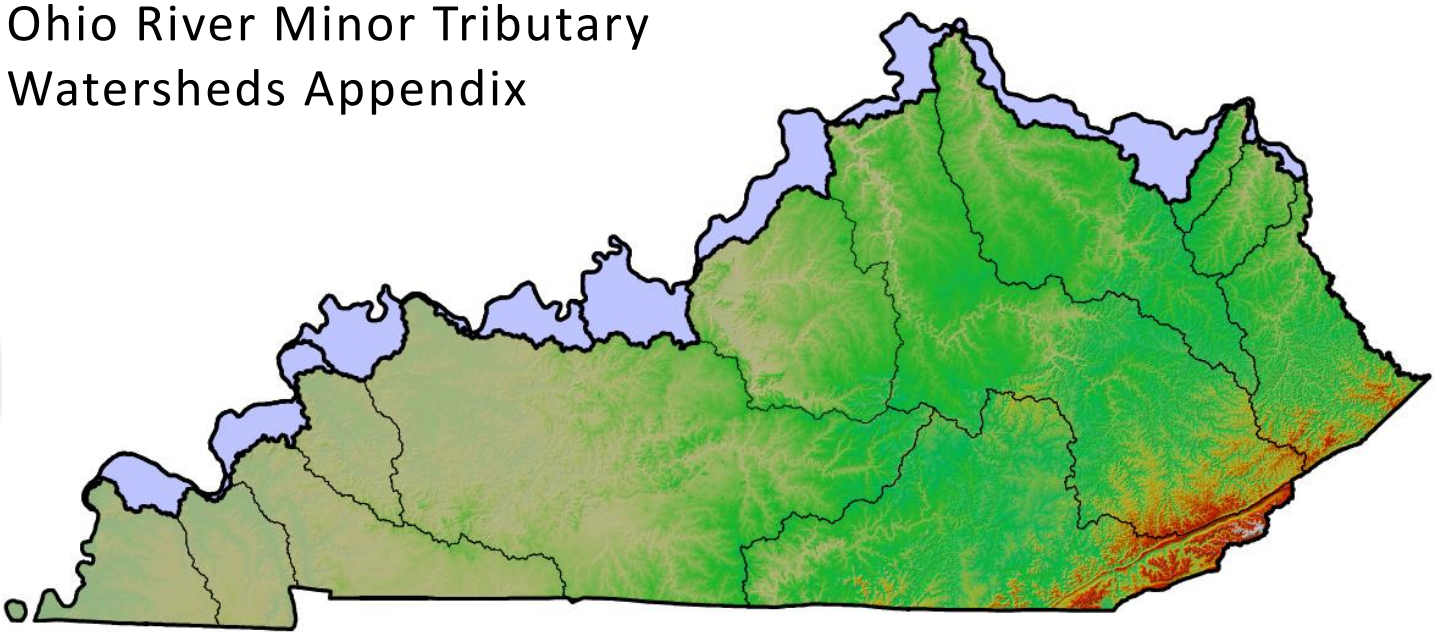
Addendum to
Kentucky Statewide Total Maximum Daily Load
for ***Bacteria*** *Impaired Waters*:

Ohio River Minor Tributary Watersheds Appendix



Final
August 2022

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TEAM KENTUCKY
ENERGY AND ENVIRONMENT CABINET

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TEAM KENTUCKY
ENERGY AND ENVIRONMENT CABINET

Addendum to Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters: Ohio River Minor Tributary Watersheds Appendix

Final
August 2022

Kentucky Department for Environmental Protection
Division of Water
Frankfort, Kentucky

This report is approved for release

Carey Johnson, Director
Division of Water

August 9, 2022

TEAM KENTUCKY
ENERGY AND ENVIRONMENT CABINET

DOCUMENT REVISION HISTORY

Date of Revision	Section(s) Revised	Revision Explanation

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

Co.	County
CSO	Combined Sewer Overflow
CWA	Clean Water Act
DOW	Kentucky Division of Water
EEC	Kentucky Energy and Environment Cabinet
EPA	United States Environmental Protection Agency
HUC	Hydrologic Unit Code
KAR	Kentucky Administrative Regulations
KPDES	Kentucky Pollutant Discharge Elimination System
LA	Load Allocation
ml	Milliliter
MOS	Margin of Safety
MS4	Municipal Separate Storm Sewer System
NHD	National Hydrography Dataset
PCR	Primary Contact Recreation
RM	River Mile
SCR	Secondary Contact Recreation
SWS	Sanitary Wastewater System
TMDL	Total Maximum Daily Load
WLA	Wasteload Allocation
WQC	Water Quality Criteria
SWQMP	Storm Water Quality Management Plan

1.0 INTRODUCTION

The *Kentucky Statewide Total Maximum Daily Load* (TMDL) *for Bacteria Impaired Waters* is a new type of TMDL report that will address bacteria-impaired waters on Kentucky's 303(d) list in one streamlined report (DOW 2019). This new type of TMDL report will consist of a core document and a set of addendums. Initially, there will be a corresponding appendix for each of the 13 major river basins in Kentucky. Each appendix will contain TMDLs for the bacteria-impaired segments within that basin as of the 2016 303(d) list (i.e. the most recent approved 303(d) list used to prioritize waters for TMDL development under EPA's 303(d) Program Long-Term Vision). The core background and methodology document and first river basin appendices (Green River and Tradewater River) were approved in 2019 by the U.S. Environmental Protection Agency (EPA). Six river basin appendices (Big Sandy River, Little Sandy River, Tygarts Creek, Kentucky River, Licking River, and Salt River) were approved in 2021 by EPA. This addendum adds one new river basin appendix and provides references or updates where appropriate to the core background and methodology document.

1.1 Overview of Section 303(d) of the Clean Water Act

The Clean Water Act (CWA) requires states to designate uses for surface waters within their jurisdiction and to establish water quality standards to protect those designated uses. The designated uses assigned to waterbodies in Kentucky can be found in Kentucky Administrative Regulations (KAR) at 401 KAR 10:026. The water quality standards can be found at 401 KAR 10:031.

Section 303(d) of the CWA requires states to develop a list of impaired waters called the 303(d) list. Waterbodies placed on the 303(d) list have been assessed, have one or more designated uses impaired by one or more pollutants, and require the development of a TMDL for each pollutant causing an impairment. The TMDL establishes the allowable amount (i.e., load) of the pollutant the waterbody can naturally assimilate while continuing to meet the water quality standards for each designated use. Additional information on TMDLs can be found on the EPA website.

The Kentucky Division of Water (DOW) submits the 303(d) list to the EPA during even-numbered years. Each submittal replaces the previous list. Listings of bacteria-impaired segments can be found in DOW's most recent *Integrated Report to Congress on the Condition of Water Resources in Kentucky* and associated supplementary workbook.

1.2 Purpose of this Addendum

The purpose of this addendum is to:

- Add an appendix to the *Kentucky Statewide TMDL for Bacteria Impaired Waters* for the Ohio River minor tributary watersheds
- Add TMDLs for 49 stream segments listed as impaired for bacteria as of Kentucky's 2016 303(d) list

- Provide the waterbody-specific information for all bacteria-impaired stream segments addressed by a TMDL in this addendum

This addendum is not a stand-alone document. The method for developing a TMDL for each of the bacteria-impaired segments within this addendum (including general information and the TMDL loadings) can be found in the core TMDL document that was approved in 2019.

If an approved TMDL report existed for a bacteria-impaired segment within the Ohio River minor tributary watersheds prior to the development of this addendum that TMDL report is still in effect and can be found on the Watershed-Scale TMDL Reports list.

DOW will provide public notice and seek comment when subsequent addendums are added to the Statewide Bacteria TMDL.

For more information, please review the Statewide Bacteria Fact Sheet [PDF, 1.1 MB] or contact the TMDL Program at TMDL@ky.gov or call (502) 564-3410.

In accordance with EPA's 303(d) Program Long-Term Vision, DOW recognizes that in some cases activities to address water quality impairments are already in the planning stages or underway. Where these activities are on track to fully restore water quality, the development of a TMDL may temporarily be given a lower priority while an alternative restoration plan is being pursued. Some Kentucky stream segments have been identified as good candidates for such alternative approaches. Footnotes in Table J.1 identify waters in this basin where a TMDL is not being developed at this time because an alternative restoration plan is under development or already in place.

1.3 Where to Find TMDL Information for this Addendum

The appendices within this addendum rely upon the core TMDL document for TMDL development. The bacteria TMDL water quality criteria (WQC) for all surface waters in Kentucky are promulgated in 401 KAR 10:031, which in Section 7(1)(a) states that for the Primary Contact Recreation (PCR) use and season (May 1-October 31),

Escherichia coli content shall not exceed 130 colonies per 100 ml as a geometric mean based on not less than five (5) samples taken during a thirty (30) day period. Content also shall not exceed 240 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period for Escherichia coli.

For the year-round Secondary Contact Recreation (SCR) use, Section 7(2)(a) states,

Fecal coliform content shall not exceed 1,000 colonies per 100 ml as a thirty (30) day geometric mean based on not less than five (5) samples; nor exceed 2,000 colonies per 100 ml in twenty (20) percent or more of all samples taken during a thirty (30) day period.

The bacteria WQC are summarized below in Table 1.3-1.

Table 1.3-1. Bacteria TMDL Water Quality Criteria for All Surface Waters[1]

Designated Use	Numeric Criterion
PCR	240 *E. coli* colonies/100 ml which must be met in at least 80% of all samples taken within a 30-day period during the Primary Contact Recreational season of May through October
PCR	130 *E. coli* colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period during the Primary Contact Recreational season of May through October
SCR	2000 fecal coliform colonies/100 ml which must be met in at least 80% of all samples taken within a 30-day period
SCR	1000 fecal coliform colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period

[1]The Primary Contact Recreation (PCR) designated use WQC are in effect from May 1 through October 31. The Secondary Contact Recreation (SCR) designated use WQC are in effect for the entire year.

Prior to November 1, 2019, PCR criteria also existed for fecal coliform. Those WQC are summarized in Table 1.3-2 for informational purposes. Prior to the expiration of the fecal coliform PCR criteria, several waterbodies in the Ohio River minor tributary watersheds had been assessed as failing to meet those WQC and were listed as impaired due to fecal coliform. On the 2018/2020 303(d) list, if insufficient *E. coli* data were available, these fecal coliform listings were replaced with the cause "pathogens" to reflect the impaired use. The TMDLs for waterbodies with pathogen impairments are calculated in this document using the *E. coli* criteria, since the *E. coli* WQC must be met for a waterbody to support the PCR designated use.

Table 1.3-2 Expired Fecal Coliform Water Quality Criteria

Designated Use	Numeric Criterion
PCR	400 fecal coliform colonies/100 ml which must be met in at least 80% of all samples taken within a 30-day period during the Primary Contact Recreational season of May through October
PCR	200 fecal coliform colonies/100 ml as a geometric mean based on not less than 5 samples taken within a 30-day period during the Primary Contact Recreational season of May through October

A list of TMDL elements and their location within this addendum or the core TMDL document is provided in Table 1.3-3.

Table 1.3-3 Where to Find Information in this Addendum and the Core TMDL Document

TMDL Element	Description	Location
Water Quality Standards	Describes recreational uses, water quality standards, and waterbody assessment	Sections 1.0 and 2.0 of Core TMDL
Water Quality Criteria	Provides the indicator bacteria used to assess pathogen levels in waterbodies and the bacteria standards for Kentucky's surface waters	Section 1.3 of this addendum
Physical Setting	Provides an overview of Kentucky's physical setting including soils, geology, and hydrology	Section 3.0 of Core TMDL
Source Assessment	Defines point and non-point sources of bacteria pollution and provides examples of bacteria sources that affect Kentucky's waterbodies	Section 4.0 of Core TMDL
Monitoring and Data Validation	Describes the types of data used for assessment and TMDL development	Section 5.0 of Core TMDL
TMDL Development	Provides a description of the TMDL calculation process and of required components such as the margin of safety factor, seasonality, and critical conditions	Section 6.0 of Core TMDL
Implementation	Provides a description of the implementation process (e.g. permit translation, development of watershed plans, coordination with local stakeholders, types of funding assistance and other resources)	Section 7.0 of Core TMDL
Public Participation	Provides a summary of the process used to solicit public comment on this addendum and DOW response to those comments	Section 2.0 of this addendum

TMDL Element	Description	Location
MS4 Communities in Kentucky	Provides a list organized by county of Municipal Separate Storm Sewer System (MS4) communities in Kentucky (as of September 2018)	Appendix A of Core TMDL
Percent of Households Serviceable by Sewer	Provides the percent of households serviceable by sewer in Kentucky (2010). The list is organized by county and includes county population totals, and total number of households and serviceable households	Appendix B of Core TMDL
National Land Cover Database Classification Descriptions (NLCD 2011)	Defines the nationwide land cover classifications. The descriptions provide information on land cover and land use	Appendix P of Core TMDL

2.0 PUBLIC PARTICIPATION

The public was invited to provide written comments on this Proposed Draft Addendum to the Kentucky Statewide TMDL for Bacteria Impaired Waters during the period of June 22, 2022 through July 25, 2022.

Notice of the public comment period was posted on the Division of Water Public Notices website and distributed to the TMDL email distribution list (TMDL@ky.gov), which is a list of persons who have expressed interest in receiving information and announcements related to the 303(d) and TMDL program. The announcement was also distributed to the Nonpoint Source Pollution Control email list of persons interested in water quality issues (olliethеotter@ky.gov), posted to the Kentucky Energy and Environment Cabinet's weblog Naturally Connected, the Kentucky Energy and Environment Cabinet Facebook page and the KY Wild Waters Facebook page.

