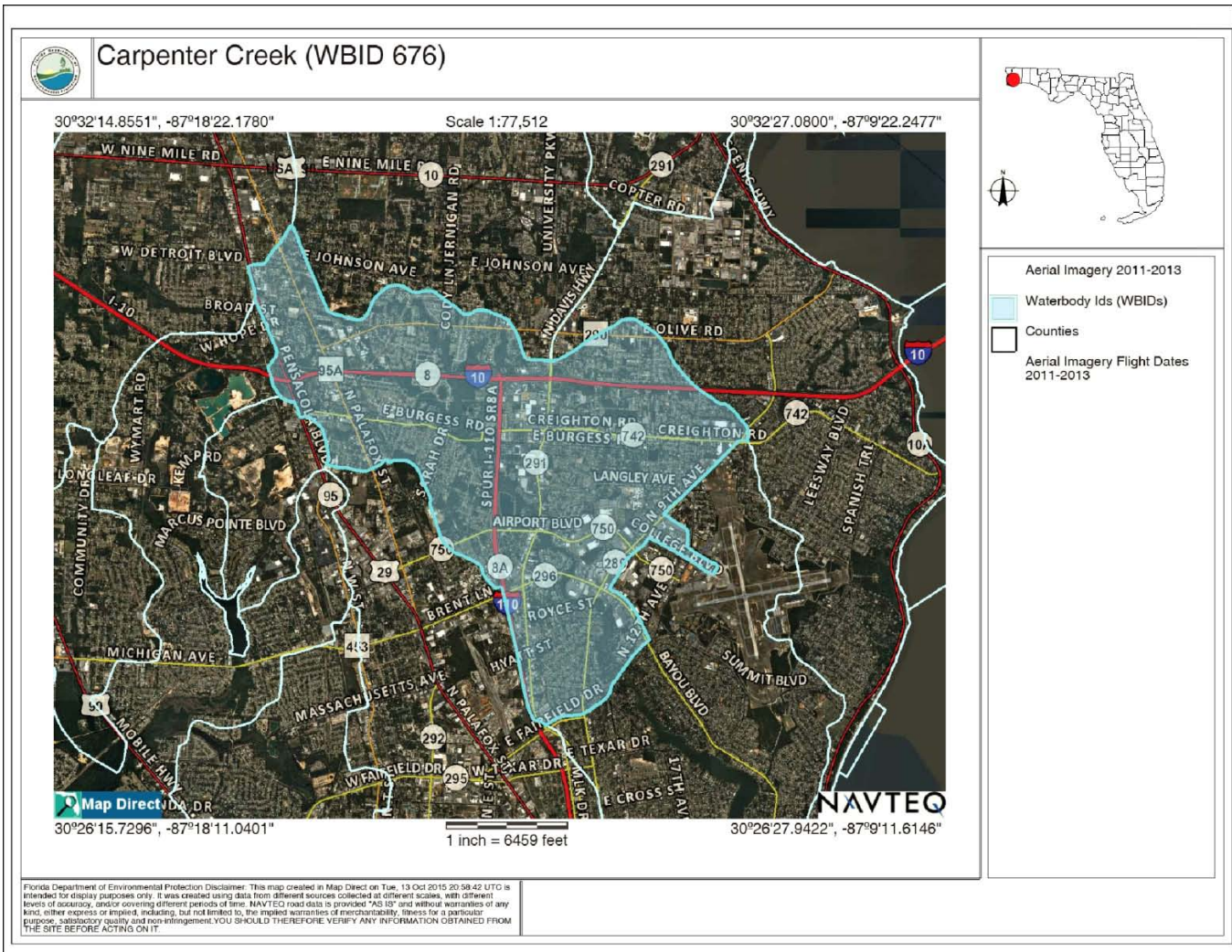

Figure 1. Carpenter Creek watershed WBID 676

All of the 2016 surface water quality data is presented in Table 2. Presented in the table are field parameters water (temperature, specific conductance, dissolved oxygen and dissolved oxygen percent saturation), turbidity and *Escherichia coli*. Across the top of the table the three day antecedent rainfall is provided as reported by the National Weather Service for Pensacola. Antecedent rainfall data is often useful when trying to understand bacterial contamination in surface waters. At the end of the status report Figures 7 – 11, present the 2016 *E. coli* data for each station in bar chart format.

Figure 3 graphically presents the 2016 *E. coli* data with the three day antecedent rainfall total. The 2016 Carpenter Creek show a very weak correlation (R2=0.0064) with the 3 day antecedent rainfall totals (Figure 4). The exception was on August 8th after a 0.52 inch rainfall event. The rain was primarily in the upstream portion of the basin and patchy in nature. This resulted in the Ninth Avenue value, still elevated at 459 MPN/100mL, being much lower than the upstream stations. All of the upstream stations were greater than 2000 MPN/100mL, with the Burgess Rd. site coming in at 7701 MPN/100mL. This one sample was the highest recorded by far for 2016. The elevated result was greater than the "re-sample threshold" of 5000 MPN/100mL, however, since it was attributed to the rain event no resampling was performed. The highest three day rainfall total was for the December 6th sampling event with a total of 5.71 inches. While all sites exceeded the 410 TPTV actual values were relatively low, none greater than 1000 MNP/100mL. The "first flush" had passed and turbidity values were all less than 10 NTUs.

Turbidity often correlates positively with elevated bacteria due to re- suspension of organisms in the sediment. The 2016 Carpenter Creek *E. coli* data is plotted against field measured turbidity in Figure 5. The 2016 data display a fairly weak positive correlation to turbidity with an R2 of 0.3173. The two highest turbidity values accompanied with their corresponding E. coli values are Burgess Rd. on August 8 (20.93 NTU/7701 MPN/100mL) and Davis Blvd. on October 31 (26.53 NTU/1076 MPN/100mL). As mentioned earlier the 7701 value was attributed to a rain event that had just occurred earlier that day. Therefore, the turbidity correlates to the rain event; the elevated value is likely to be attributed to runoff and re-suspended bottom sediments.   The Davis Blvd. sample on October 31 had no corresponding rain event to attribute the elevated turbidity to. Therefore, the 1076 value quite probably represents typical data for that site. In fact, the geometric mean for Davis Blvd. was 784 MPN/100mL. The turbidity source must have been between Burgess Rd. (1.99 NTU) and the Davis Blvd. site.

