Addendum to the Haw River TMDL for Reedy Fork Fecal Coliform Impairment in the Haw River Watershed

EPA Approved July 9, 2018

Waterbody ID: 16-11-(9)b

Cape Fear River Basin

Submitted by:
NC Department of Environmental Quality
Division of Water Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

Introduction

The North Carolina Division of Water Resources (DWR) developed a Total Daily Maximum Load (TMDL) for the Haw River in January 2005 to address fecal coliform and turbidity impairments. This TMDL also included impairments in the Deep River, Dan River, and Third Fork Creek. The TMDL was approved by EPA Region 4 on January 11, 2005.

This addendum to the Haw River TMDL includes a segment of Reedy Fork [16-11-(9)b] which has been listed on North Carolina's 303(d) list since 2006 for fecal coliform. Reedy Fork is a tributary to the Haw River (Figure 1) and waste load (WLA) and load allocations (LA) for point and nonpoint sources in the Reedy Fork Watershed have been assigned through the Haw River TMDL. The original impaired Haw River segment is now meeting water quality standards for fecal coliform at DWR Ambient Monitoring Station (AMS) B1140000.

Watershed Description

The Reedy Fork Watershed is located mostly within Guilford County, NC covering 255 square miles. Within the watershed, North and South Buffalo Creeks drain the majority of downtown Greensboro then join to form Buffalo Creek, which flows through primarily agricultural and forested land, and finally joins Reedy Fork nine miles before the confluence with the Haw River.

Reedy Fork itself spans the northern portion of the watershed flowing through suburban areas around Lake Brandt and Lake Townsend and agricultural and forested land east of Lake Townsend.

The 2011 National Land Cover Dataset (NLCD) coverage for the watershed is 46% developed (all developed classes), 18% Agricultural (pasture/hay and cultivated crops), and 30% forest (deciduous and evergreen).

Water Quality Target

The North Carolina fresh water quality standard for Class WS-IV NSW waters for fecal coliform (15A NCAC 02B.0211) states:

> *Organisms of the coliform group: Fecal coliforms shall not exceed a geometric mean of 200/100mL (MF count) based upon at least five consecutive samples examined during any 30-day period, nor exceed 400/100mL in more than 20 percent of the samples examined during such period; violations of the fecal coliform standard are expected during rainfall events and, in some cases, this violation is expected to be caused by uncontrollable nonpoint source pollution. All coliform concentrations are to be analyzed using the membrane filter technique unless high turbidity or other adverse conditions necessitate the tube dilution method; in case of controversy over results, the MPN 5-tube dilution technique will be used as the reference method.*