Legal advertisements were purchased in the following local newspapers throughout the state: The Daily Independent (Ashland, Boyd Co.), Kentucky Enquirer (Covington, Kenton Co.), The Crittenden Press (Marion, Crittenden Co.), The Herald-News (Hardinsburg, Breckinridge Co.), The Gleaner (Henderson, Henderson Co.), Courier-Journal (Louisville, Jefferson Co.), Messenger-Inquirer (Owensboro, Daviess Co), and The Paducah Sun (Paducah, McCracken Co.).

All comments received during the public notice period were incorporated into the administrative record for this TMDL. Comments received and the responses to them have been incorporated into this TMDL in Section 2.1 of the Public Participation Section. Based upon comments received, some revisions were made to the final TMDL document.

2.1 Response to Comments

The Division would like to thank all the stakeholders who took the time to read the document and provide comments. Comments are reproduced as received below in black text, and the Division's responses are in blue text.

Commenter #1:
Emily Boone

Comment 1a:

Reduce load to ZERO harmful bacteria and chemicals.

DOW Response 1a:

This TMDL report is limited in scope to impairment of recreational uses related to human pathogens. The loading targets and allocations are based on maintaining *E. coli* or fecal coliform concentrations at or below the water quality criteria for primary contact recreation (e.g.,

swimming) or secondary contact recreation (e.g., boating, wading). *E. coli* and fecal coliform bacteria are in most cases not harmful themselves (i.e., not the cause of infectious disease). Rather, they are indicators of the potential for disease based on their tendency to be present with fecal contamination. The water quality criteria are designed to protect recreational uses by limiting *E. coli* and fecal coliform bacteria to levels that have been shown in studies to be associated with minimal risk of illness while undertaking those activities in and on the water. Detailed information on how these criteria were developed can be found here: https://www.epa.gov/sites/default/files/2019-03/documents/ambient-wqc-bacteria-1986.pdf.

Commenter #2:
James P. Gibson Jr.
Director of Water Resources
SD1
1045 Eaton Drive
Ft. Wright, KY 41017

Comment 2a:

Pages J-6 and J-8, Table J.1 2018/2020 303(d) List of Bacteria-impaired Stream Segments in the Ohio River Minor Tributary Watersheds

Both Long Branch (0.0 to 2.55) and Riddles Run (0.0 to 4.7) waterbody segments in Boone County have "Municipal Point Source Discharges" identified as a suspected source. These segments should be reviewed since they are in rural portions of the county. SD1 realizes that this will not change in this report but will be reviewed during the 2022 review cycle of the 303(d) list.

DOW Response 2a:

The Division agrees that the sources of these two waterbody segments are in need of review based on the commenter's observation of current land use and point source information. Because Table J.1 of this report shows the listed segments with sources as they were on the approved 2018/2020 303(d) list, the table will not be updated. However, these two waterbody segments have been added to the Division's 2022 assessment cycle work flow to have sources reviewed and updated as appropriate. Any updates will be reflected on the 2022 303(d) list and will be available for review by the commenter during that public comment period.

Comment 2b:

Page J-23 Section J.4

The summary in the middle of the page could use some clarification. It currently reads "Samples were collected from four stations on this segment during the PCR season in 1990. Sanitation District No. 1 of Northern Kentucky (SD1) collected samples from stations BRC 1.8, BRC 0.1, and BRC 2.0. The Division of Water (DOW) collected samples from station LR035. Table J.4-1 summarizes information about these sampling stations; Table J.4-2 provides a summary of the data collected from these stations."

SD1 suggests this clarification "The Division of Water (DOW) collected samples from station LR035 on this segment during the PCR season in 1990. Sanitation District No. 1 of Northern Kentucky (SD1) collected samples on this segment from stations BRC 1.8, BRC 0.1, and BRC 2.0 in July of 2010 to assess instream water quality improvements resulting from the construction of SD1's Eastern Regional Water Reclamation Facility which began operations during September of 2007. Table J.4-1 summarizes information about these sampling stations; Table J.4-2 provides a summary of the data collected from these stations."

DOW Response 2b:

The compiled data for Brush Creek 0.0 to 2.4 were reviewed in response to the commenter's description of data collected by SD1. The correct year for the fecal coliform data summarized in the proposed draft report was determined to be 1999 and not 1990. Both DOW and SD1 collected fecal coliform data in 1999. SD1 collected *E. coli* data in 2010. These 2010 data had been inadvertently omitted from the compiled data summary in the draft report. The Division confirmed that the 2010 SD1 data were previously used in the assessment of this segment. The 2010 *E. coli* data have been added to the Sample Data Summary (Table J.4-2) and the narrative summary of monitoring data updated to reflect the correct information.

REFERENCES

33 U.S.C. § 1251. Section 303(d). Clean Water Act. 1972.

401 KAR 10:026. Designation of uses of surface waters. Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. 2009.

401 KAR 10:031. Surface water standards. Kentucky Energy and Environment Cabinet, Department for Environmental Protection, Division of Water. 2009. Frankfort, KY.

DOW (Kentucky Division of Water). 2019. *Kentucky Statewide Total Maximum Daily Load for Bacteria Impaired Waters*. February 2019. Kentucky Department of Environmental Protection.

NLCD 2011. National Land Cover Database 2011 Legend and Land Cover Classification Description. Available at URL: https://www.mrlc.gov/data/legends/national-land-cover-database-2011-nlcd2011-legend.

APPENDIX J

Appendix J
Ohio River Minor Tributary Watersheds

HUC 8s: 05090103, 05090201, 05090203, 05140101, 05140104, 05140201, 05140202, 05140203, 05140206

Level IV Ecoregions: Caseyville Hills, Carter Hills, Crawford-Mammoth Cave Uplands, Green River-Southern Wabash Lowlands, Hills of the Bluegrass, Knobs-Lower Scioto Dissected Plateau, Knobs-Norman Upland, Loess Plains, Mitchell Plain, Monongahela Transition Zone, Northern Holocene Meander Belts, Ohio/Kentucky Carboniferous Plateau, Outer Bluegrass, Wabash-Ohio Bottomlands, Western Highland Rim

Drainage Area Within Kentucky: 4,145.87 square miles

Counties: Ballard, Boone, Boyd, Bracken, Breckinridge, Campbell, Carroll, Carter, Crittenden, Daviess, Fleming, Gallatin, Grant, Greenup, Hancock, Hardin, Henderson, Henry, Jefferson, Kenton, Lewis, Livingston, McCracken, Mason, Meade, Oldham, Pendleton, Rowan, Trimble, Union, Webster

Major Cities: Ashland, Flatwoods, Henderson, Louisville, Maysville, Newport, Owensboro, Prospect

The Ohio River forms the border between Kentucky and Ohio near Catlettsburg, Kentucky and meanders north and west flowing past the cities of Maysville, Kentucky and Cincinnati, Ohio. The Ohio River begins to flow south near North Bend, Ohio and forms the border between Kentucky and Indiana near Lawrenceburg, Indiana. The Ohio River continues to flow south and west past Louisville and Owensboro, Kentucky. The Ohio River flows past Evansville, Indiana and forms the border between Kentucky and Illinois just past Uniontown, Kentucky. The Ohio River meanders south and west past Paducah, Kentucky where the Tennessee River joins the Ohio River. The Ohio River joins the Mississippi River along the border of Kentucky and Illinois near the city of Cairo, Illinois.

Major river basins in Kentucky that contribute to the Ohio River are the Big Sandy, Cumberland, Green, Kentucky, Licking, Little Sandy, Salt, Tennessee, and Tradewater rivers and Tygarts Creek. TMDL segments within those major river basins are addressed in other documents. This appendix will not address the Ohio River main stem or tributaries in other states. The TMDL segments contained within this appendix address the minor tributaries of the Ohio River located in Kentucky only.

Table J.1 provides a summary of the stream segments located in the Ohio River minor tributary watersheds that are on the Kentucky 2018/2020 303(d) list for impairment due to fecal coliform, *E. coli* and/or pathogens. Segments addressed by a TMDL in this report are listed in the table with the TMDL pollutant. Segments not addressed by a TMDL in this report have a footnote explaining why they are not included. Note that stream segments listed for the first time for a bacteria-related cause on the 2018/2020 303(d) list are prioritized for TMDL

development in a future report. Table J.1 also provides a crosswalk between the waterbody IDs on the 2016 303(d) list and the corresponding waterbody IDs on the 2018/2020 303(d) list. This information is provided to assist with cross-referencing waterbodies to prior lists following the implementation of a new system of waterbody IDs with the 2018/2020 list. Figure J.1 shows the location of all segments within the Ohio River minor tributary watersheds addressed by a TMDL in this report.

The river miles for each TMDL segment in this appendix match the 2018/2020 303(d) list. Since the National Hydrography Dataset (NHD) is continually updated to maintain accurate waterbody information, the river mile information in this appendix may not reflect the current 1:24,000 NHD for Kentucky. River mile information for stream segments is updated in each new 303(d) list submitted to EPA.

Table J.1 2018/2020 303(d) List of Bacteria-impaired Stream Segments in the Ohio River Minor Tributary Watersheds

Waterbody Name	Waterbody ID	2016 Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)	County
Allen Fork 0.0 to 4.3[1]	KY-131	KY485869_01	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Managed Pasture Grazing, Municipal (Urbanized High Density Area), Residential Districts	Boone
Berry Creek 0.0 to 3.1	KY-232	KY486913_01	PCR (partial support)	*E. coli*	*E. coli*	Managed Pasture Grazing, Non-Point Source	Oldham, Henry
Blackford Creek 0.0 to 3.8	KY-282	KY487412_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, Source Unknown	Hancock, Daviess
Brush Creek 0.0 to 1.8	KY-25	KY488068_01	PCR (partial support)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source, Residential Districts	Oldham
Brush Creek 0.0 to 2.4	KY-328	KY488069_01	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source	Campbell
Brushy Fork 0.0 to 4.5	KY-2117	KY510977_01	PCR (nonsupport)	*E. coli*	*E. coli*	Source Unknown	Crittenden
Butler Creek 0.0 to 4.1	KY-2139	KY511100_01	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source	Crittenden

Waterbody Name	Waterbody ID	2016 Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)	County
Canoe Creek 0.0 to 3.95	KY-430	KY488897_01	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source, Package Plant or Other Permitted Small Flows Discharges	Henderson
Canoe Creek 0.0 to 3.95	KY-430	KY488897_01	SCR (nonsupport)	Fecal Coliform	Fecal Coliform	Source Unknown	Henderson
Canoe Creek 14.6 to 23.95	KY-432	KY488897_03	PCR (nonsupport)	*E. coli*	*E. coli*	Agriculture	Henderson
Canoe Creek 3.95 to 14.5	KY-431	KY488897_02	PCR (nonsupport)	*E. coli*	*E. coli*	Source Unknown	Henderson
Coefield Creek 0.0 to 8.9[2]	KY-533	KY489769_01	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Agriculture, Grazing in Riparian or Shoreline Zones, Non-Point Source	Crittenden
Crooked Creek 0.0 to 12.1	KY-2201	KY511649_01	PCR (nonsupport)	*E. coli*	*E. coli*	Agriculture, Loss of Riparian Habitat, Non-Point Source, Rural (Residential Areas)	Crittenden
Crooked Creek 12.1 to 18.1[3]	KY-2757	KY511649_02	PCR (nonsupport)	*E. coli*	*E. coli*	Source Unknown	Crittenden
Crooked Creek 18.1 to 26.4[3]	KY-2756	KY511649_02	PCR (nonsupport)	*E. coli*	*E. coli*	Source Unknown	Crittenden
Darby Creek 0.0 to 1.3	KY-624	KY490588_01	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, Upstream Source	Oldham
Darby Creek 1.3 to 3.4	KY-625	KY490588_02	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, Upstream Source	Oldham
Darby Creek 3.4 to 5.9	KY-626	KY490588_03	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, Residential Districts, Upstream Source	Oldham
Darby Fork 0.0 to 1.55	KY-627	KY490589_01	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source	Oldham

Waterbody Name	Waterbody ID	2016 Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)	County
Darby Fork 1.55 to 2.85	KY-628	KY490589_02	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, Residential Districts, Upstream Source	Oldham
Dennis O'Nan Ditch 0.2 to 5.2	KY-635	KY490816_01	PCR (partial support)	*E. coli*	*E. coli*	Agriculture, Non-Point Source	Union
Doe Run 5.2 to 8.3	KY-2877	KY490968_01	PCR (nonsupport)	Pathogens	*E. coli*	Source Unknown	Meade
East Fork Canoe Creek 0.0 to 7.85	KY-684	KY491444_01	PCR (nonsupport)	*E. coli*	*E. coli*	Agriculture, Loss of Riparian Habitat	Henderson
Elam Ditch 0.0 to 5.3	KY-711	KY491607_01	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source	Henderson
Fourmile Creek 0.2 to 8.3	KY-780	KY492390_01	PCR (nonsupport)	Pathogens	*E. coli*	Municipal Point Source Discharges, Sanitary Sewer Overflows (Collection System Failures)	Campbell
Fowlers Fork 0.0 to 4.1[1]	KY-784	KY492398_01	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Livestock (Grazing or Feeding Operations), Non-Point Source, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems), Upstream Source, Urban Runoff/Storm Sewers	Boone