The 2016 data confirms that Carpenter Creek is indeed impaired for the fresh surface water bacteriological criteria *Escherichia coli* (*E. coli*). All of the five stations monitored exceeded the 410 MPN/100mL *E. coli* ten percent threshold value (TPTV). The worst water quality was at Davis Blvd. with 91 a percent exceedance of the TPTV. The two upstream sites (Burgess and Olive) had 25 percent greater than the TPTV. The two sites downstream of Davis (Brent and Ninth) had 42 percent samples greater than the TPTV. As a whole the 2016 data set exceeded the TPTV 43 percent of the time. The geometric mean for the 60, 2016 *E. coli* data points is 368 MPN/100mL with the Davis Blvd. station over twice that value, 784 MPN/100mL. The percent samples exceeding the TPTV and *E. coli* geometric mean data are presented in Figure 6. The 2016 appear to indicate a potential *E. coli* source between Burgess Rd. and Davis Hwy. This area will be to focus of more intensive investigations in 2017.
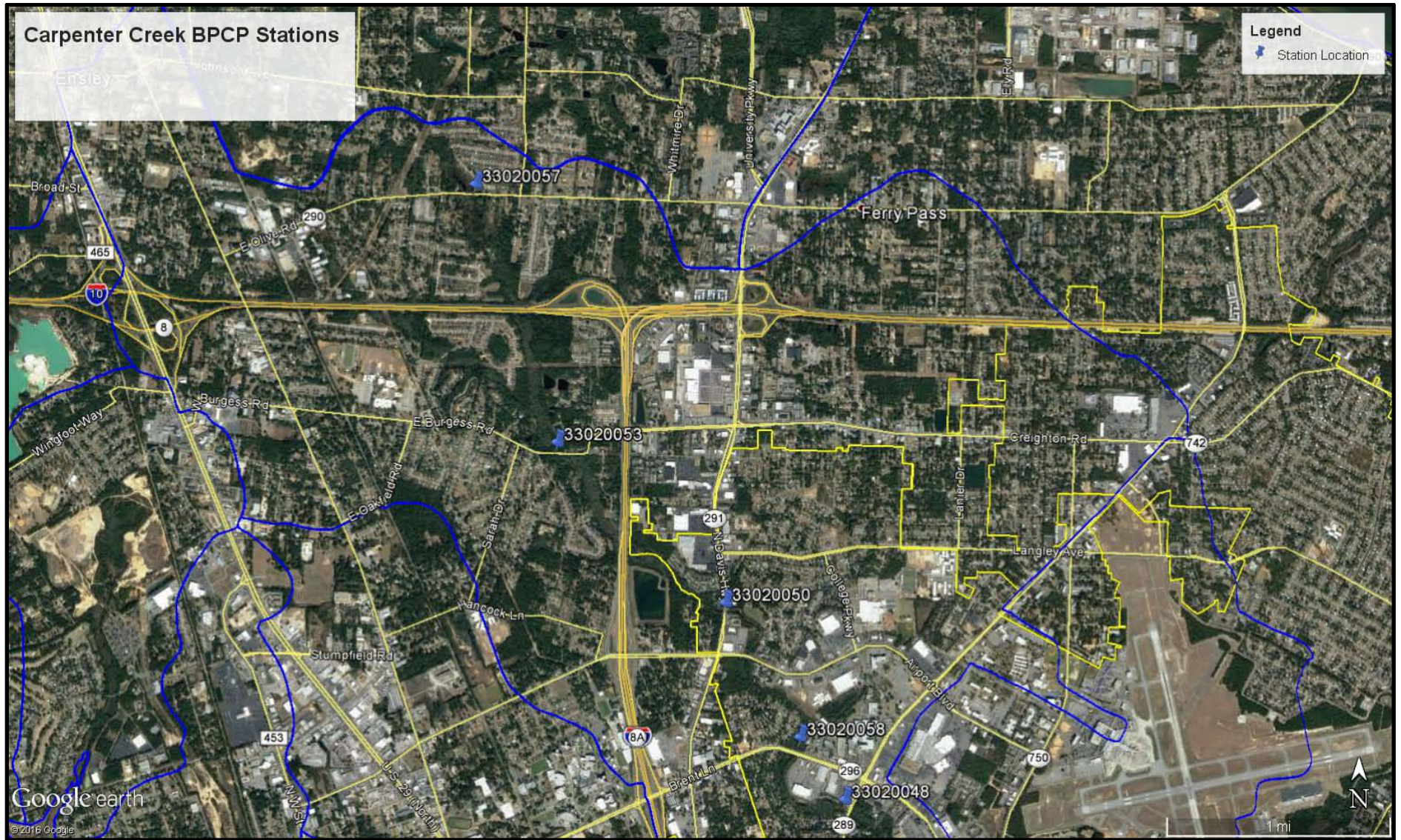
Figure 2. Map of Carpenter Creek BPCP Sampling Locations

5

Table 1. Stations Sample for Carpenter Creek BPCP.

NAME/WBID	STATION	DESCRIPTION	LATITUDE	LONGITUDE
Carpenter Creek (676)	33020057	@ Olive Rd.	30° 30' 39.5"	87° 14' 31.5"
Carpenter Creek (676)	33020053	@ Burgess Rd.	30° 29' 38.61"	87° 14' 6.32"
Carpenter Creek (676)	33020050	@ Davis Hwy.	30° 29' 2.9248"	87° 13' 21.2649"
Carpenter Creek (676)	33020058	@ Brent Lane	30° 28' 31.01"	87° 13' 2.8"
Carpenter Creek (676)	33020048	@ 9th Ave.	30° 28' 16.3228"	87° 12' 48.02"

Table 2. 2016 Water Quality Data.

January 25, 2016   3 Day Rainfall: 0.76"

Station	Temp (ºC)	Specific Cond. (µmho/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat.)	pH (SU)	Turbidity (NTU)	*E. coli* (MPN/100 mL)
33020057	9.3	75	9.1	79	7.0	2.34	63
33020053	9.0	96	9.7	83	7.1	1.36	173
33020050	8.9	93	10.0	85	7.0	1.78	**695**
33020058	14.3	85	8.9	86	6.7	1.38	**538**
33020048	15.5	81	8.7	86	6.8	1.37	315

February 22, 2016   3 Day Rainfall: 0.00"

Station	Temp (ºC)	Specific Cond. (µmho/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat.)	pH (SU)	Turbidity (NTU)	*E. coli* (MPN/100 mL)
33020057	19.1	116	6.0	65	6.7	1.04	74
33020053	17.8	106	7.5	79	6.8	1.25	175
33020050	17.5	104	7.9	83	6.7	2.28	318
33020058	19.9	91	7.9	87	6.6	1.41	185
33020048	20.2	84	8.0	88	6.8	1.47	246

Note: Exceeds ten percent threshold value (410) in **RED.**

Table 2. 2016 Water Quality Data (continued).