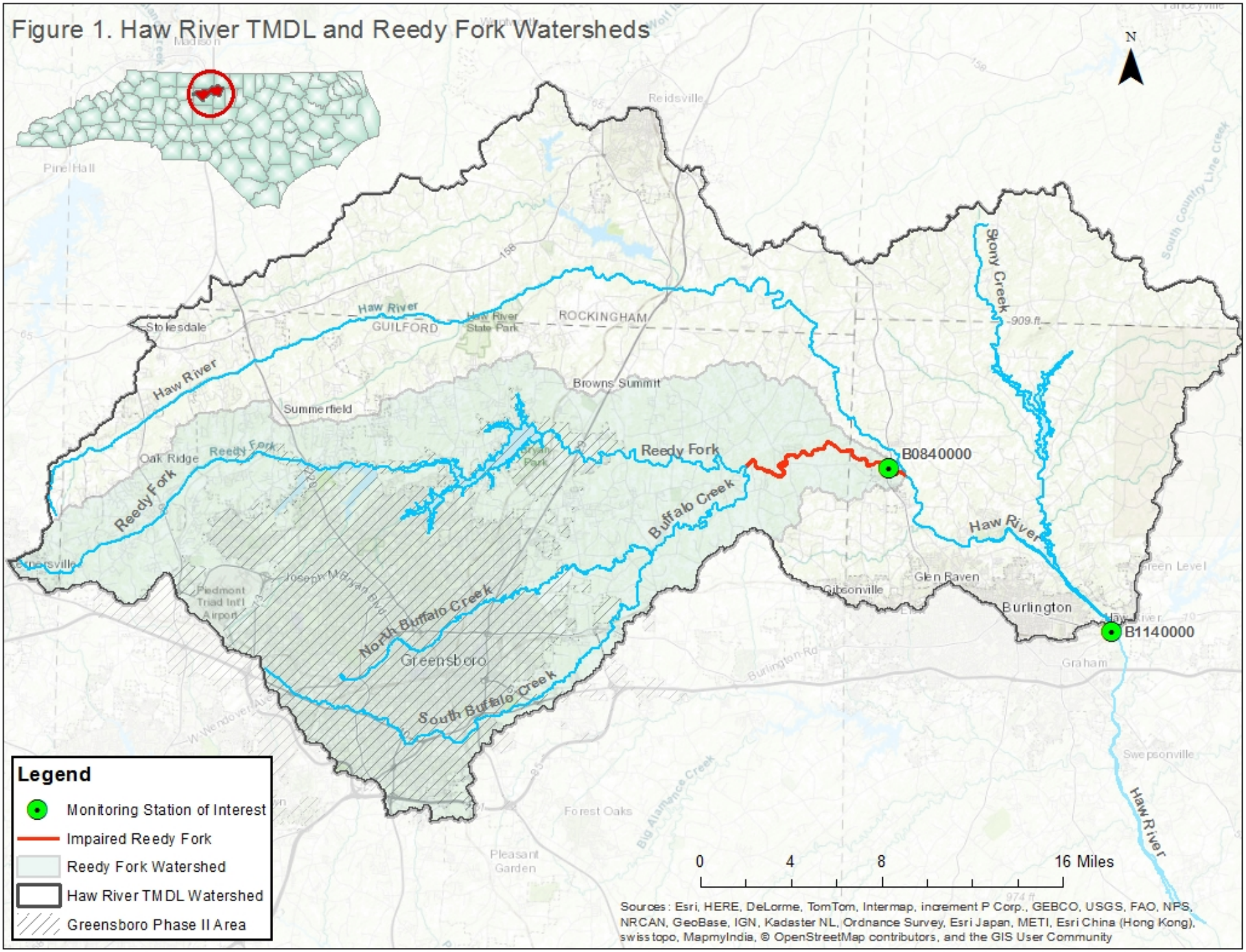


Figure 1. Haw River TMDL and Reedy Fork Watersheds
N
Haw River
Stony Creek
Reedy Fork
Buffalo Creek
North Buffalo Creek
South Buffalo Creek
B0840000
B1140000
Stokesdale
GUILFORD
ROCKINGHAM
Haw River State Park
Browns Summit
Summerfield
Oak Ridge
Reidsville
Gibsonville
Glen Raven
Burlington
Graham
Greensboro
Pleasant Garden
Forest Oaks
Piedmont Triad Intl Airport
Joseph M. Bryan Blvd
Burlington Rd
Legend
Monitoring Station of Interest
Impaired Reedy Fork
Reedy Fork Watershed
Haw River TMDL Watershed
Greensboro Phase II Area
0
4
8
16 Miles
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Documentation of Impairment

Reedy Fork AMS station B0840000 was sampled frequently as part of a larger monitoring study in May through July of 2002. The results showed rolling geometric means of at least five samples in 30 days ranging from 462 to 811 cfu/100ml. This sampling study resulted in Reedy Fork being included on North Carolina's 303(d) list in 2006.

In July and August of 2017, DWR conducted a new fecal coliform sampling study for Reedy Fork to reassess the impairment status. This sampling resulted in a five-sample geometric mean of 226 cfu/100ml, again exceeding the geometric mean portion of the fecal coliform standard.

Water Quality Monitoring and Trends Post TMDL

Both AMS stations B0840000 (Reedy Fork) and B1140000 (Haw River) are sampled monthly. Box plot summaries and a table of fecal coliform monitoring results are provided in Appendix A. In addition, DWR used this data to conduct a trend analysis for Reedy Fork and Haw River stations using the Seasonal Kendall trend analysis at alpha 0.05 (95 percent confidence) for years 2005-2016. This data window was chosen as the year of TMDL approval and up to the most recent complete year of data available. Results of this trend analysis (Appendix A) did not show statistically discernable trends for both stations.

Source Assessment

General sources of fecal coliform can include both urban and agricultural sources, human and non-human. Nonpoint sources of fecal coliform include wildlife, livestock (land application of agricultural manure and grazing), urban development, failing septic systems, and sewer line systems (illicit connections, leaky sewer lines and sewer system overflows). Point sources of fecal coliform consist primarily of wastewater treatment plant effluent and Municipal Separate Storm Sewer Systems (MS4s).