Waterbody Name	Waterbody ID	2016 Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)	County
Goose Creek 0.05 to 3.3	KY-822	KY493014_01	PCR (nonsupport)	Pathogens	*E. coli*	Illegal Dumps or Other Inappropriate Waste Disposal, Industrial Point Source Discharge, Municipal Point Source Discharges, Urban Runoff/Storm Sewers	Jefferson
Goose Creek 3.3 to 12.85	KY-823	KY493014_02	PCR (nonsupport)	Pathogens	*E. coli*	Source Unknown	Jefferson
Gunpowder Creek 0.0 to 15.35[1]	KY-872	KY493502_01	PCR (partial support)	*E. coli*	TMDL not included in this document	Package Plant or Other Permitted Small Flows Discharges	Boone
Harrods Creek 0.05 to 3.2	KY-905	KY493826_01	PCR (partial support)	Pathogens	*E. coli*	Highway/Road/ Bridge Runoff (Non-construction Related), Municipal (Urbanized High Density Area), Package Plant or Other Permitted Small Flows Discharges	Jefferson
Harrods Creek 27.3 to 33.3	KY-908	KY493826_04	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source	Henry, Oldham
Highland Creek 0.0 to 7.65	KY-924	KY494210_01	PCR (nonsupport)	Pathogens	*E. coli*	Agriculture, Loss of Riparian Habitat	Union
Highland Creek 7.65 to 21.15	KY-925	KY494210_02	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Upstream Source	Union, Henderson
Highland Creek 7.65 to 21.15	KY-925	KY494210_02	SCR (nonsupport)	Fecal Coliform	Fecal Coliform	Loss of Riparian Habitat, Upstream Source	Union, Henderson

Waterbody Name	Waterbody ID	2016 Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)	County
Hood Creek 0.8 to 5.3	KY-944	KY494492_02	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source, Urban Runoff/Storm Sewers	Boyd
Humphrey Creek 3.4 to 11.25	KY-959	KY494758_02	PCR (partial support)	Pathogens	*E. coli*	Source Unknown	Ballard
Little Goose Creek 0.0 to 9.5	KY-1126	KY496745_01	PCR (partial support)	Pathogens	*E. coli*	Source Unknown	Jefferson
Locust Creek 0.0 to 4.25	KY-1175	KY496941_01	PCR (nonsupport)	Pathogens	*E. coli*	Source Unknown	Bracken
Long Branch 0.0 to 2.55[1]	KY-1183	KY497064_01	PCR (partial support)	*E. coli*	TMDL not included in this document	Livestock (Grazing or Feeding Operations), Municipal Point Source Discharges, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	Boone
Mill Creek 0.0 to 9.8	KY-1317	KY498268_01	PCR (nonsupport)	Pathogens	*E. coli*	Illegal Dumps or Other Inappropriate Waste Disposal, Municipal Point Source Discharges, Urban Runoff/Storm Sewers	Jefferson
Mill Creek Cutoff 0.0 to 2.3	KY-1319	KY498275_01	PCR (nonsupport)	Pathogens	*E. coli*	Illegal Dumps or Other Inappropriate Waste Disposal, Municipal Point Source Discharges, Urban Runoff/Storm Sewers	Jefferson

Waterbody Name	Waterbody ID	2016 Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)	County
North Fork Canoe Creek 0.0 to 8.05	KY-1389	KY499544_01	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source, Upstream Source, Urban Runoff/Storm Sewers	Henderson
Otter Creek 0.0 to 8.5[3]	KY-2925	KY500026_01	PCR (partial support)	Pathogens	*E. coli*	Landfills, Livestock (Grazing or Feeding Operations), Municipal Point Source Discharges, Unspecified Urban Stormwater	Meade
Otter Creek 8.5 to 9.7[3]	KY-2926	KY500026_01	PCR (partial support)	Pathogens	*E. coli*	Landfills, Livestock (Grazing or Feeding Operations), Municipal Point Source Discharges, Unspecified Urban Stormwater	Meade
Otter Creek 9.7 to 10.9[3]	KY-2883	KY500026_01	PCR (partial support)	Pathogens	*E. coli*	Landfills, Livestock (Grazing or Feeding Operations), Municipal Point Source Discharges, Unspecified Urban Stormwater	Meade

Waterbody Name	Waterbody ID	2016 Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)	County
Riddles Run 0.0 to 4.7[1]	KY-1576	KY501838_01	PCR (partial support)	*E. coli*	TMDL not included in this document	Livestock (Grazing or Feeding Operations), Municipal Point Source Discharges, On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	Boone
Sellers Ditch 0.0 to 1.4	KY-1690	KY503159_01	PCR (nonsupport)	*E. coli*	*E. coli*	Agriculture, Non-Point Source	Henderson
Sinking Creek 15.5 to 39.9	KY-2544	KY515434_03	PCR (partial support)	Pathogens	*E. coli*	Agriculture, Municipal Point Source Discharges	Breckinridge
Sinking Creek 8.85 to 15.5	KY-2543	KY515434_02	PCR (nonsupport)	*E. coli*	*E. coli*	Agriculture, Municipal Point Source Discharges, Non-Point Source	Breckinridge
Snag Creek 1.1 to 6.55	KY-1743	KY503833_01	PCR (nonsupport)	Pathogens	*E. coli*	Source Unknown	Bracken
South Fork Darby Creek 0.0 to 3.95	KY-1760	KY503920_01	PCR (partial support)	*E. coli*	*E. coli*	Non-Point Source, Residential Districts	Oldham
South Fork Gunpowder Creek 4.2 to 6.4[1]	KY-1765	KY503926_02	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Non-Point Source, Residential Districts, Upstream Source	Boone
South Fork Gunpowder Creek 6.4 to 8.1[1]	KY-1766	KY503926_03	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Source Unknown	Boone
Tiger Ditch 0.0 to 0.8	KY-1390	KY499544-0.7_01	PCR (nonsupport)	*E. coli*	*E. coli*	Source Unknown	Henderson

Waterbody Name	Waterbody ID	2016 Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)	County
UT of Allen Fork 0.0 to 2.0[1]	KY-132	KY485869-2.1_01	PCR (partial support)	*E. coli*	TMDL not included in this document	Loss of Riparian Habitat, Managed Pasture Grazing, Non-Point Source, Residential Districts	Boone
UT of Canoe Creek 0.0 to 1.0	KY-433	KY488897-19.8_01	PCR (nonsupport)	*E. coli*	*E. coli*	Agriculture, Non-Point Source	Henderson
UT of Crooked Creek 0.0 to 1.95[4]	KY-2203	KY511649-8.3_01	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Non-Point Source	Crittenden
UT of Elam Ditch 0.0 to 0.82	KY-712	KY491607-2.8_01	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source	Henderson
UT of Gunpowder Creek 0.0 to 4.0[1]	KY-875	KY493502-17.05_01	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Source Unknown	Boone
UT of South Fork Gunpowder Creek 0.0 to 2.5[1]	KY-1767	KY503926-5.3_01	PCR (partial support)	*E. coli*	TMDL not included in this document	Non-Point Source, Upstream Source	Boone
UT of West Fork Canoe Creek 0.0 to 2.2	KY-1975	KY506424-3.4_01	PCR (nonsupport)	*E. coli*	*E. coli*	Non-Point Source	Henderson
UT of Woolper Creek 0.0 to 3.4[1]	KY-123	KY485711-8.0_01	PCR (partial support)	*E. coli*	TMDL not included in this document	Managed Pasture Grazing, Non-irrigated Crop Production, Upstream Source	Boone
West Fork Canoe Creek 0.0 to 7.75	KY-1974	KY506424_01	PCR (nonsupport)	*E. coli*	*E. coli*	Source Unknown	Henderson
Wilson Creek 0.0 to 6.9	KY-2033	KY506900_01	PCR (nonsupport)	*E. coli*	*E. coli*	Loss of Riparian Habitat, Non-Point Source	Henderson

Waterbody Name	Waterbody ID	2016 Waterbody ID	Impaired Use (Support Status)	Listed Pollutant	TMDL Pollutant	Suspected Source(s)	County
Woolper Creek 7.45 to 14.2[1]	KY-122	KY485711_02	PCR (nonsupport)	*E. coli*	TMDL not included in this document	Loss of Riparian Habitat, Managed Pasture Grazing, Non-Point Source, Residential Districts, Upstream Source	Boone

[1]A TMDL is not included for this segment because an alternative restoration plan is under development or already in place.
[2]TMDLs for these segments will be developed in a future TMDL report. These are new 2018/2020 bacteria listings. These segments may have a 2016 waterbody ID listed in the table if they had any assessed use prior to the 2018/2020 IR reporting cycle.
[3]The *2016 Waterbody ID* for this segment identifies a 2016 303(d) listed waterbody that has since been split into two or more segments. The *Waterbody ID* in this table is the new waterbody ID assigned to this split segment during the 2018/2020 IR reporting cycle.
[4]A TMDL is not included because this segment will be proposed for delisting on a future 303(d) list due to a listing error.

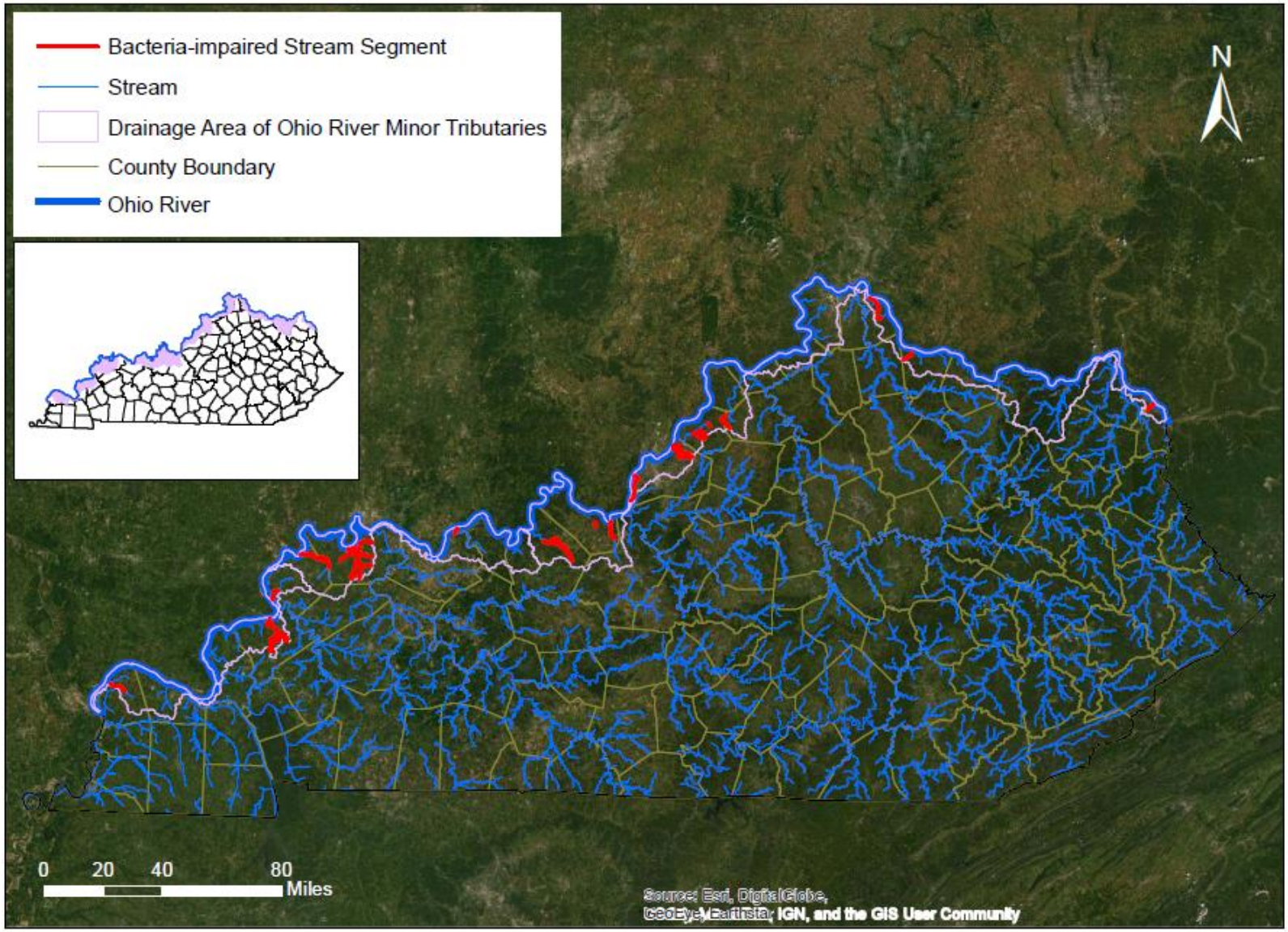

Figure J.1 Location of Bacteria-impaired Stream Segments within Ohio River Minor Tributary Watersheds Addressed by a TMDL in This Report

Land cover data is summarized in Table J.2, and its geographic distribution is shown in Figure J.2. Deciduous Forest is the predominant class of land cover in the Ohio River minor tributary watersheds, accounting for approximately 41 percent. The next three classes by magnitude are cultivated crops, pasture/hay, and open developed. Land cover classes are described in Appendix P of the core TMDL document.