March 8, 2016 Station	Temp (ºC)	Specific Cond. (μmho/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat.)	pH (SU)	Turbidity (NTU)	*E. coli* (MPN/100 mL)
33020057	20.1	93	7.9	86	6.7	1.75	201
33020053	18.4	104	8.7	92	6.7	1.38	305
33020050	17.4	101	8.6	89	6.5	2.18	**771**
33020058	19.9	91	8.4	92	6.2	13.28	**504**
33020048	20.2	85	8.4	92	6.1	2.44	364

3 Day Rainfall: 0.00"

April 5, 2016 Station	Temp (ºC)	Specific Cond. (μmho/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat.)	pH (SU)	Turbidity (NTU)	*E. coli* (MPN/100 mL)
33020057	19.6	82	6.5	71	7.3	1.72	52
33020053	17.6	92	7.3	76	7.3	1.89	279
33020050	18.1	90	7.8	82	7.5	2.75	410
33020058	19.3	86	8.0	86	7.5	1.99	315
33020048	19.6	82	8.1	87	7.9	1.95	**545**

3 Day Rainfall: 0.00"

Note: Exceeds ten percent threshold value (410) in **RED**.

Table 2. 2016 Water Quality Data (continued).

May 3, 2016		3 Day Rainfall: 0.03"					
Station	**Temp** (ºC)	**Specific Cond.** (μmho/cm)	**Dissolved Oxygen** (mg/L)	**Dissolved Oxygen** (% Sat.)	**pH** (SU)	**Turbidity** (NTU)	***E. coli*** (MPN/100 mL)
33020057	26.8	110	3.6	45	6.9	1.82	**422**
33020053	23.1	110	6.1	71	7.0	1.84	122
33020050	23.1	108	6.8	79	6.9	2.61	**906**
33020058	22.8	93	7.5	87	6.7	1.61	359
33020048	22.3	88	7.6	87	6.7	1.24	262

June 13, 2016		3 Day Rainfall: 0.01"					
Station	**Temp** (ºC)	**Specific Cond.** (μmho/cm)	**Dissolved Oxygen** (mg/L)	**Dissolved Oxygen** (% Sat.)	**pH** (SU)	**Turbidity** (NTU)	***E. coli*** (MPN/100 mL)
33020057	30.3	119	3.0	40	6.9	2.49	146
33020053	26.7	116	5.5	68	7.0	2.05	279
33020050	26.7	112	6.4	80	6.8	2.68	**771**
33020058	24.8	94	7.5	90	6.7	1.44	259
33020048	24.3	87	7.4	89	6.7	1.24	275

Note: Exceeds ten percent threshold value (410) in **RED**.

Table 2. 2016 Water Quality Data (continued).

July 11, 2016		3 Day Rainfall: 0.26"					
Station	**Temp** (°C)	**Specific Cond.** (μmho/cm)	**Dissolved Oxygen** (mg/L)	**Dissolved Oxygen** (% Sat.)	**pH** (SU)	**Turbidity** (NTU)	***E. coli*** (MPN/100 mL)
33020057	29.5	119	1.7	23	6.8	2.23	110
33020053	26.4	106	5.5	68	7.2	3.22	**749**
33020050	26.3	104	6.2	77	7.3	3.99	**990**
33020058	25.0	90	7.0	84	7.1	2.49	**471**
33020048	24.7	82	6.9	83	6.8	2.86	**842**

August 8, 2016		3 Day Rainfall: 0.52"					
Station	**Temp** (°C)	**Specific Cond.** (μmho/cm)	**Dissolved Oxygen** (mg/L)	**Dissolved Oxygen** (% Sat.)	**pH** (SU)	**Turbidity** (NTU)	***E. coli*** (MPN/100 mL)
33020057	29.8	67	4.6	61	6.7	4.90	**2909**
33020053	27.0	68	5.2	65	6.8	20.93	**7701**
33020050	27.8	79	6.1	77	6.9	4.66	**2723**
33020058	26.2	80	6.7	84	6.8	2.92	**3654**
33020048	25.8	76	7.0	86	6.8	2.39	**459**

Note: Exceeds ten percent threshold value (410) in **RED**.

Table 2. 2016 Water Quality Data (continued).

September 6, 2016		3 Day Rainfall: 0.00"					
Station	Temp (ºC)	Specific Cond. (μmho/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat.)	pH (SU)	Turbidity (NTU)	*E. coli* (MPN/100 mL)
33020057	29.2	110	2.4	31	6.7	2.49	52
33020053	26.8	112	5.2	65	6.8	3.60	328
33020050	26.7	110	6.4	79	6.8	2.84	**813**
33020058	25.4	96	7.1	86	6.5	1.76	241
33020048	25.1	89	7.2	87	6.7	1.46	**638**

October 3, 2016		3 Day Rainfall: 0.00"					
Station	Temp (ºC)	Specific Cond. (μmho/cm)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat.)	pH (SU)	Turbidity (NTU)	*E. coli* (MPN/100 mL)
33020057	25.2	101	2.8	34	7.0	2.39	30
33020053	22.7	104	6.4	75	7.2	2.01	146
33020050	22.4	104	7.4	86	7.0	2.67	**602**
33020058	23.0	93	7.3	86	6.9	1.76	256
33020048	22.7	87	7.5	87	7.4	1.46	275

Note: Exceeds ten percent threshold value (410) in **RED**.

Table 2. 2016 Water Quality Data (continued).

October 31, 2016 (for November)				3 Day Rainfall: 0.00"			
Station	**Temp** (ºC)	**Specific Cond.** (µmho/cm)	**Dissolved Oxygen** (mg/L)	**Dissolved Oxygen** (% Sat.)	**pH** (SU)	**Turbidity** (NTU)	***E. coli*** (MPN/100 mL)
33020057	22.0	115	1.8	20	6.7	3.10	199
33020053	21.0	124	6.4	71	6.8	1.99	146
33020050	20.8	120	7.5	83	6.6	26.53	**1076**
33020058	22.3	96	7.1	82	6.5	1.47	193
33020048	22.4	88	7.5	86	6.7	1.27	253

December 6, 2016				3 Day Rainfall: 5.71"			
Station	**Temp** (ºC)	**Specific Cond.** (µmho/cm)	**Dissolved Oxygen** (mg/L)	**Dissolved Oxygen** (% Sat.)	**pH** (SU)	**Turbidity** (NTU)	***E. coli*** (MPN/100 mL)
33020057	19.1	74	3.8	42	6.8	3.21	**962**
33020053	18.6	85	6.8	73	7.0	3.51	**610**
33020050	18.7	79	7.6	82	6.7	6.13	**776**
33020058	19.5	77	7.9	86	6.4	5.19	**618**
33020048	19.6	75	7.9	86	6.1	5.81	**766**