A more detailed source assessment is provided in section 3.1 of the TMDL.

TMDL Reductions

The Haw River TMDL determined that an approximate 77% reduction in fecal coliform was needed to meet water quality standards. The wasteload allocation included the City of Greensboro MS4 as well as 24 NPDES dischargers. Some changes in NPDES wastewater permits have occurred in the Haw River watershed since the TMDL was approved. The City of Greensboro North Buffalo Creek WWTP closed on October 6, 2017, and all wastewater flow for the City of Greensboro is now being received and treated at the T.Z. Osborne WWTP (NC0047384). Overall, of the 24 dischargers, only 16 facilities remain active dischargers with no new wastewater dischargers in the watershed. The required watershed reductions specified in the EPA approved TMDL are expected to achieve water quality standards in the addendum-impaired section of the creek. Regular monitoring at ambient stations B0840000 (Reedy Fork) and B1140000 (Haw River) will continue to provide a measure of progress towards meeting TMDL goals.

The City of Greensboro continues to implement multiple projects to limit or treat stormwater runoff, thus limiting the amount of fecal coliform entering North and South Buffalo Creeks. Information about Greensboro's initiatives can be found on their Stormwater Programs and Projects website.

DWR may reevaluate the need for a specific TMDL for the creek if the required reduction is determined to be insufficient.

Public Participation

A draft of the Haw River TMDL was placed on public notice for approximately one month between September and October of 2004. Notices of the TMDL comment period were published in several newspapers including the Greensboro News and Record and also on DWR's website.

A draft of this addendum to the Haw River TMDL was publicly noticed through the DWR TMDL listserv, Water Resources Research Institute listserv, and the DWR Public Events Calendar from May 1, 2018 through June 5, 2018. The addendum was also available on DWR's TMDL website during the comment period. No comments were received. A copy of this notice is provided in Appendix B