Table J.2 Land Cover Classes in the Ohio River Minor Tributary Watersheds (NLCD 2011)

Land Cover	Percent of Total Area	Square Miles	Acres
Open Water	6.00	248.54	159,062.75
Developed, Open	6.05	251.02	160,653.17
Developed, Low Intensity	2.81	116.31	74,438.28
Developed, Medium Intensity	1.51	62.74	40,155.26
Developed, High Intensity	0.77	31.96	20,456.87
Barren Land (Rock, Sand, Clay)	0.15	6.29	4,027.46
Deciduous Forest	41.06	1,702.27	1,089,449.86
Evergreen Forest	1.49	61.90	39,618.08
Mixed Forest	0.23	9.48	6,065.99
Shrub/Scrub	0.37	15.44	9,880.42
Grassland/Herbaceous	2.22	92.08	58,928.05
Pasture/Hay	17.01	705.38	451,444.07
Cultivated Crops	18.63	772.32	494,284.31
Woody Wetlands	1.24	51.52	32,973.59
Emergent Herbaceous Wetlands	0.45	18.62	11,918.02

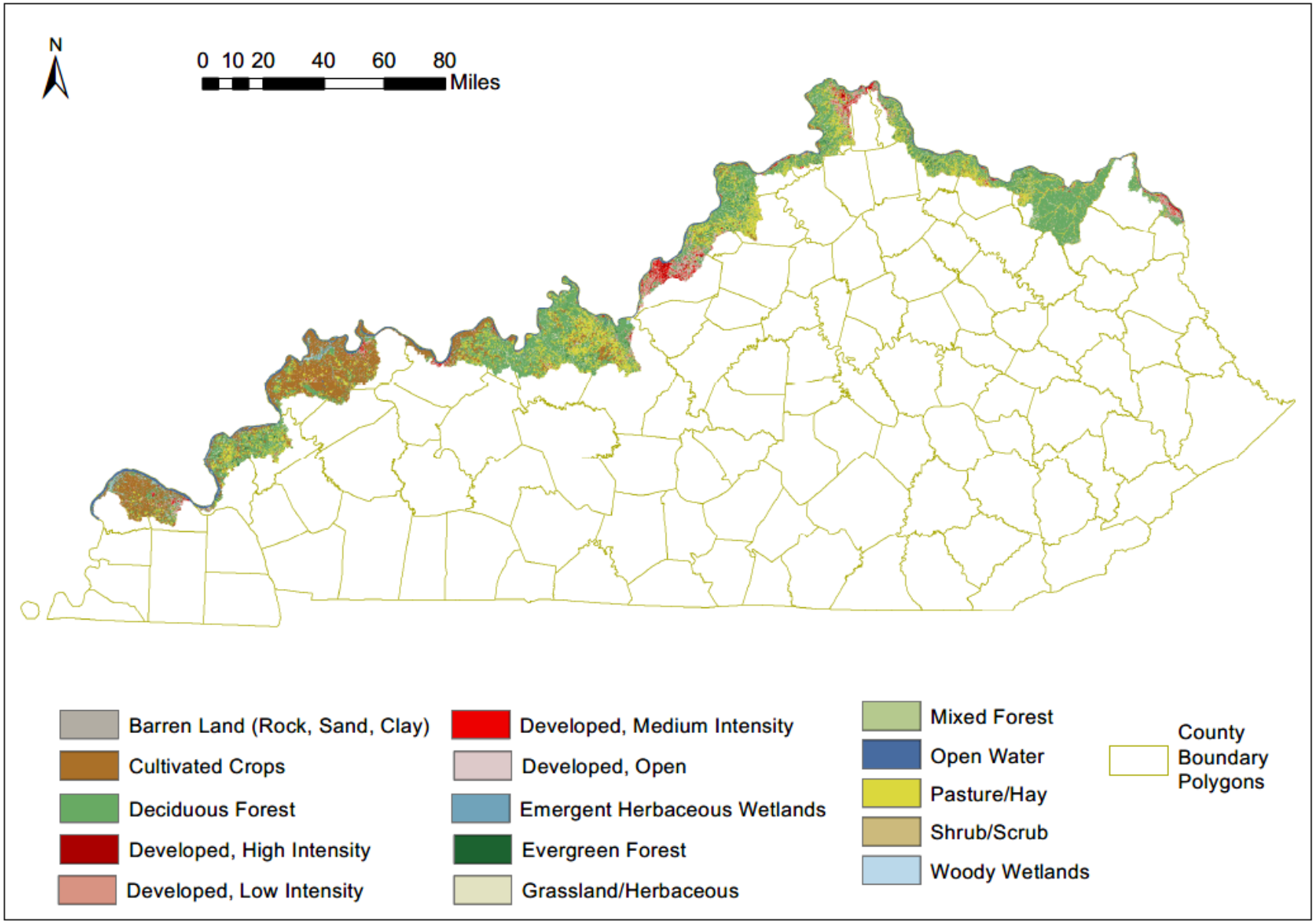

Figure J.2 Land Cover Types in the Ohio River Minor Tributary Watersheds

Section J.1 Berry Creek 0.0 to 3.1

Waterbody ID: KY-232

Receiving Water: Harrods Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 51401010501

Counties: Oldham, Henry

Kentucky Waterways Alliance collected samples from station UH-2, located near river mile 0.1, in 2014 for a monitoring project in the Upper Harrods Creek watershed. The station was sampled five times during the PCR season. Table J.1-1 summarizes information about this sampling station; Table J.1-2 summarizes the data collected from this station.

Table J.1-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
UH-2	38.4555800	-85.3496800	Berry Creek 0.0 to 3.1	0.1

Table J.1-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
UH-2	*E. coli*	5	19	517	251

[(1)]The full data set for samples collected from UH-2 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Berry Creek 0.0 to 3.1 are presented in Table J.1-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Berry Creek. The location of the segment within the Headwaters Harrods Creek watershed is shown in Figure J.1-1.

Table J.1-3 Berry Creek 0.0 to 3.1 *E. coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[(4)]	MOS[(5)]
	LA[(3)]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(5)]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.1-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Headwaters Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

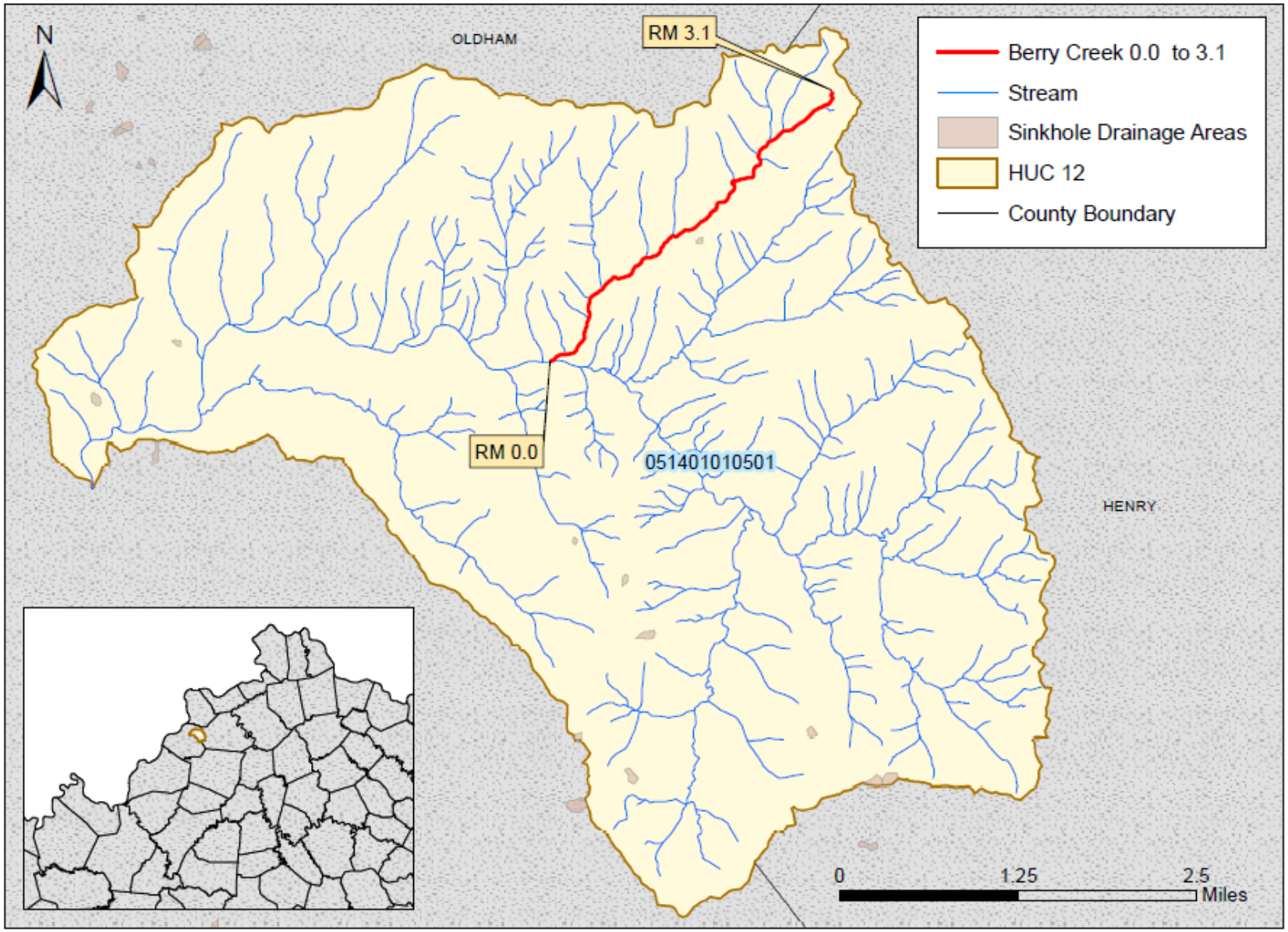

Figure J.1-1 Location of Berry Creek 0.0 to 3.1

Section J.2 Blackford Creek 0.0 to 3.8

Waterbody ID: KY-282

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402010605

Counties: Hancock, Daviess

The Division of Water (DOW) collected samples at an Ambient Monitoring Network Station, GRN011, located near river mile 3.5. The station was sampled every five years during the PCR season from 2001 to 2016. The station has been sampled between five and six times during a monitoring year. Table J.2-1 summarizes information about this sampling station; Table J.2-2 provides a summary of the data collected from this station.

Table J.2-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
GRN011	37.8989260	-86.9862930	Blackford Creek 0.0 to 3.8	3.5

Table J.2-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
GRN011	*E. coli*	13	28	>2,420	373
GRN011	fecal coliform	9	1	43,000	5,463

[(1)]The full data set for samples collected from GRN011 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Blackford Creek 0.0 to 3.8 are presented in Table J.2-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Blackford Creek. The location of the segment within the Little Blackford Creek-Blackford Creek watershed is shown in Figure J.2-1.

Table J.2-3 Blackford Creek 0.0 to 3.8 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

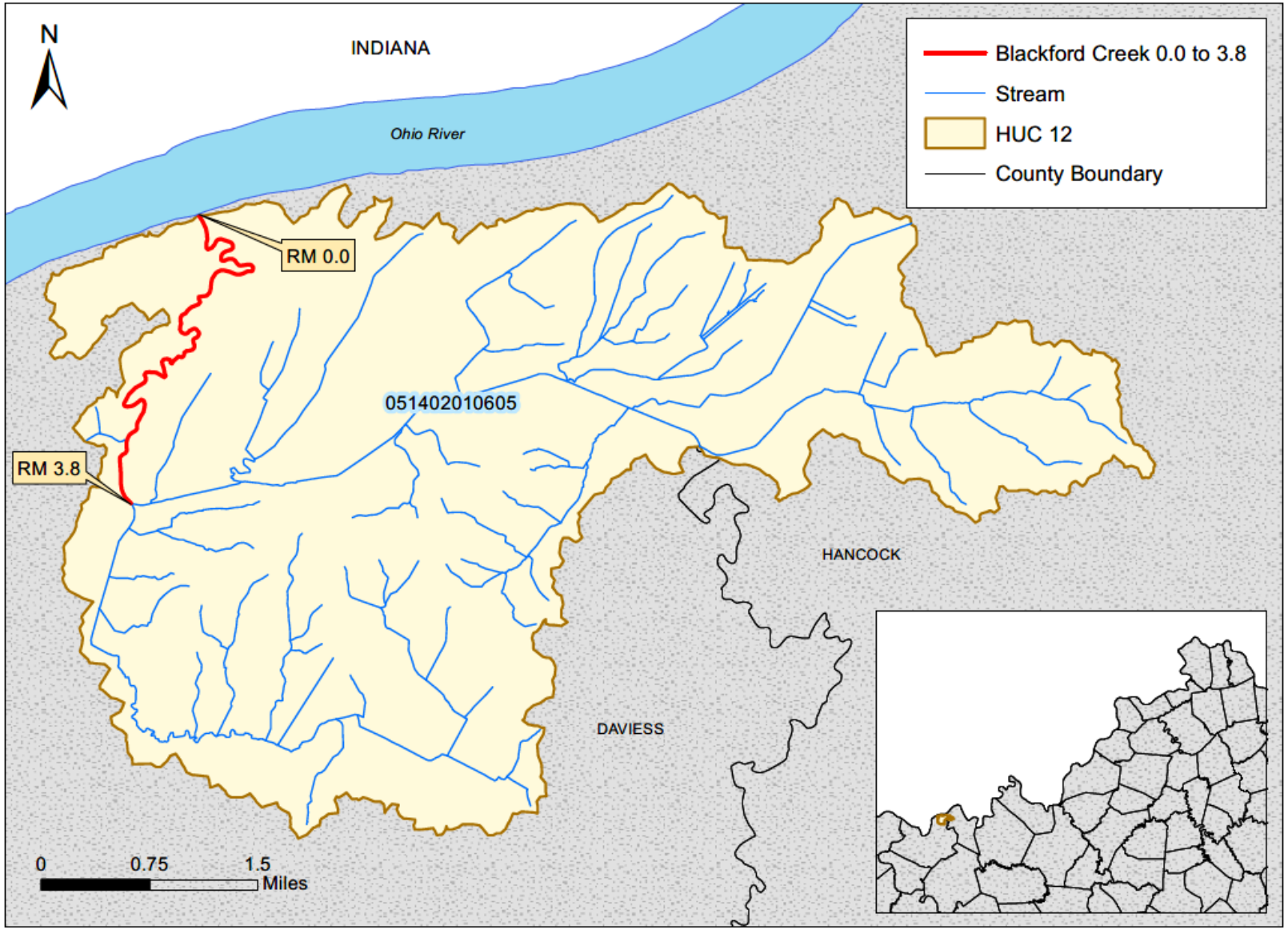

Figure J.2-1 Location of Blackford Creek 0.0 to 3.8

Section J.3 Brush Creek 0.0 to 1.8

Waterbody ID: KY-25

Receiving Water: Harrods Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051401010502

County: Oldham

Kentucky Waterways Alliance collected samples from station UH-5, located near river mile 0.3, in 2014 for a monitoring project in the Upper Harrods Creek watershed. The station was sampled five times during the PCR season. Table J.3-1 summarizes information about this sampling station; Table J.3-2 provides a summary of the data collected from this station.