Note: Exceeds ten percent threshold value (410) in **RED**.
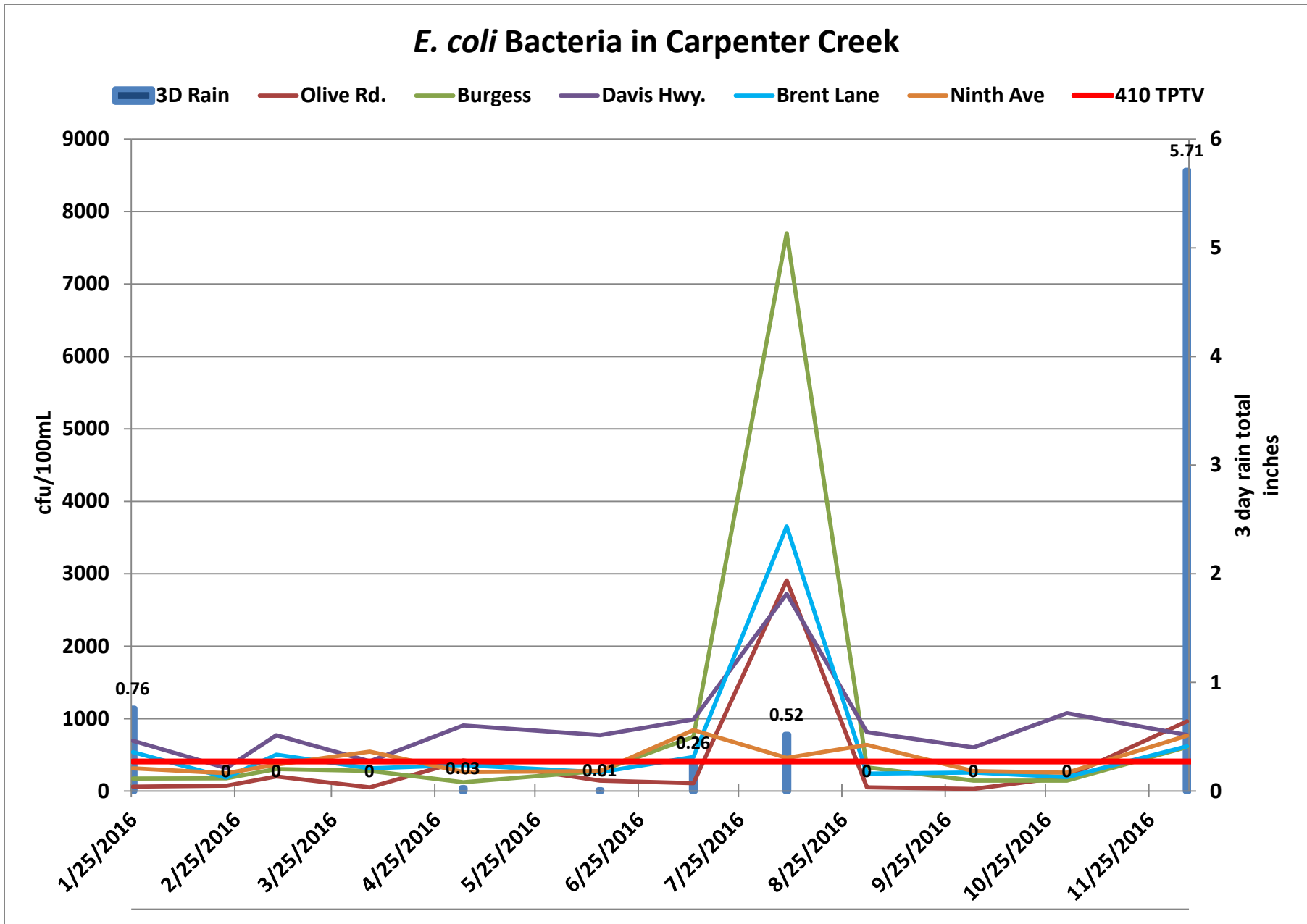
Figure 3. 2016 BPCP Carpenter Creek *E.coli* and 3 day antecedent rainfall data.
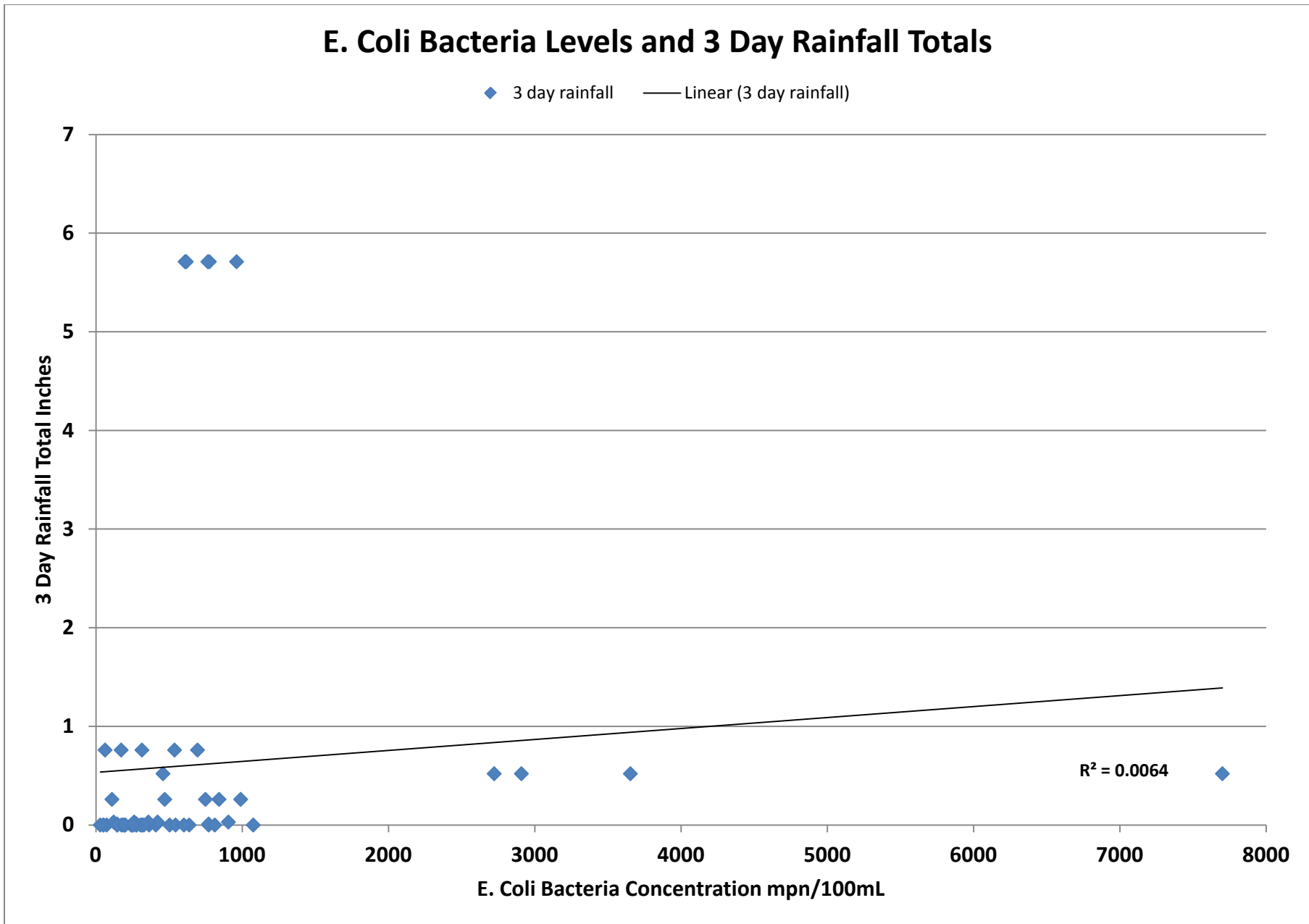
Figure 4. 2016 BPCP Carpenter Creek correlation between *E.coli* and 3 day antecedent rainfall data (R^2 = 0.0064).