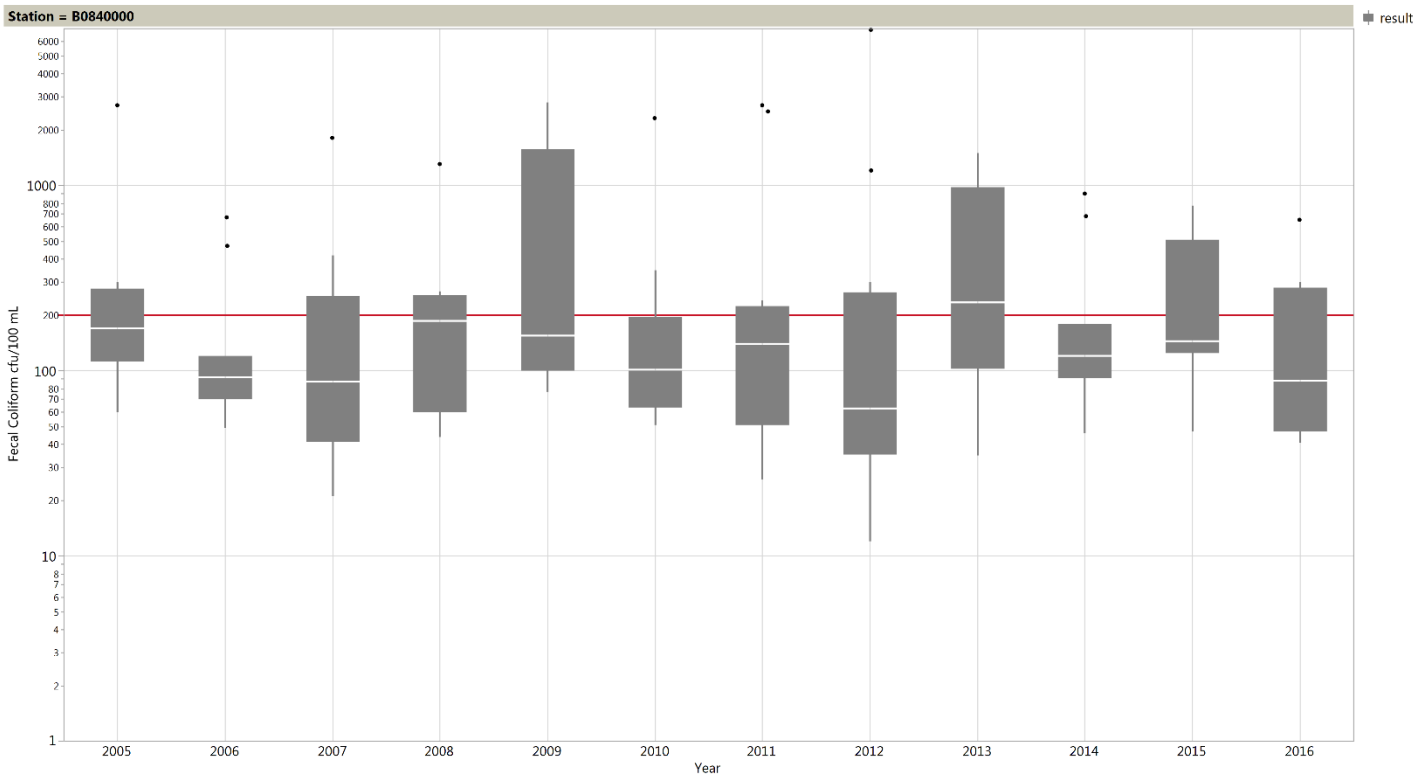
Appendix A

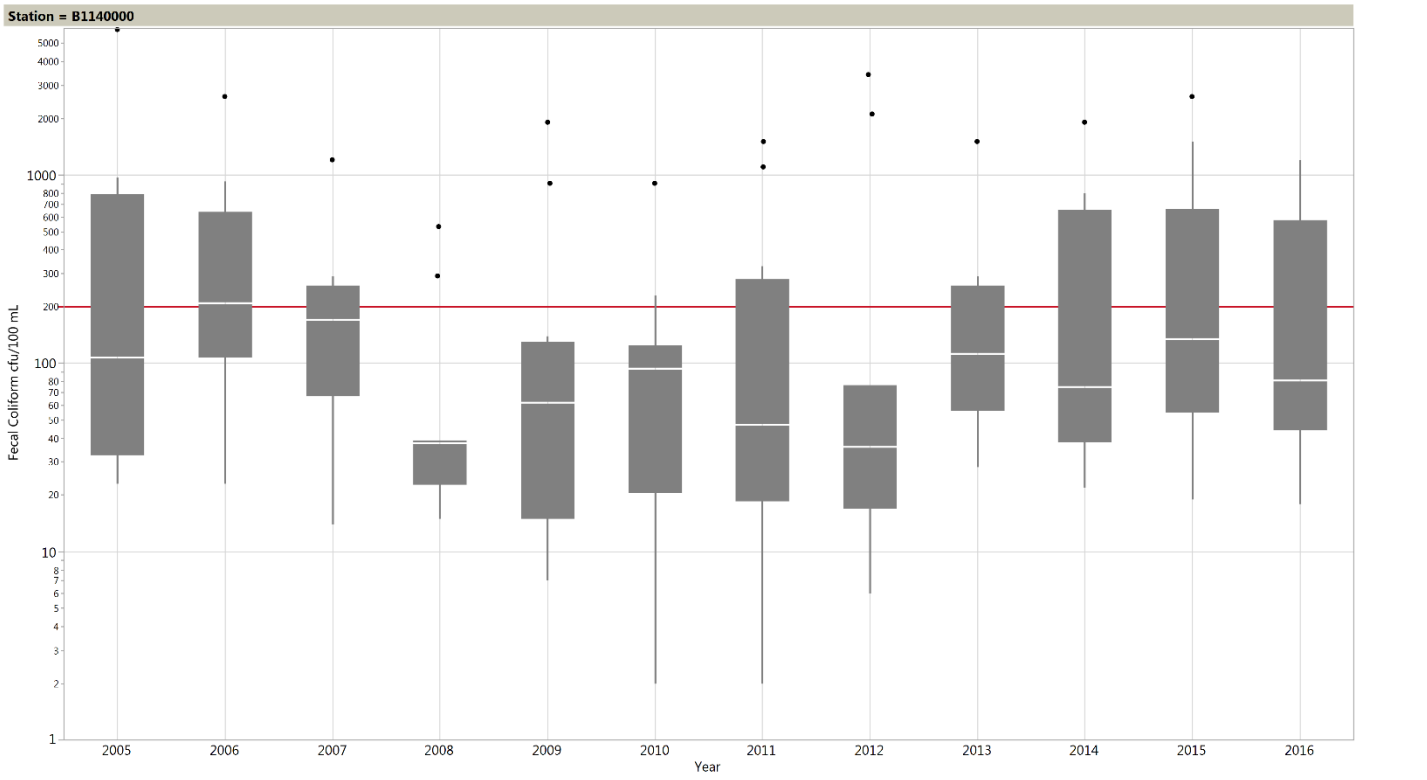
Fecal Coliform Concentration Box Plots

Data Tables

Seasonal Kendall Trend Results

Fecal Coliform Concentration Box Plots 2005-2016





Station	Date	Result	Unit		Station	Date	Result	Unit
B0840000	5/18/2005	120	cfu/100mL		B0840000	1/6/2011	49	cfu/100mL
B0840000	6/7/2005	240	cfu/100mL		B0840000	2/14/2011	26	cfu/100mL
B0840000	7/7/2005	120	cfu/100mL		B0840000	3/1/2011	2500	cfu/100mL
B0840000	8/15/2005	300	cfu/100mL		B0840000	4/11/2011	240	cfu/100mL
B0840000	10/4/2005	170	cfu/100mL		B0840000	5/16/2011	100	cfu/100mL
B0840000	11/17/2005	170	cfu/100mL		B0840000	6/8/2011	44	cfu/100mL
B0840000	12/6/2005	2700	cfu/100mL		B0840000	7/14/2011	170	cfu/100mL
B0840000	1/10/2006	54	cfu/100mL		B0840000	8/16/2011	140	cfu/100mL
B0840000	2/9/2006	49	cfu/100mL		B0840000	9/13/2011	140	cfu/100mL
B0840000	3/9/2006	73	cfu/100mL		B0840000	10/5/2011	170	cfu/100mL
B0840000	4/17/2006	70	cfu/100mL		B0840000	11/16/2011	57	cfu/100mL
B0840000	5/4/2006	120	cfu/100mL		B0840000	12/8/2011	2700	cfu/100mL
B0840000	6/6/2006	93	cfu/100mL		B0840000	1/10/2012	77	cfu/100mL
B0840000	8/2/2006	97	cfu/100mL		B0840000	2/13/2012	12	cfu/100mL
B0840000	8/15/2006	120	cfu/100mL		B0840000	3/5/2012	97	cfu/100mL
B0840000	9/6/2006	670	cfu/100mL		B0840000	4/30/2012	47	cfu/100mL
B0840000	10/9/2006	470	cfu/100mL		B0840000	5/14/2012	300	cfu/100mL
B0840000	12/12/2006	77	cfu/100mL		B0840000	6/6/2012	160	cfu/100mL
B0840000	1/2/2007	420	cfu/100mL		B0840000	7/5/2012	42	cfu/100mL