Table J.3-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
UH-5	38.4373400	-85.4260000	Brush Creek 0.0 to 1.8	0.3

Table J.3-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
UH-5	*E. coli*	5	51	>2,420	554

[(1)]The full data set for samples collected from UH-5 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Brush Creek 0.0 to 1.8 are presented in Table J.3-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Brush Creek. The location of the segment within the Brush Creek-Harrods Creek watershed is shown in Figure J.3-1.

Table J.3-3 Brush Creek 0.0 to 1.8 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.3-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Brush Creek-Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

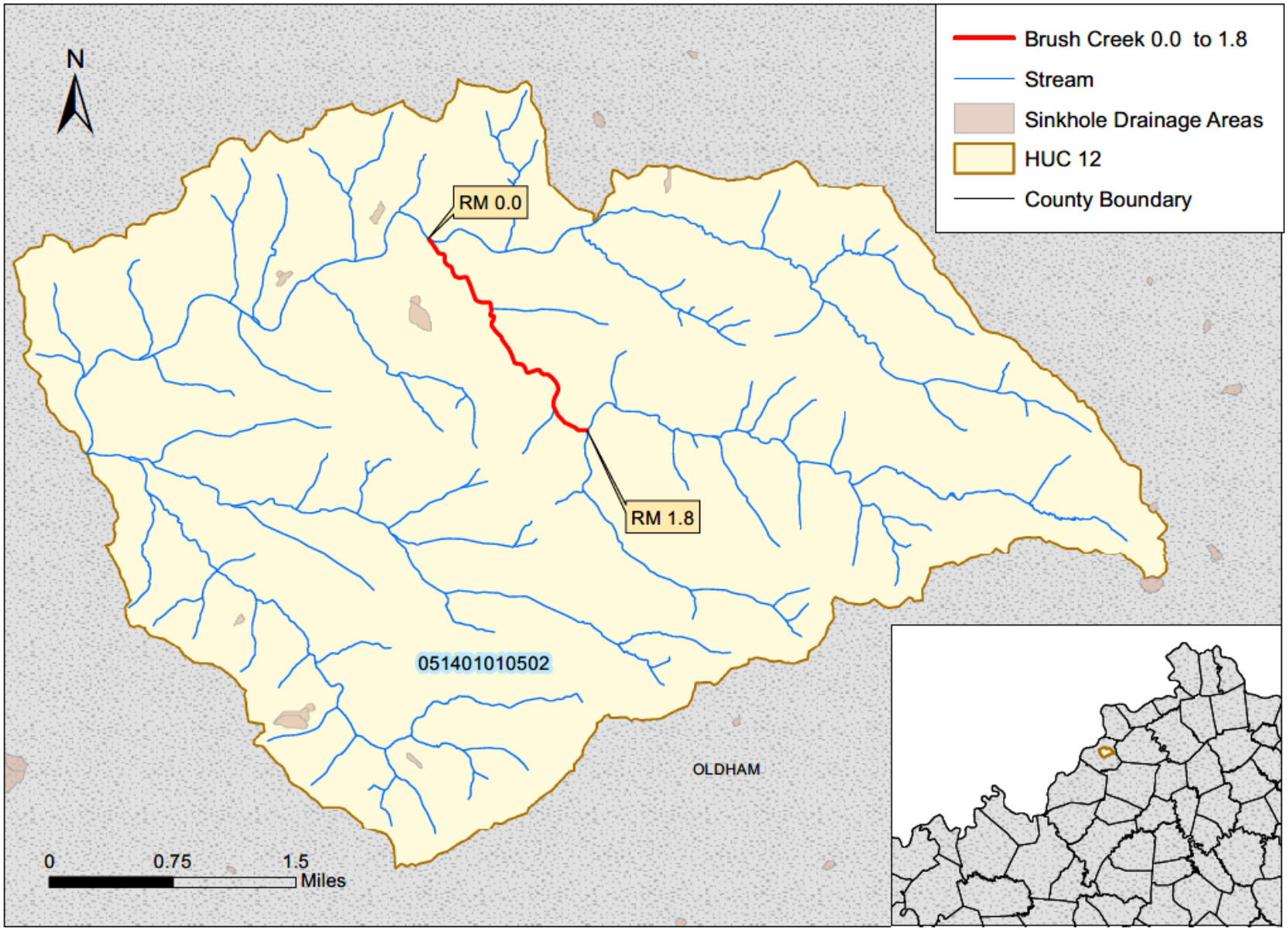

Figure J.3-1 Location of Brush Creek 0.0 to 1.8

Section J.4 Brush Creek 0.0 to 2.4

Waterbody ID: KY-328

Receiving Water: Twelvemile Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050902011205

County: Campbell

Samples were collected from four stations on this segment during the PCR season in 1999. The Division of Water (DOW) collected samples from station LR035 and Sanitation District No.1 of Northern Kentucky (SD1) collected samples from stations BRC 1.8, BRC 0.1, and BRC 2.0. SD1 also collected samples on this segment from stations BRC 1.8, BRC 0.1, and BRC 2.0 in 2010 to assess instream water quality improvements resulting from the construction of SD1's Eastern Regional Water Reclamation Facility which began operations during September of 2007. Table J.4-1 summarizes information about these sampling stations; Table J.4-2 provides a summary of the data collected from these stations.

Table J.4-1 Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
BRC 1.8	38.9472500	-84.3698500	Brush Creek 0.0 to 2.4	1.80
BRC 0.1	38.9463900	-84.3486900	Brush Creek 0.0 to 2.4	0.10
BRC 2.0	38.9451400	-84.3716400	Brush Creek 0.0 to 2.4	2.00
LR035	38.9416000	-84.3586000	Brush Creek 0.0 to 2.4	0.90

Table J.4-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BRC 1.8	fecal coliform	2	520	41,000	20,760
BRC 1.8	*E. coli*	5	48	2,450	577
BRC 0.1	fecal coliform	2	1,100	4,000	2,550
BRC 0.1	*E. coli*	5	80	2,750	718
BRC 2.0	fecal coliform	1	390	390	390

BRC 2.0	*E. coli*	5	181	4,180	1,244
LR035	fecal coliform	6	580	3,200	1,625

(1)The full data set for samples collected from these stations may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
(2)The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Brush Creek 0.0 to 2.4 are presented in Table J.4-3.

Table J.4-3 Brush Creek 0.0 to 2.4 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment			Allocations for Upstream Loads to the Segment[6]	Allocations for Tributary Loads to the Segment[7]	MOS[8]
	MS4-WLA[3]	SWS-WLA[4]	LA[5]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli.* The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[5]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[6]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[7]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[8]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Brush Creek. This directly discharging facility is a sanitary wastewater system. Sanitation District No.1 of Northern Kentucky (SD1) and the Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Brush Creek. Information concerning Alexandria MS4 permit coverage can be found as a co-permittee of SD1's MS4 permit (Permit number KYG200007). There are no CSOs discharging directly to this segment of Brush Creek. The definitions for MS4 and CSO are found in 401 KAR 5:002. The facility and MS4s are identified in Table J.4-4. The location of the facility, MS4 areas, and the segment within the Twelvemile Creek watershed is shown in Figure J.4-1. The MS4 area boundaries are from DOW information last updated in 2015 (Alexandria) and 2022 (SD1). Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.4-4 Summary of Active KPDES-permitted Sources as of April 2022

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KY0105031	Eastern Regional STP	4.0	38.947301	84.370062	2/28/2027	Q_{SWS}×WQC×CF
KYG200007	SD1	N/A	N/A	N/A	04/30/2023	Q_{MS4}×WQC×CF
KYG200007	Alexandria	N/A	N/A	N/A	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	N/A	N/A	N/A	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. Q_{SWS} is the flow in the segment due to a SWS entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

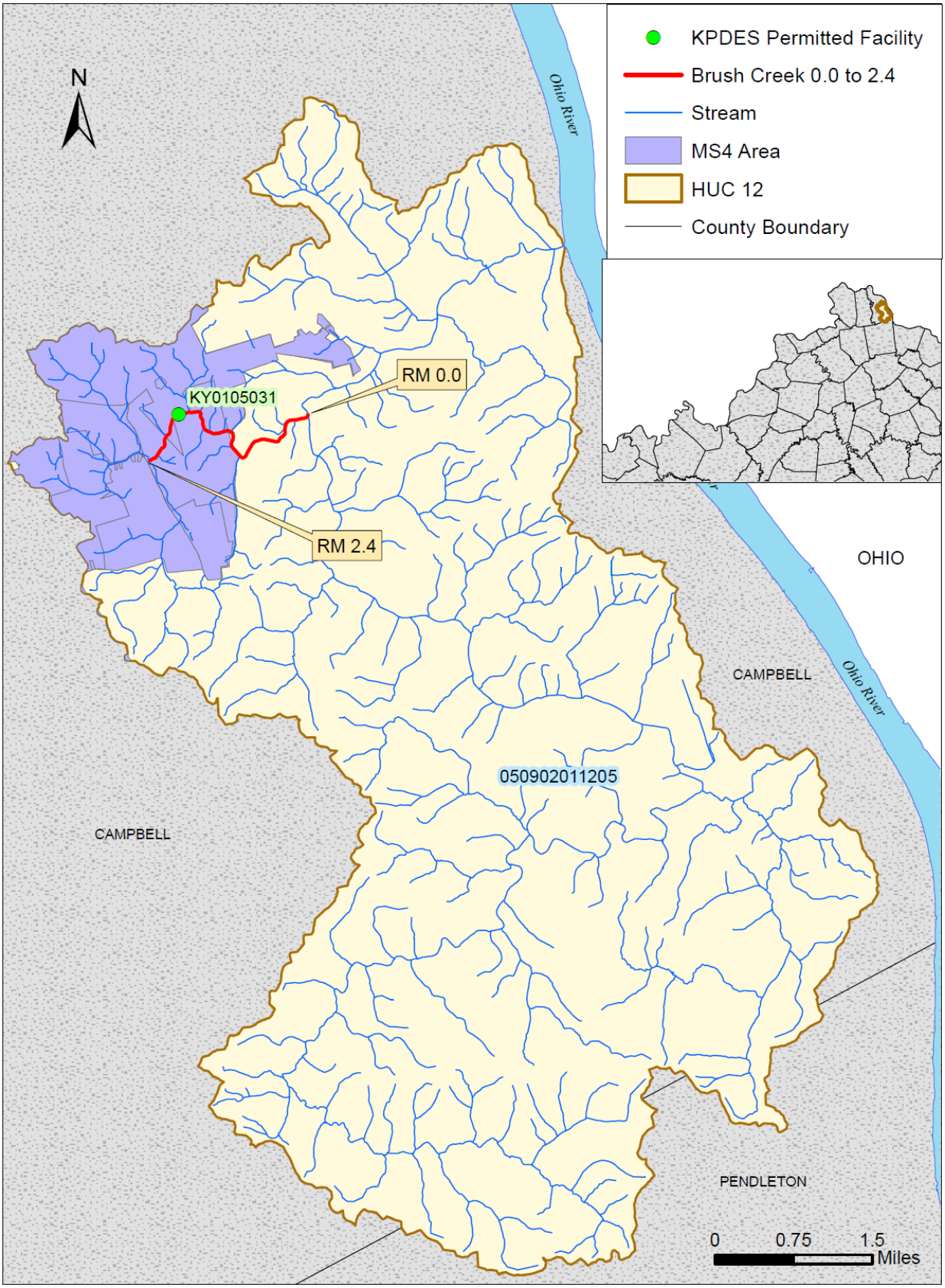

Figure J.4-1 Location of the KPDES-permitted Facility on Brush Creek 0.0 to 2.4

Section J.5 Brushy Fork 0.0 to 4.5

Waterbody ID: KY-2117

Receiving Water: Crooked Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402030302

County: Crittenden

The Division of Water (DOW) collected samples from station DOW08013008, located near river mile 1.8, in 2009. The station was sampled six times during the PCR season. Table J.5-1 summarizes information about this sampling station; Table J.5-2 provides a summary of the data collected from this station.

Table J.5-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08013008	37.3890600	-88.0249000	Brushy Fork 0.0 to 4.5	1.8

Table J.5-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08013008	*E. coli*	6	99	>2,420	816

[(1)]The full data set for samples collected from station DOW08013008 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Brushy Fork 0.0 to 4.5 are presented in Table J.5-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Brushy Fork. The location of the segment within the Lower Crooked Creek watershed is shown in Figure J.5-1.