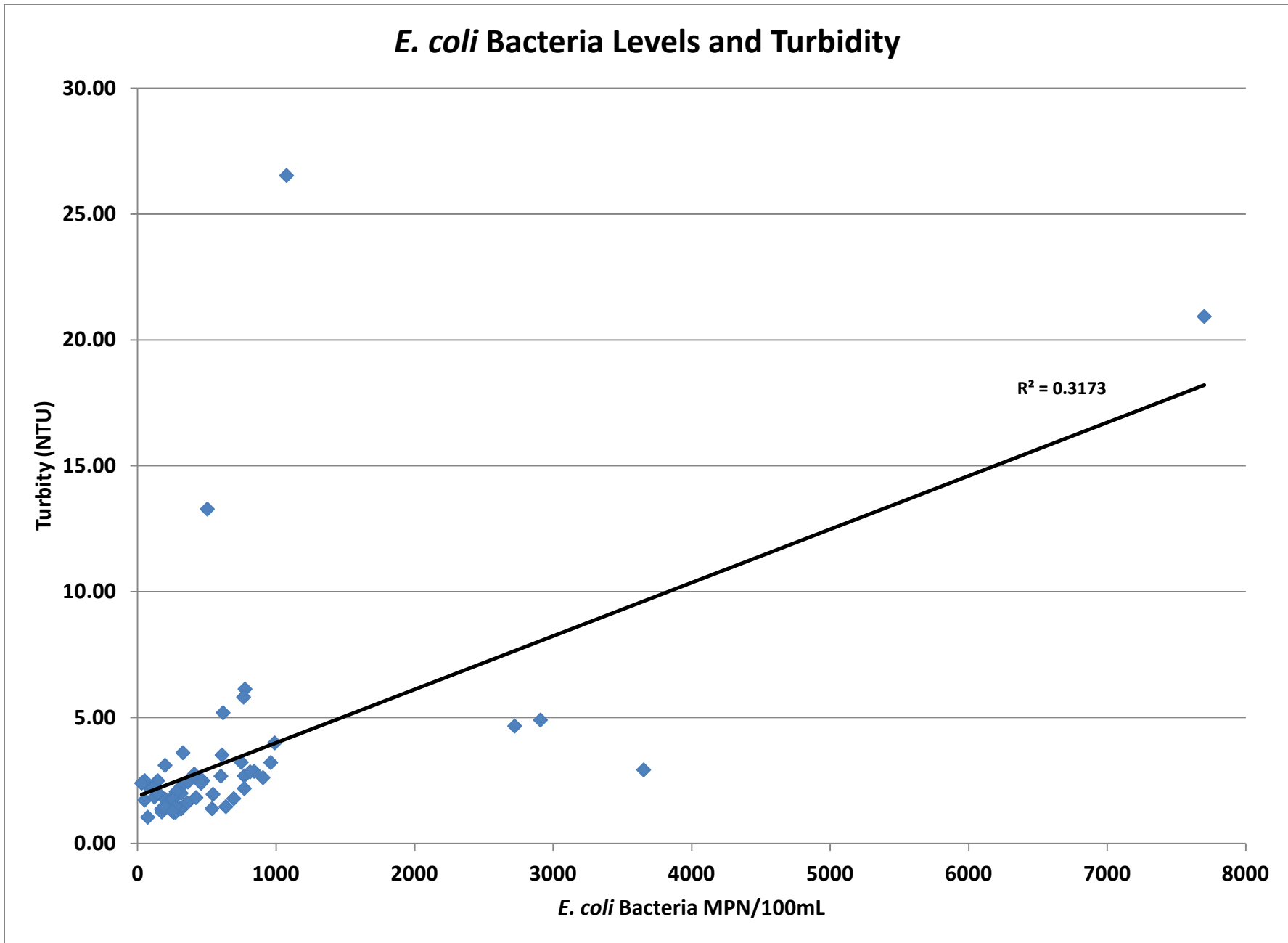
Figure 5. 2016 BPCP Carpenter Creek correlation between *E.coli* and turbidity (R^2 = 0.3173).
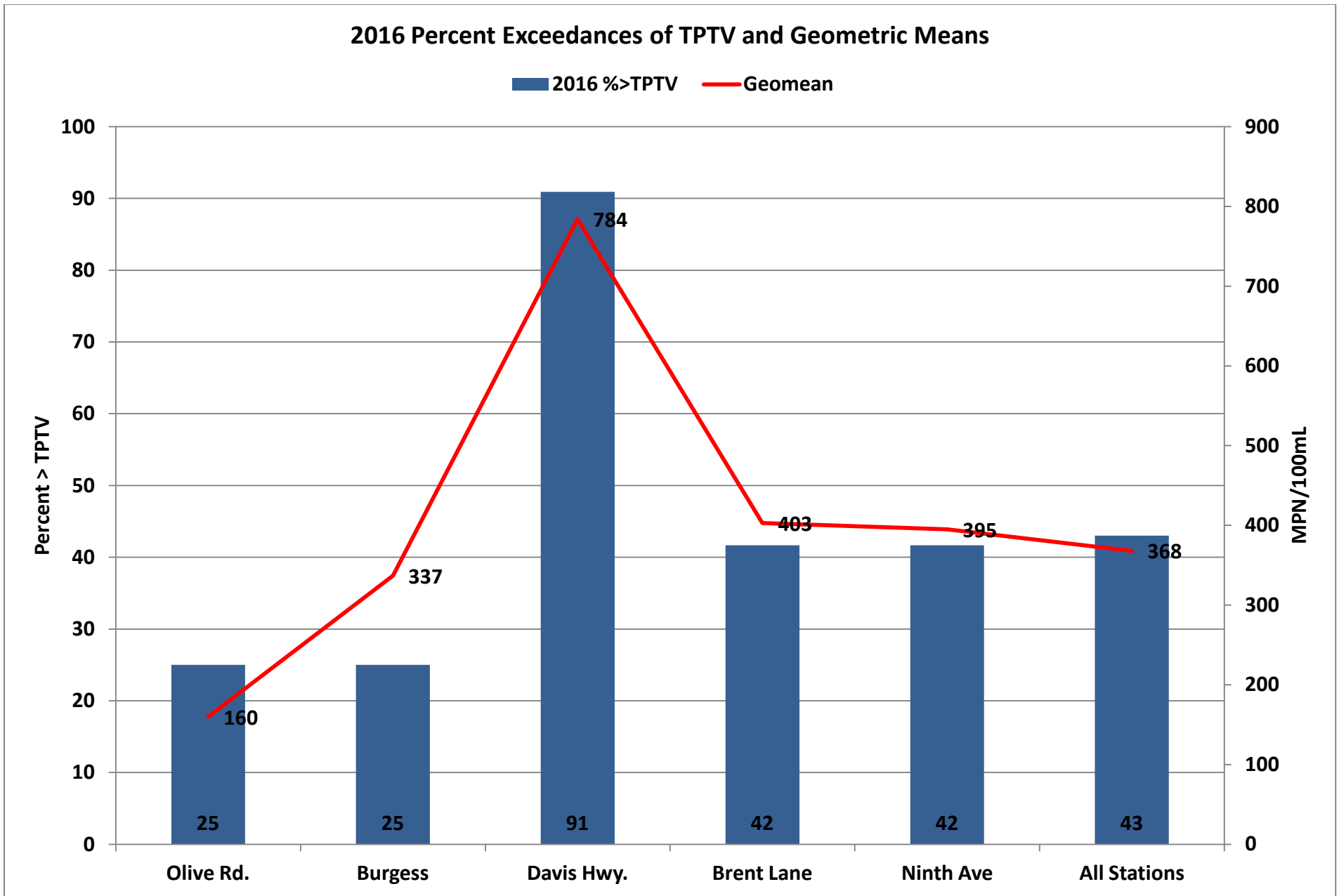
Figure 6. 2016 BPCP Carpenter Creek exceedence of ten percent threshold value of 410 MPN/100mL criteria and *E. coli* geometric means.