B0840000	2/14/2007	1800	cfu/100mL		B0840000	8/6/2012	48	cfu/100mL
B0840000	3/13/2007	21	cfu/100mL		B0840000	9/4/2012	6900	cfu/100mL
B0840000	4/9/2007	34	cfu/100mL		B0840000	10/16/2012	1200	cfu/100mL
B0840000	5/7/2007	260	cfu/100mL		B0840000	11/7/2012	33	cfu/100mL
B0840000	6/7/2007	230	cfu/100mL		B0840000	12/5/2012	27	cfu/100mL
B0840000	7/12/2007	65	cfu/100mL		B0840000	1/2/2013	110	cfu/100mL
B0840000	8/6/2007	37	cfu/100mL		B0840000	2/6/2013	190	cfu/100mL
B0840000	9/5/2007	55	cfu/100mL		B0840000	3/5/2013	46	cfu/100mL
B0840000	10/3/2007	55	cfu/100mL		B0840000	4/17/2013	120	cfu/100mL
B0840000	11/15/2007	160	cfu/100mL		B0840000	5/21/2013	1100	cfu/100mL
B0840000	11/29/2007	110	cfu/100mL		B0840000	6/10/2013	280	cfu/100mL
B0840000	1/9/2008		cfu/100mL		B0840000	7/8/2013	1500	cfu/100mL
B0840000	2/6/2008	250	cfu/100mL		B0840000	7/30/2013	1500	cfu/100mL
B0840000	3/10/2008	220	cfu/100mL		B0840000	9/3/2013	600	cfu/100mL
B0840000	4/9/2008	180	cfu/100mL		B0840000	10/21/2013	100	cfu/100mL
B0840000	5/8/2008	54	cfu/100mL		B0840000	11/4/2013	35	cfu/100mL
B0840000	6/16/2008		cfu/100mL		B0840000	12/9/2013	620	cfu/100mL
B0840000	7/7/2008	270	cfu/100mL		B0840000	1/14/2014	680	cfu/100mL
B0840000	8/25/2008	44	cfu/100mL		B0840000	2/10/2014	46	cfu/100mL
B0840000	9/2/2008	190	cfu/100mL		B0840000	3/6/2014	58	cfu/100mL
B0840000	10/6/2008	110	cfu/100mL		B0840000	4/23/2014	91	cfu/100mL
B0840000	11/3/2008	62	cfu/100mL		B0840000	5/5/2014	100	cfu/100mL
B0840000	12/1/2008	1300	cfu/100mL		B0840000	6/9/2014	180	cfu/100mL
B0840000	1/6/2009	2800	cfu/100mL		B0840000	7/14/2014	100	cfu/100mL