Table J.5-3 Brushy Fork 0.0 to 4.5 *E. coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[(4)]	MOS[(5)]
	LA[(3)]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(5)]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.5-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower Crooked Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

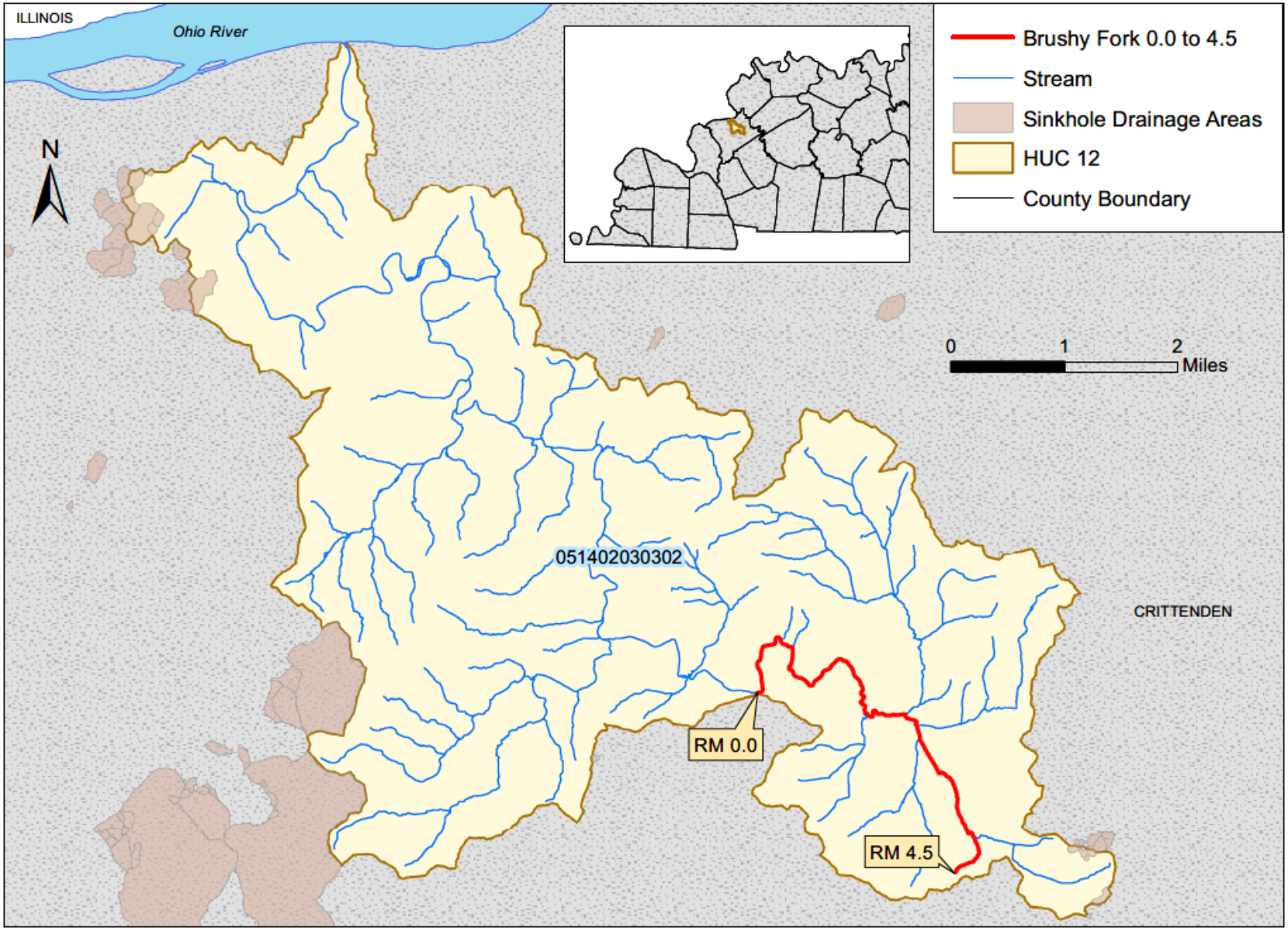

Figure J.5-1 Location of Brushy Fork 0.0 to 4.5

Section J.6 Butler Creek 0.0 to 4.1

Waterbody ID: KY-2139

Receiving Water: Crooked Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402030302

County: Crittenden

The Division of Water (DOW) collected samples at station DOW08013007, located near river mile 0.7, in 2009. The station was sampled five times during the PCR season. Table J.6-1 summarizes information about this sampling station; Table J.6-2 provides a summary of the data collected from this station.

Table J.6-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08013007	37.3851000	-88.0689900	Butler Creek 0.0 to 4.1	0.7

Table J.6-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08013007	*E. coli*	5	114	1,733	723

[(1)]The full data set for samples collected from station DOW08013007 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.

[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Butler Creek 0.0 to 4.1 are presented in Table J.6-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Butler Creek. The location of the segment within the Lower Crooked Creek watershed is shown in Figure J.6-1.

Table J.6-3 Butler Creek 0.0 to 4.1 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.6-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower Crooked Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

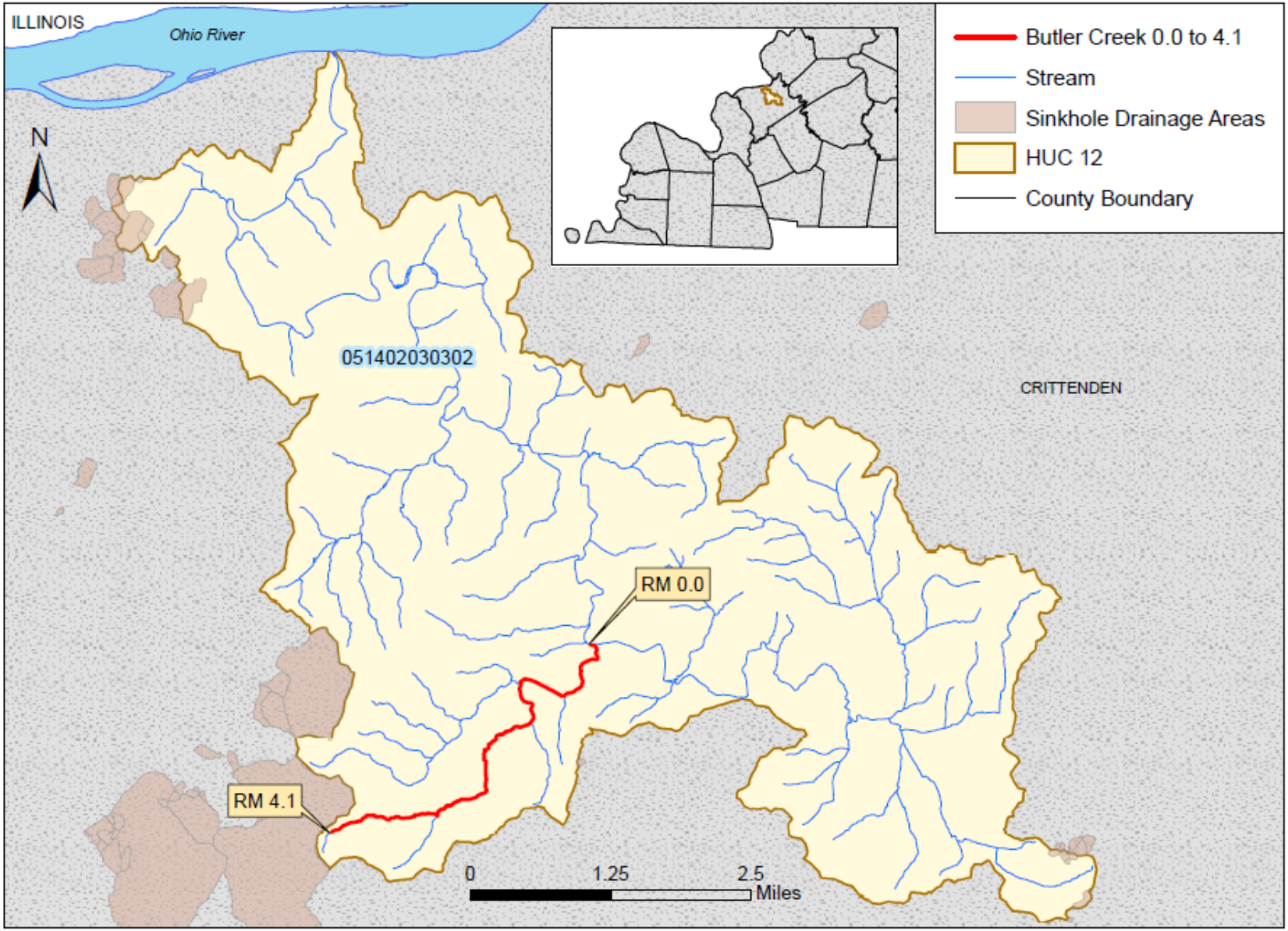

Figure J.6-1 Location of Butler Creek 0.0 to 4.1

Section J.7 Canoe Creek 0.0 to 3.95

Waterbody ID: KY-430

Receiving Water: Ohio River

Impaired Use: PCR, SCR

Support Status: nonsupport (both uses)

Listed Pollutant/TMDL Pollutant: *E. coli* (PCR), fecal coliform (SCR)

HUC 12: 051402020405

County: Henderson

The Division of Water (DOW) collected samples from two stations on this segment during the PCR season. The station, DOW08023004, located near river mile 3.5, was sampled nine times in 2010. The Ambient Monitoring Network Station, GRN007, located near river mile 3.5, was sampled every five years from 2001 to 2016. The station has been sampled between two and six times during a monitoring year. Table J.7-1 summarizes information about these sampling stations; Table J.7-2 provides a summary of the data collected from these stations.

Table J.7-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023004	37.8020000	-87.6248000	Canoe Creek 0.0 to 3.95	3.5
GRN007	37.8020020	-87.6248000	Canoe Creek 0.0 to 3.95	3.5

Table J.7-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023004	*E. coli*	9	5	>2,420	788
GRN007	*E. coli*	13	28	>2,420	420
GRN007	fecal coliform	6	80	1,900	817

[(1)]The full data set for samples collected from these stations may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Canoe Creek 0.0 to 3.95 are presented in Table J.7-3.

Table J.7-3 Canoe Creek 0.0 to 3.95 TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli* or fecal coliform. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Henderson, Henderson County Fiscal Court, and the Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Canoe Creek. Information about MS4 permits is summarized in Table J.7-4. There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 areas and the segment within the Wilson Creek-Canoe Creek watershed is shown in Figure J.7-1. The MS4 area boundaries are from DOW information last updated in 2014 (City of Henderson) and 2016 (Henderson County Fiscal Court).

Table J.7-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies/day)
KYG200019	City of Henderson	4/30/2023	Q_{MS4}×WQC×CF
KYG200059	Henderson County Fiscal Court	4/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

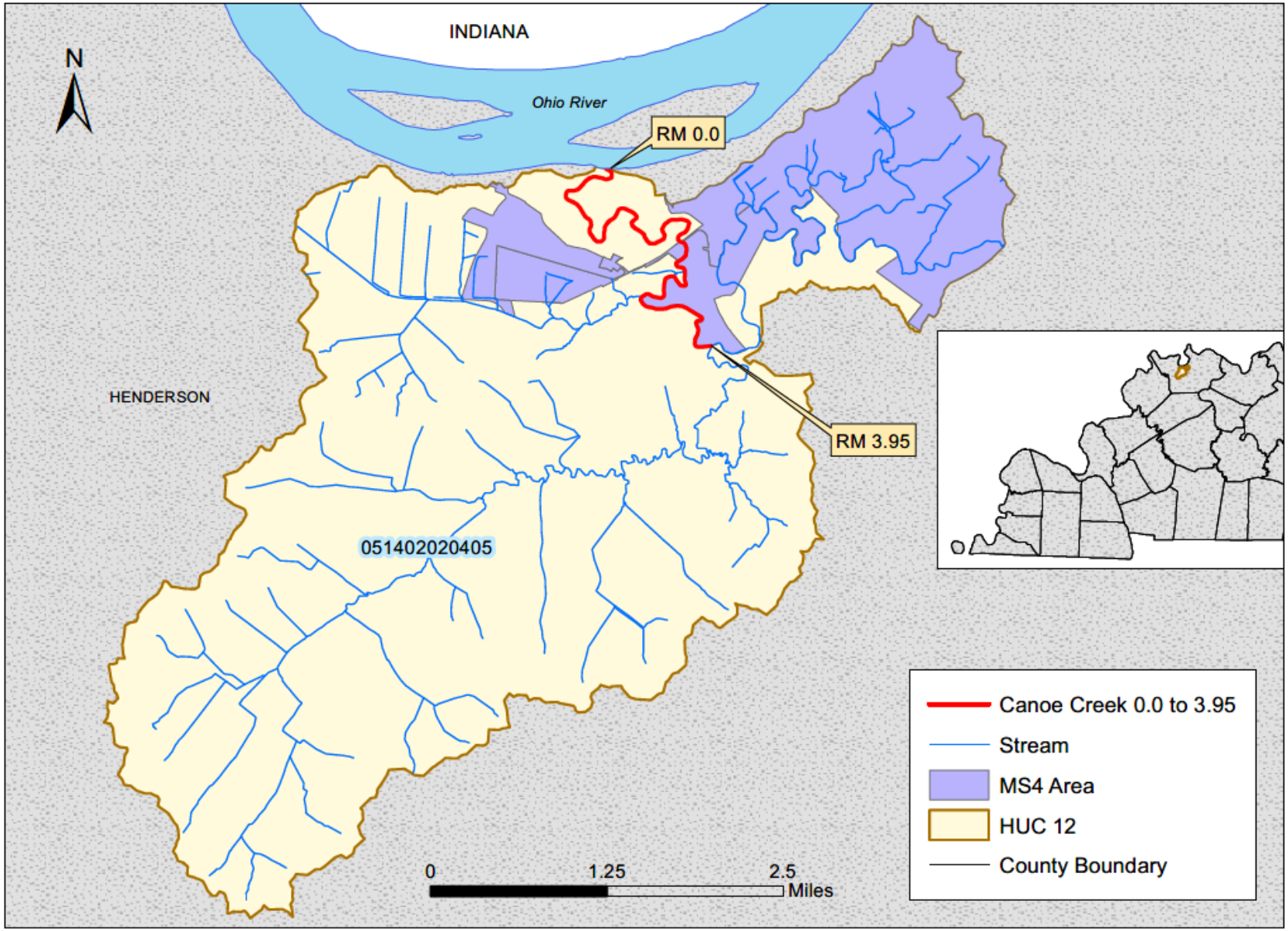

Figure J.7-1 Location of Canoe Creek 0.0 to 3.95

Section J.8 Canoe Creek 14.6 to 23.95

Waterbody ID: KY-432

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12s: 051402020403, 051402020404

County: Henderson

The Division of Water (DOW) collected samples from station DOW08023010, located near river mile 18.9, in 2010. The station was sampled four times during the PCR season. Table J.8-1 summarizes information about this sampling station; Table J.8-2 provides a summary of the data collected from this station.