Figure 7. 2016 BPCP Carpenter Creek *E.coli* results for Olive Road (33020057) sampling location.

Carpenter Creek at Burgess Road
E. coli Bacteria (MPN/100mL)

E. coli ━ 410 TPTV

MPN/100mL

7701

173 175 305 279 122 279 749 328 146 146 610

Sample Date: 1/25/2016, 2/22/2016, 3/8/2016, 4/5/2016, 5/3/2016, 6/13/2016, 7/11/2016, 8/8/2016, 9/6/2016, 10/3/2016, 10/31/2016, 12/6/2016
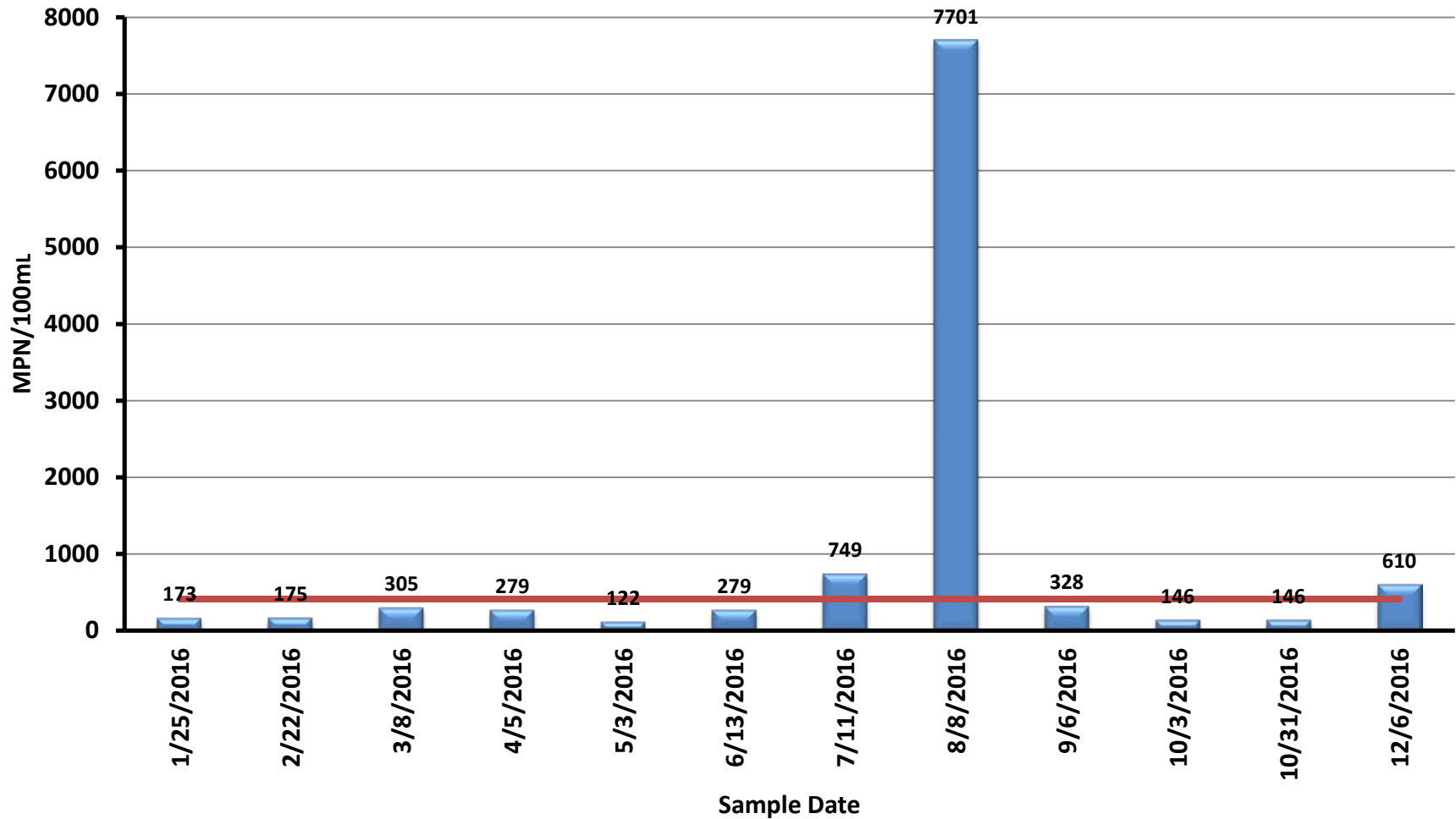
Figure 8. 2016 BPCP Carpenter Creek *E.coli* results for Burgess Road (33020053) sampling location.
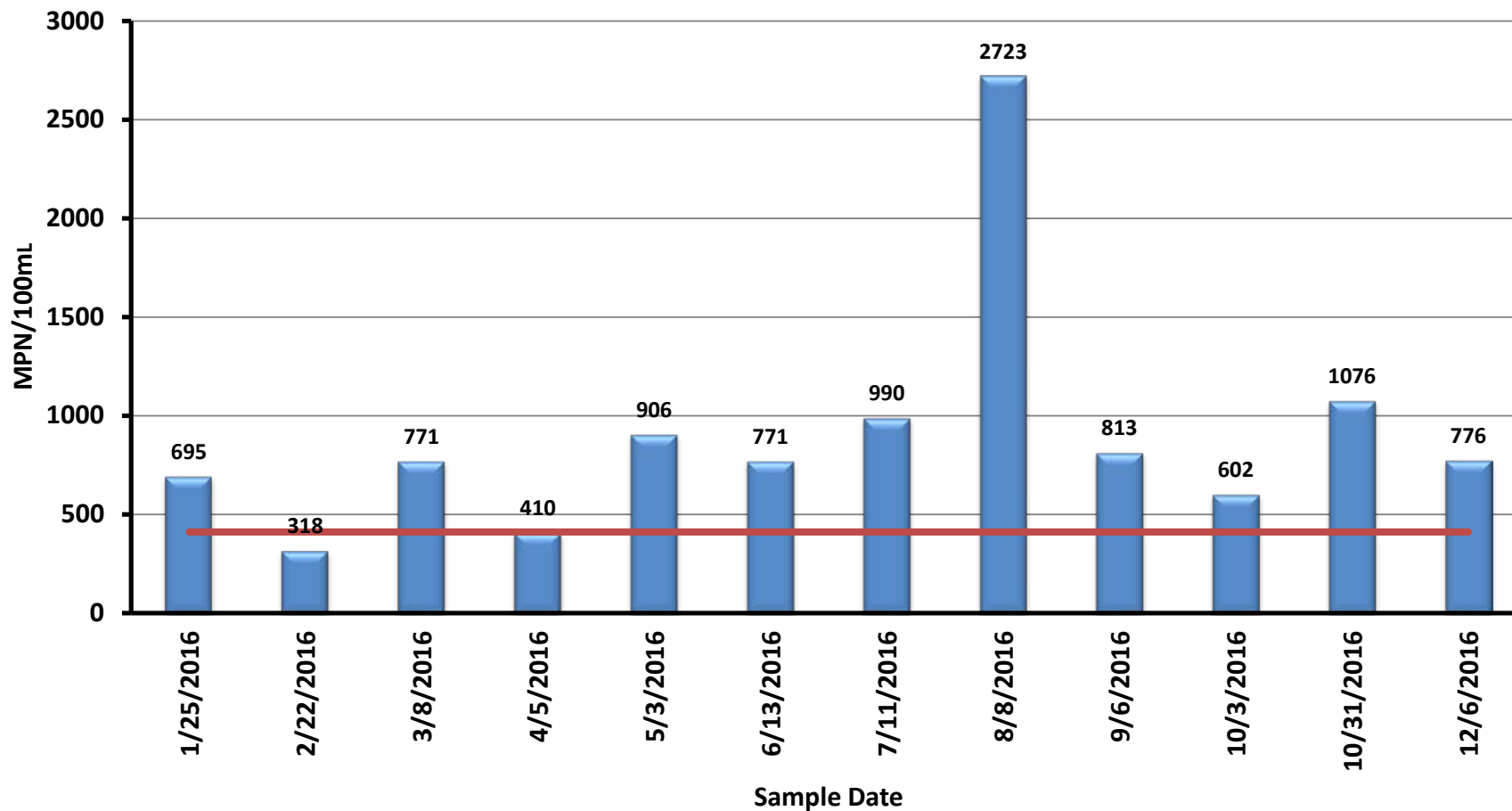
Figure 9. 2016 BPCP Carpenter Creek *E.coli* results for Davis Highway (33020050) sampling location.