B0840000	2/2/2009	120	cfu/100mL		B0840000	8/4/2014	150	cfu/100mL
B0840000	3/9/2009	110	cfu/100mL		B0840000	9/8/2014	140	cfu/100mL
B0840000	4/6/2009	140	cfu/100mL		B0840000	10/1/2014	180	cfu/100mL
B0840000	5/5/2009	270	cfu/100mL		B0840000	11/18/2014	900	cfu/100mL
B0840000	6/4/2009	2000	cfu/100mL		B0840000	12/9/2014	92	cfu/100mL
B0840000	7/6/2009	97	cfu/100mL		B0840000	1/13/2015	780	cfu/100mL
B0840000	8/6/2009	77	cfu/100mL		B0840000	2/10/2015	120	cfu/100mL
B0840000	9/10/2009	77	cfu/100mL		B0840000	3/11/2015	47	cfu/100mL
B0840000	10/19/2009	170	cfu/100mL		B0840000	5/12/2015	150	cfu/100mL
B0840000	10/28/2009	2000	cfu/100mL		B0840000	7/6/2015	290	cfu/100mL
B0840000	12/2/2009	190	cfu/100mL		B0840000	8/11/2015	580	cfu/100mL
B0840000	1/5/2010	350	cfu/100mL		B0840000	10/13/2015	140	cfu/100mL
B0840000	2/8/2010	180	cfu/100mL		B0840000	11/23/2015	140	cfu/100mL
B0840000	3/1/2010	67	cfu/100mL		B0840000	2/17/2016	300	cfu/100mL
B0840000	4/27/2010	62	cfu/100mL		B0840000	3/30/2016	180	cfu/100mL
B0840000	5/10/2010	73	cfu/100mL		B0840000	4/18/2016	44	cfu/100mL
B0840000	6/9/2010	68	cfu/100mL		B0840000	5/25/2016	84	cfu/100mL
B0840000	7/12/2010	60	cfu/100mL		B0840000	6/28/2016	280	cfu/100mL
B0840000	8/25/2010	200	cfu/100mL		B0840000	7/21/2016	240	cfu/100mL
B0840000	9/23/2010	51	cfu/100mL		B0840000	8/30/2016	650	cfu/100mL
B0840000	10/14/2010	130	cfu/100mL		B0840000	9/21/2016	88	cfu/100mL
B0840000	11/2/2010	130	cfu/100mL		B0840000	10/26/2016	47	cfu/100mL
B0840000	12/2/2010	2300	cfu/100mL		B0840000	11/21/2016	41	cfu/100mL
					B0840000	12/19/2016	54	cfu/100mL