Table J.8-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023010	37.7358000	-87.5684000	Canoe Creek 14.6 to 23.95	18.9

Table J.8-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023010	*E. coli*	4	365	>2,420	1,162

[(1)]The full data set for samples collected from DOW08023010 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Canoe Creek 14.6 to 23.95 are presented in Table J.8-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Canoe Creek. The location of the segment within the East Fork Canoe Creek-Canoe Creek and West Fork Canoe Creek-Canoe Creek watersheds is shown in Figure J.8-1.

Table J.8-3 Canoe Creek 14.6 to 23.95 *E. coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[(4)]	MOS[(5)]
	LA[(3)]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(5)]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

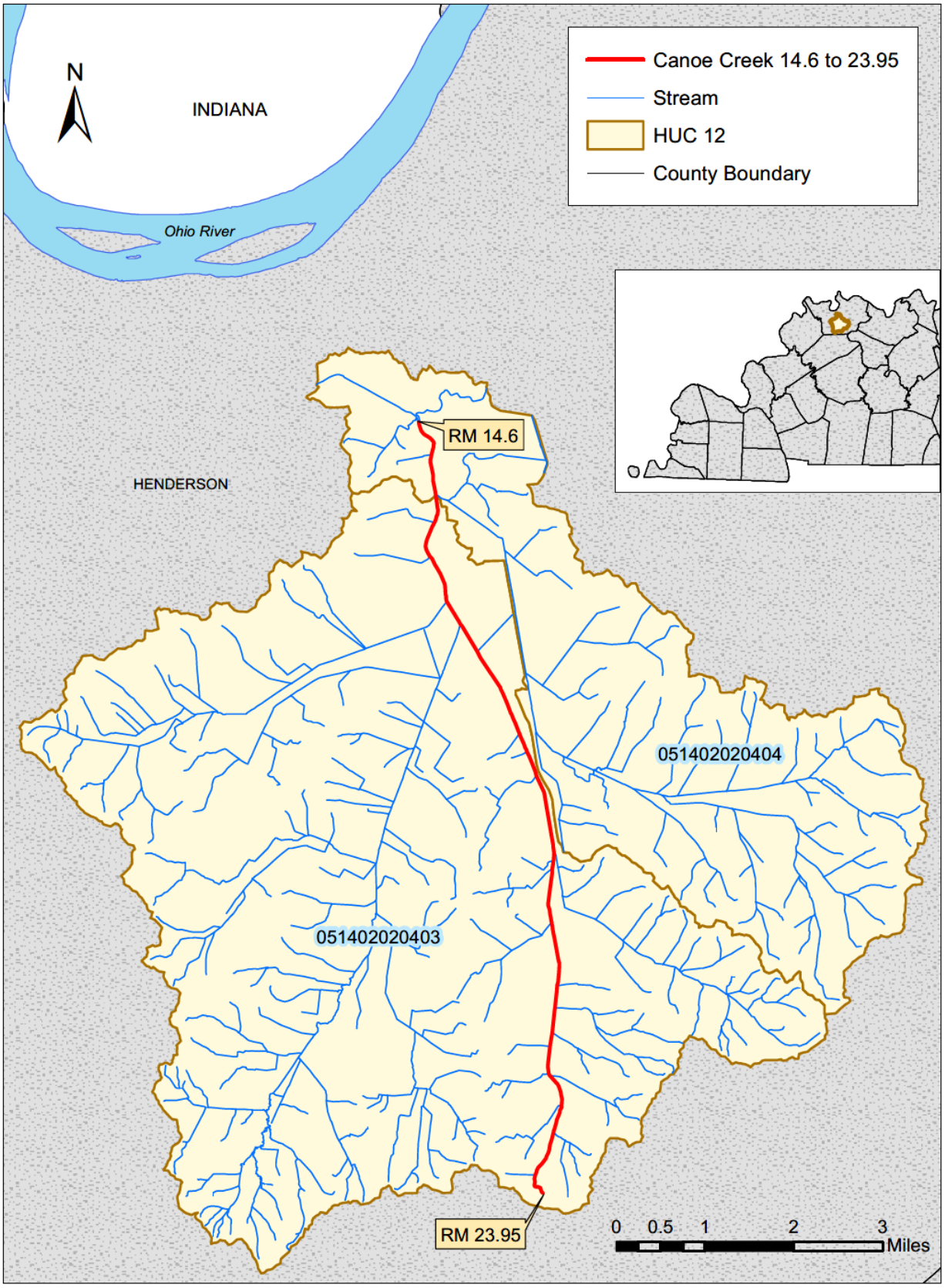

Figure J.8-1 Location of Canoe Creek 14.6 to 23.95

Section J.9 Canoe Creek 3.95 to 14.5

Waterbody ID: KY-431

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12s: 051402020402, 051402020404, 051402020405

County: Henderson

The Division of Water (DOW) collected samples during the PCR season from two stations on this segment. In 2010, nine samples were collected from DOW08023003, and three samples were collected from DOW08023007. Table J.9-1 summarizes information about these sampling stations; Table J.9-2 provides a summary of the data collected from these stations.

Table J.9-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023003	37.8171000	-87.6113000	Canoe Creek 3.95 to 14.5	8.10
DOW08023007	37.7979000	-87.5897000	Canoe Creek 3.95 to 14.5	13.90

Table J.9-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023003	*E. coli*	9	19	>2,420	839
DOW08023007	*E. coli*	3	60	1,553	667

[(1)]The full data set for samples collected from these stations may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Canoe Creek 3.95 to 14.5 are presented in Table J.9-3.

Table J.9-3 Canoe Creek 3.95 to 14.5 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Henderson, Henderson County Fiscal Court, and the Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Canoe Creek. Information about MS4 permits is summarized in Table J.9-4. There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 areas and the segment within the Wilson Creek-Canoe Creek, North Fork Canoe Creek-Canoe Creek, and East Fork Canoe Creek-Canoe Creek watersheds is shown in Figure J.9-1. The MS4 area boundaries are from DOW information last updated in 2014 (City of Henderson) and 2016 (Henderson County Fiscal Court).

Table J.9-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli*/day)
KYG200019	City of Henderson	4/30/2023	Q_{MS4}×WQC×CF
KYG200059	Henderson County Fiscal Court	4/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

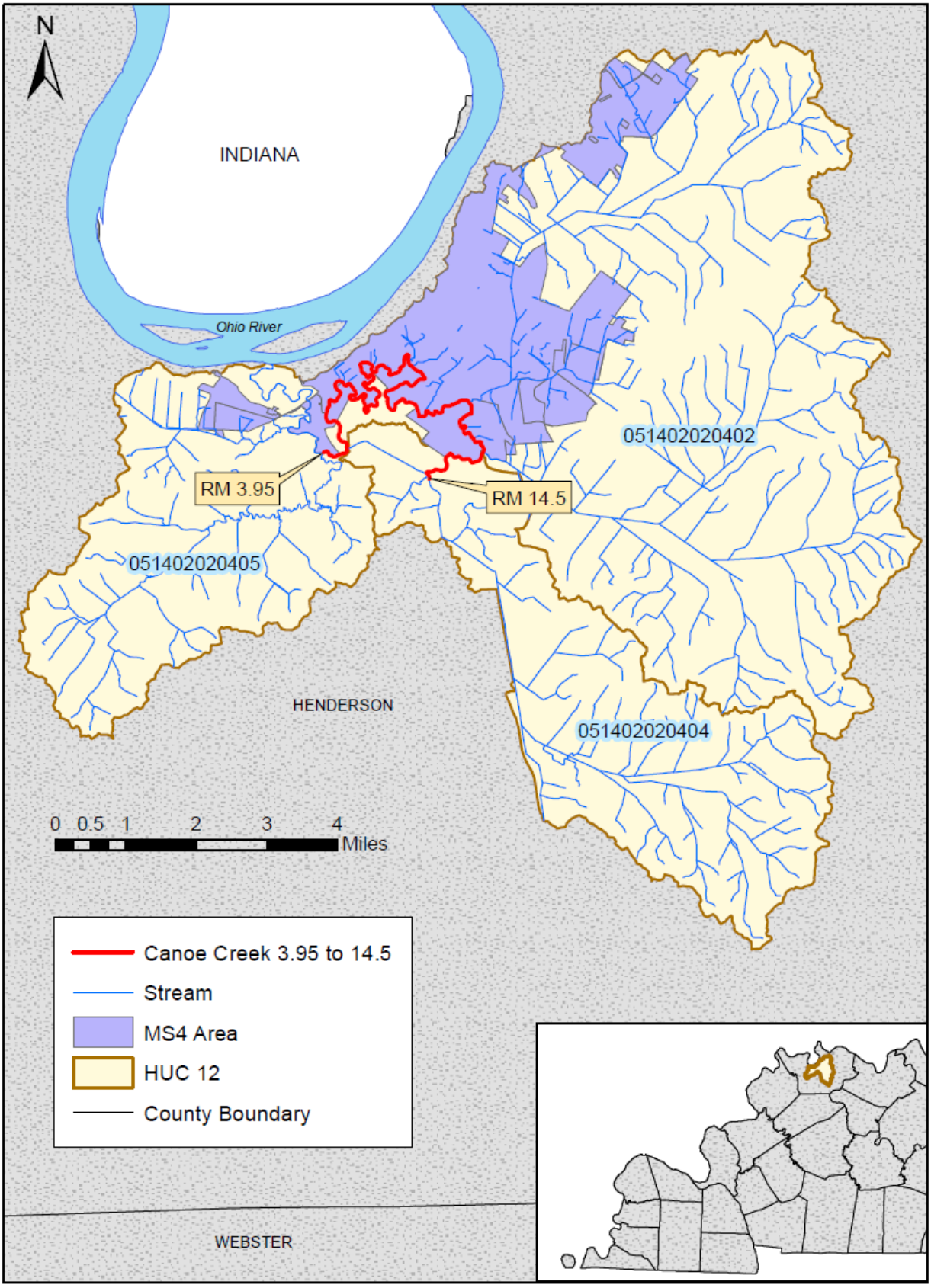

Figure J.9-1 Location of Canoe Creek 3.95 to 14.5

Section J.10 Crooked Creek 0.0 to 12.1

Waterbody ID: KY-2201

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402030302

County: Crittenden

The Division of Water (DOW) collected samples from station DOW08013006, located near river mile 11.9, in 2009. The station was sampled 11 times during the PCR season. Table J.10-1 summarizes information about the sampling station; Table J.10-2 provides a summary of the data collected from this station.

Table J.10-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08013006	37.4381200	-88.1235200	Crooked Creek 0.0 to 12.1	11.9

Table J.10-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08013006	*E. coli*	11	43	>2,420	439

[(1)]The full data set for samples collected from DOW08013006 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Crooked Creek 0.0 to 12.1 are presented in Table J.10-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Crooked Creek. The location of the segment within the Lower Crooked Creek watershed is shown in Figure J.10-1.

Table J.10-3 Crooked Creek 0.0 to 12.1 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.10-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower Crooked Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

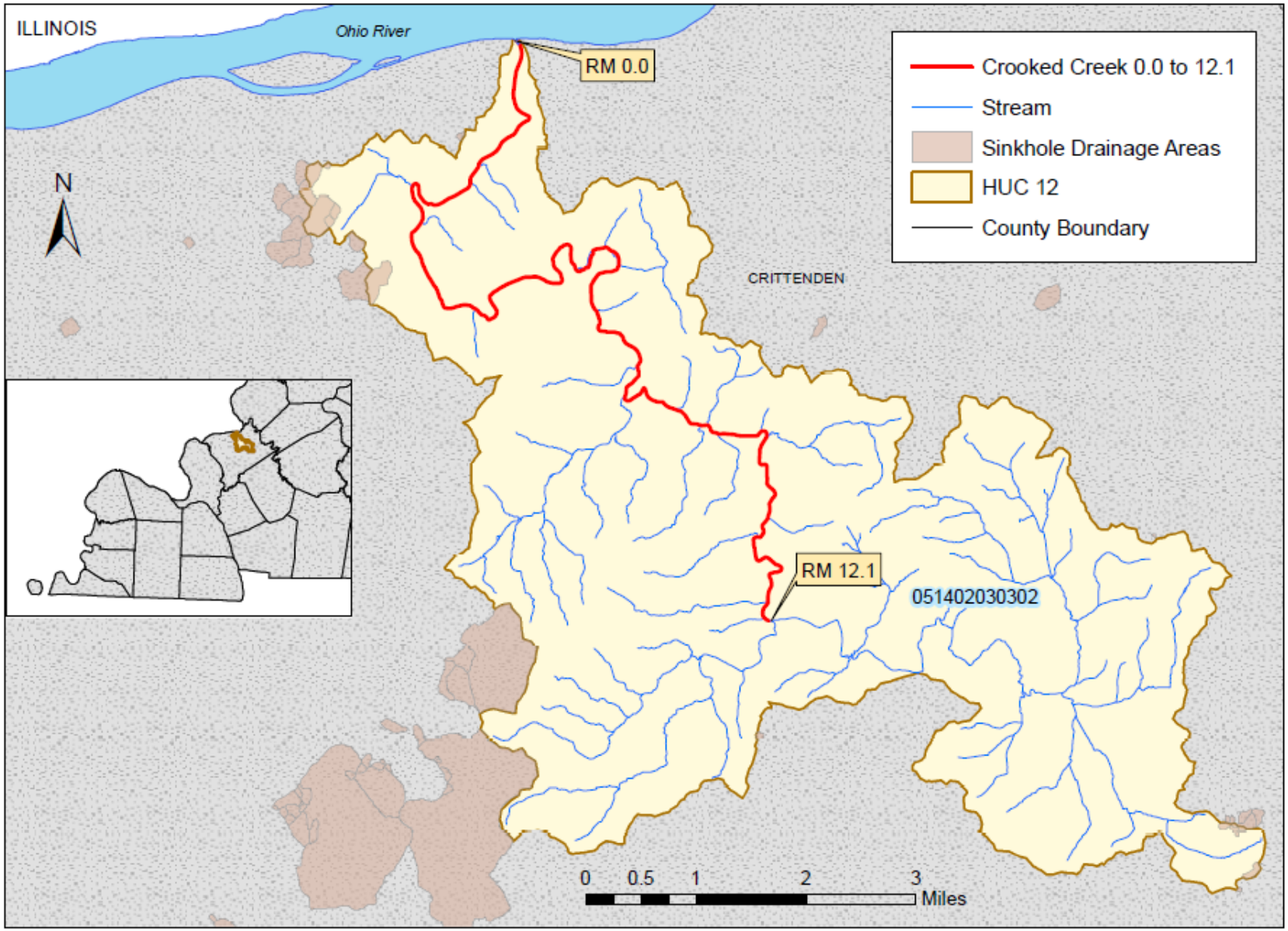

Figure J.10-1 Location of Crooked Creek 0.0 to 12.1

Section J.11 Crooked Creek 12.1 to 18.1

Waterbody ID: KY-2757

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12s: 051402030301, 051402030302