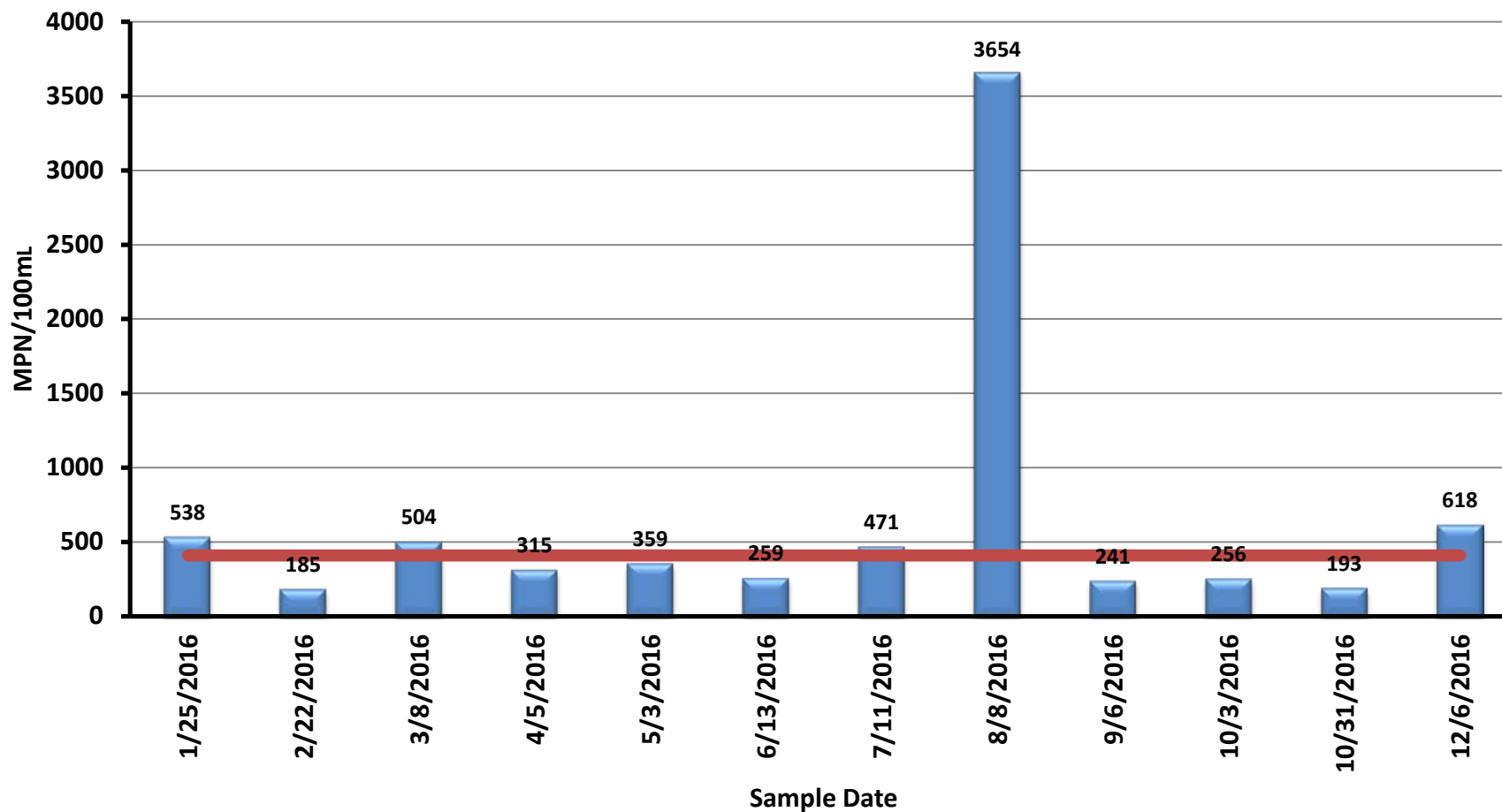
Figure 10. 2016 BPCP Carpenter Creek *E.coli* results for Brent Lane (33020058) sampling location.
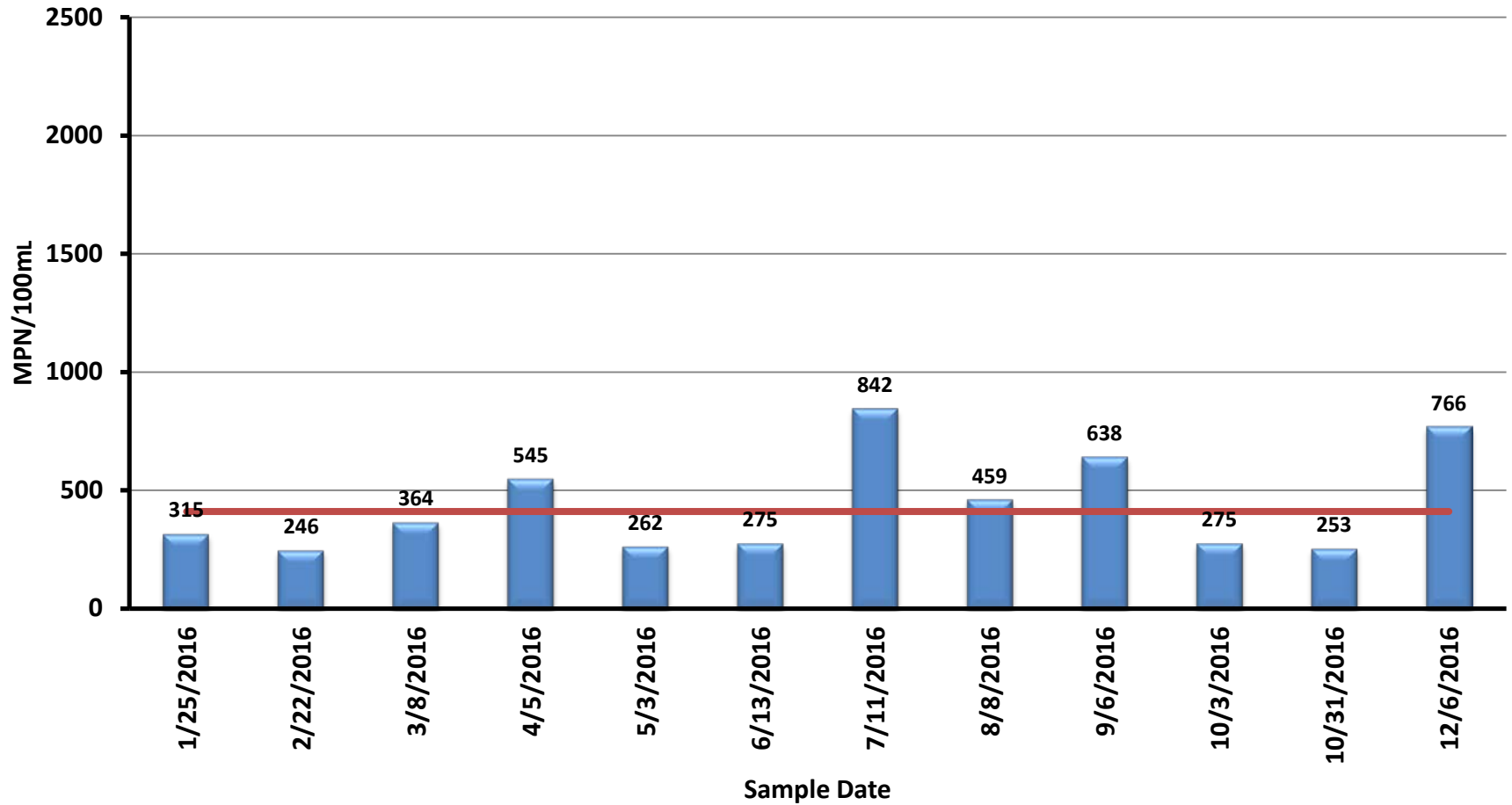
Figure 11. 2016 BPCP Carpenter Creek *E.coli* results for Ninth Avenue (33020048) sampling location.