Station	Date	Result	Unit		Station	Date	Result	Unit
B1140000	1/18/2005	970	cfu/100mL		B1140000	1/19/2011	2	cfu/100mL
B1140000	3/21/2005	28	cfu/100mL		B1140000	2/3/2011	18	cfu/100mL
B1140000	4/6/2005	23	cfu/100mL		B1140000	3/7/2011	1100	cfu/100mL
B1140000	5/11/2005	190	cfu/100mL		B1140000	4/12/2011	330	cfu/100mL
B1140000	6/20/2005	140	cfu/100mL		B1140000	5/5/2011	1500	cfu/100mL
B1140000	7/11/2005	730	cfu/100mL		B1140000	6/8/2011	13	cfu/100mL
B1140000	8/22/2005	75	cfu/100mL		B1140000	7/21/2011	42	cfu/100mL
B1140000	10/6/2005	73	cfu/100mL		B1140000	8/29/2011	44	cfu/100mL
B1140000	11/8/2005	34	cfu/100mL		B1140000	9/27/2011	130	cfu/100mL
B1140000	12/6/2005	5900	cfu/100mL		B1140000	10/6/2011	51	cfu/100mL
B1140000	1/18/2006	360	cfu/100mL		B1140000	11/1/2011	20	cfu/100mL
B1140000	2/9/2006	100	cfu/100mL		B1140000	12/7/2011	53	cfu/100mL
B1140000	3/9/2006	23	cfu/100mL		B1140000	1/10/2012	29	cfu/100mL
B1140000	4/17/2006	230	cfu/100mL		B1140000	2/28/2012	39	cfu/100mL
B1140000	5/9/2006	930	cfu/100mL		B1140000	3/6/2012	17	cfu/100mL
B1140000	6/7/2006	31	cfu/100mL		B1140000	4/16/2012	7	cfu/100mL
B1140000	7/20/2006	200	cfu/100mL		B1140000	5/10/2012	3400	cfu/100mL
B1140000	8/9/2006	130	cfu/100mL		B1140000	6/18/2012	38	cfu/100mL
B1140000	9/26/2006	730	cfu/100mL		B1140000	7/5/2012	6	cfu/100mL
B1140000	10/19/2006	220	cfu/100mL		B1140000	8/29/2012	2100	cfu/100mL
B1140000	11/13/2006	2600	cfu/100mL		B1140000	10/18/2012	36	cfu/100mL
B1140000	12/4/2006	190	cfu/100mL		B1140000	11/19/2012	77	cfu/100mL
B1140000	2/5/2007	1200	cfu/100mL		B1140000	12/11/2012	33	cfu/100mL
B1140000	3/1/2007	260	cfu/100mL		B1140000	1/22/2013	290	cfu/100mL
B1140000	4/18/2007	190	cfu/100mL		B1140000	2/13/2013	160	cfu/100mL
B1140000	5/10/2007	250	cfu/100mL		B1140000	3/7/2013	170	cfu/100mL
B1140000	6/6/2007	290	cfu/100mL		B1140000	4/9/2013	28	cfu/100mL
B1140000	7/12/2007	170	cfu/100mL		B1140000	5/7/2013	1500	cfu/100mL
B1140000	8/14/2007	29	cfu/100mL		B1140000	6/5/2013	84	cfu/100mL
B1140000	9/20/2007	70	cfu/100mL		B1140000	7/17/2013	140	cfu/100mL
B1140000	10/2/2007	67	cfu/100mL		B1140000	8/8/2013	83	cfu/100mL
B1140000	11/6/2007	140	cfu/100mL		B1140000	9/24/2013	64	cfu/100mL
B1140000	12/6/2007	14	cfu/100mL		B1140000	10/15/2013	53	cfu/100mL
B1140000	1/8/2008	39	cfu/100mL		B1140000	11/21/2013	38	cfu/100mL
B1140000	2/12/2008	38	cfu/100mL		B1140000	12/2/2013	290	cfu/100mL
B1140000	3/4/2008	38	cfu/100mL		B1140000	1/15/2014	260	cfu/100mL
B1140000	4/15/2008	15	cfu/100mL		B1140000	2/3/2014	50	cfu/100mL
B1140000	5/6/2008	29	cfu/100mL		B1140000	3/27/2014	22	cfu/100mL
B1140000	6/24/2008	530	cfu/100mL		B1140000	4/14/2014	1900	cfu/100mL
B1140000	7/22/2008	39	cfu/100mL		B1140000	5/14/2014	36	cfu/100mL
B1140000	8/5/2008	22	cfu/100mL		B1140000	6/4/2014	38	cfu/100mL
B1140000	9/23/2008	22	cfu/100mL		B1140000	7/7/2014	49	cfu/100mL
B1140000	10/7/2008	25	cfu/100mL		B1140000	8/12/2014	650	cfu/100mL
B1140000	11/4/2008	37	cfu/100mL		B1140000	9/4/2014	800	cfu/100mL
B1140000	12/2/2008	290	cfu/100mL		B1140000	10/2/2014	88	cfu/100mL
B1140000	1/26/2009	41	cfu/100mL		B1140000	12/2/2014	75	cfu/100mL
B1140000	2/12/2009	14	cfu/100mL		B1140000	1/6/2015	68	cfu/100mL
B1140000	3/12/2009	7	cfu/100mL		B1140000	2/3/2015	54	cfu/100mL
B1140000	4/13/2009	100	cfu/100mL		B1140000	3/2/2015	100	cfu/100mL
B1140000	5/18/2009	140	cfu/100mL		B1140000	3/31/2015	19	cfu/100mL
B1140000	6/8/2009	90	cfu/100mL		B1140000	5/6/2015	39	cfu/100mL
B1140000	7/8/2009	10	cfu/100mL		B1140000	6/10/2015	58	cfu/100mL
B1140000	9/1/2009	83	cfu/100mL		B1140000	7/13/2015	230	cfu/100mL
B1140000	9/15/2009	18	cfu/100mL		B1140000	8/6/2015	210	cfu/100mL
B1140000	10/8/2009	40	cfu/100mL		B1140000	9/22/2015	170	cfu/100mL
B1140000	11/3/2009	900	cfu/100mL		B1140000	9/29/2015	1500	cfu/100mL
B1140000	12/9/2009	1900	cfu/100mL		B1140000	10/29/2015	2600	cfu/100mL
B1140000	1/12/2010	900	cfu/100mL		B1140000	11/30/2015	800	cfu/100mL
B1140000	2/3/2010	130	cfu/100mL		B1140000	1/27/2016	520	cfu/100mL
B1140000	3/9/2010	2	cfu/100mL		B1140000	2/9/2016	69	cfu/100mL
B1140000	4/28/2010	15	cfu/100mL		B1140000	3/29/2016	1200	cfu/100mL
B1140000	5/12/2010	34	cfu/100mL		B1140000	4/21/2016	18	cfu/100mL
B1140000	6/28/2010	100	cfu/100mL		B1140000	5/25/2016	160	cfu/100mL
B1140000	7/19/2010	230	cfu/100mL		B1140000	6/28/2016	1100	cfu/100mL
B1140000	8/16/2010	90	cfu/100mL		B1140000	7/21/2016	81	cfu/100mL
B1140000	9/14/2010	52	cfu/100mL		B1140000	8/30/2016	68	cfu/100mL
B1140000	10/5/2010	97	cfu/100mL		B1140000	9/21/2016	580	cfu/100mL
B1140000	11/18/2010	16	cfu/100mL		B1140000	11/3/2016	44	cfu/100mL
B1140000	12/7/2010	110	cfu/100mL		B1140000	12/20/2016	43	cfu/100mL

Seasonal Kendall Trend Analysis Results

station	trend_n	trend_years	kendall_sum	zscore	zprob	trend	season	sen_slope	lo_confidence	hi_confidence
B0840000	134	12	-36	-0.067	0.946	insignificant	non-seasonal	1.101252603	-2.587770107	9.072703689
B1140000	138	12	148	0.271	0.787	insignificant	non-seasonal	0.41634981	-4.111196147	4.275630477

Appendix B

Copy of Public Notice

From: denr.dwq.tmdl303d-bounces@lists.ncmail.net <denr.dwq.tmdl303d-bounces@lists.ncmail.net> on behalf of public notice TMDLs, 303d lists, or 303d listing methodology <denr.dwq.tmdl303d@lists.ncmail.net>
Sent: Tuesday, May 1, 2018 3:28 PM
To: NCDENR.denr.dwq.TMDL303d
Subject: TMDL/303(d) Info - Public Comment Period - Draft Addendum to the Haw River Fecal Coliform TMDL

North Carolina Department of Environmental Quality
Division of Water Resources

Draft Addendum to the Haw River Fecal Coliform TMDL to Include Reedy Fork Fecal Coliform Impairment

Now Available for Public Comment

The draft Addendum proposes that the fecal coliform standard is expected to be met within the impaired Reedy Fork segment by implementation of the existing Haw River Fecal Coliform TMDL. No additional load reductions or other requirements are proposed.

The Draft Addendum document can be found at:
https://files.nc.gov/ncdeq/Water%20Quality/Planning/TMDL/Draft%20TMDLs/CapeFear/Haw%20River%20Addendum%20TMDL4.30.183.pdf

The draft Addendum was developed to meet requirements of Section 303(d) of the Federal Water Pollution Control Act. It is subject to approval by EPA.

Interested parties are invited to comment on the draft Addendum by June 5, 2018. Comments should be directed to Andy Painter at andy.painter@ncdenr.gov.

Andy Painter
Division of Water Resources – Modeling and Assessment Branch
North Carolina Department of Environmental Quality

919-807-6409
andy.painter@ncdenr.gov

1611 Mail Service Center
Raleigh, NC 27699-1611