County: Crittenden

The Division of Water (DOW) collected samples during the PCR season from two stations in 2009. The station, DOW08013009, was sampled 14 times and the station, DOW08013010, was sampled 10 times.

Crooked Creek 12.1 to 18.1 and Crooked Creek 18.1 to 26.4 (J.12) were assessed as one segment in 2014. These segments were subsequently split. Therefore, the data collected at stations DOW08013009 and DOW08013010 was used for both the upper segment, Crooked Creek 18.1 to 26.4, and the lower segment, Crooked Creek 12.1 to 18.1. Table J.11-1 summarizes information about these sampling stations; Table J.11-2 provides a summary of the data collected from these stations.

Table J.11-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08013009	37.3614200	-88.0762200	Crooked Creek 12.1 to 18.1	19.2
DOW08013010	37.31187	-88.09447	Crooked Creek 12.1 to 18.1	26.2

Table J.11-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08013009	*E. coli*	14	29	1,986	658
DOW08013010	*E. coli*	10	12	1,986	327

[(1)]The full data set for samples collected from DOW08013009 and DOW08013010 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Crooked Creek 12.1 to 18.1 are presented in Table J.11-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Crooked Creek. The location of the segment within the Lower and Upper Crooked Creek watersheds is shown in Figure J.11-1.

Table J.11-3 Crooked Creek 12.1 to 18.1 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.11-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower and Upper Crooked Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

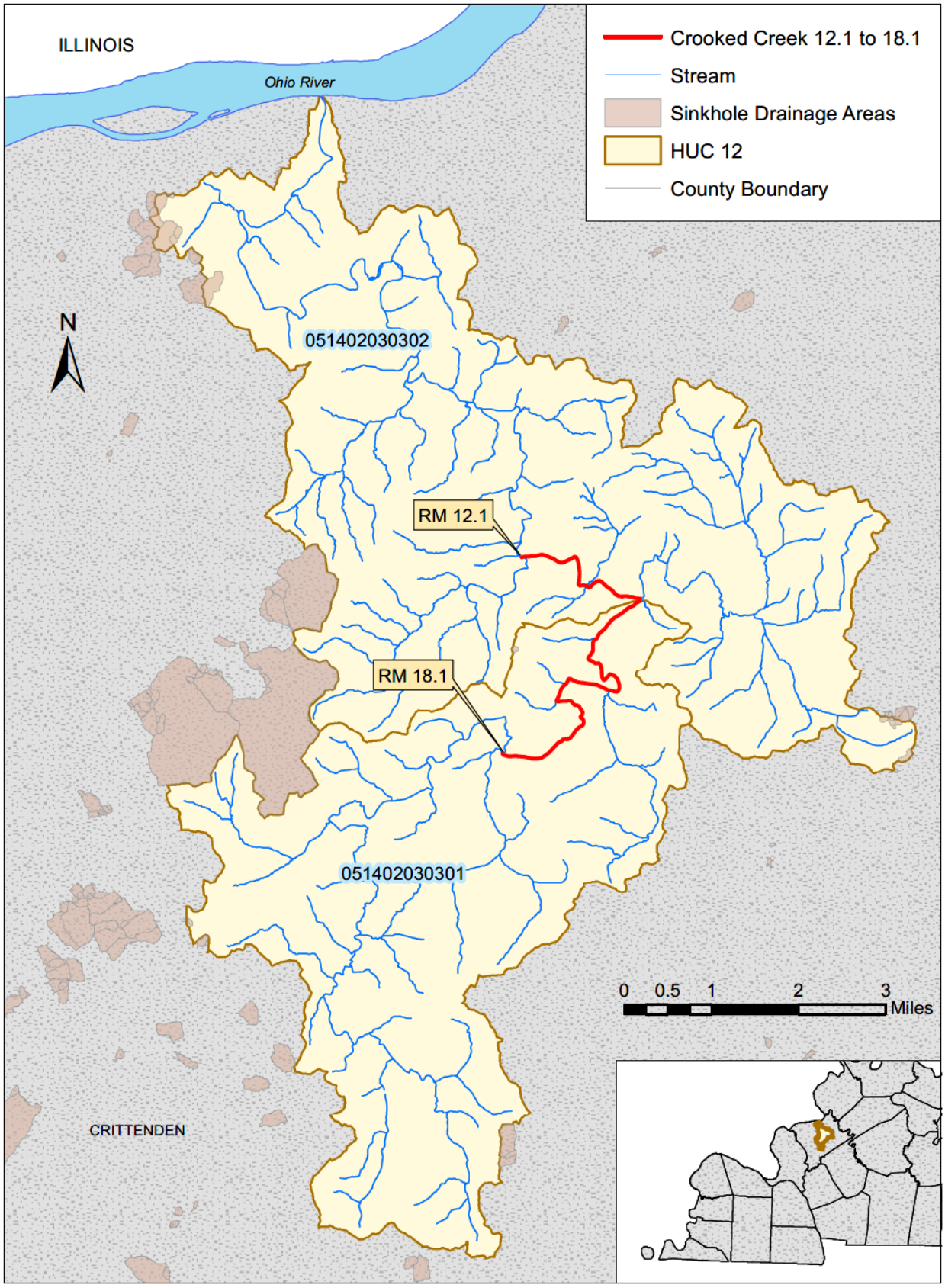

Figure J.11-1 Location of Crooked Creek 12.1 to 18.1

Section J.12 Crooked Creek 18.1 to 26.4

Waterbody ID: KY-2756

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402030301

County: Crittenden

The Division of Water (DOW) collected samples during the PCR season from two stations in 2009. The station, DOW08013009, was sampled 14 times and the station, DOW08013010, was sampled 10 times.

Crooked Creek 12.1 to 18.1 (J.11) and Crooked Creek 18.1 to 26.4 were assessed as one segment in 2014. These segments were subsequently split. Therefore, the data collected at stations DOW08013009 and DOW08013010 was used for both the upper segment, Crooked Creek 18.1 to 26.4, and the lower segment, Crooked Creek 12.1 to 18.1. Table J.12-1 summarizes information about these sampling stations; Table J.12-2 provides a summary of the data collected from these stations.

Table J.12-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08013009	37.3614200	-88.0762200	Crooked Creek 18.1 to 26.4	19.2
DOW08013010	37.31187	-88.09447	Crooked Creek 18.1 to 26.4	26.2

Table J.12-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08013009	*E. coli*	14	29	1,989	658
DOW08013010	*E. coli*	10	12	1,986	327

[(1)]The full data set for samples collected from DOW08013009 and DOW08013010 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Crooked Creek 18.1 to 26.4 are presented in Table J.12-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Crooked Creek. The location of the segment within the Upper Crooked Creek watershed is shown in Figure J.12-1.

Table J.12-3 Crooked Creek 18.1 to 26.4 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.12-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Upper Crooked Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

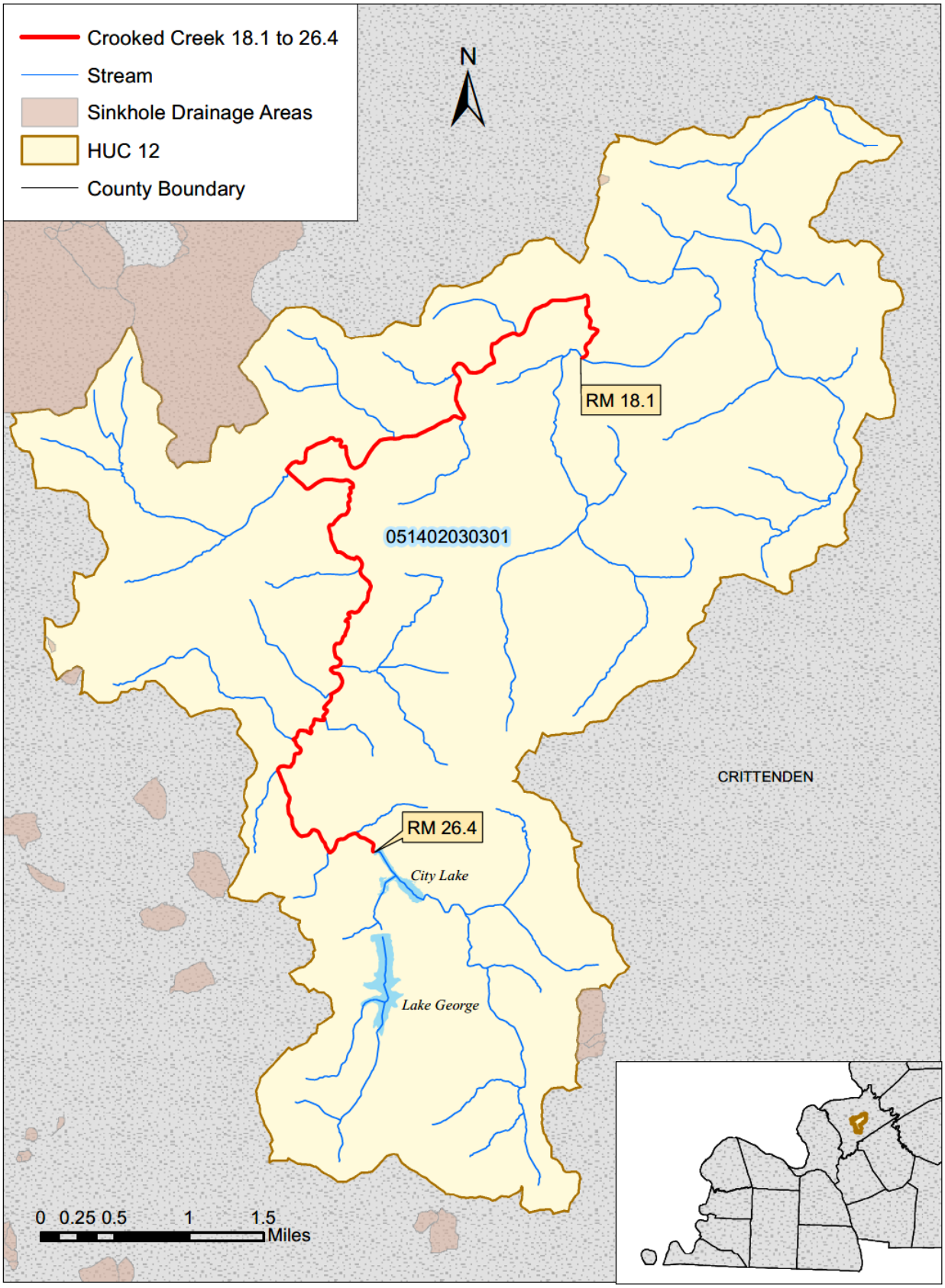

Figure J.12-1 Location of Crooked Creek 18.1 to 26.4

Section J.13 Darby Creek 0.0 to 1.3

Waterbody ID: KY-624

Receiving Water: Harrods Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051401010503

County: Oldham

The Division of Water (DOW) and Third Rock Consulting collected samples from station DOW12051002, located near river mile 0.05, for a watershed-based plan in Darby Creek watershed. DOW collected five samples during the PCR season in 2014. Third Rock Consulting collected four samples during the PCR season in 2008. Station DOW12051002 is identified as DC1 in the Darby Creek watershed-based plan. Table J.13-1 summarizes information about this sampling station; Table J.13-2 provides a summary of the data collected from this station.

Table J.13-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW12051002	38.3902900	-85.5214500	Darby Creek 0.0 to 1.3	0.05

Table J.13-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW12051002	*E. coli*	9	57	>2,420	415

[(1)]The full data set for samples collected from DOW12051002 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Darby Creek 0.0 to 1.3 are presented in Table J.13-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Darby Creek. The location of the segment within the Darby Creek-Harrods Creek watershed is shown in Figure J.13-1**.**

Table J.13-3 Darby Creek 0.0 to 1.3 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.13-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Darby Creek-Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

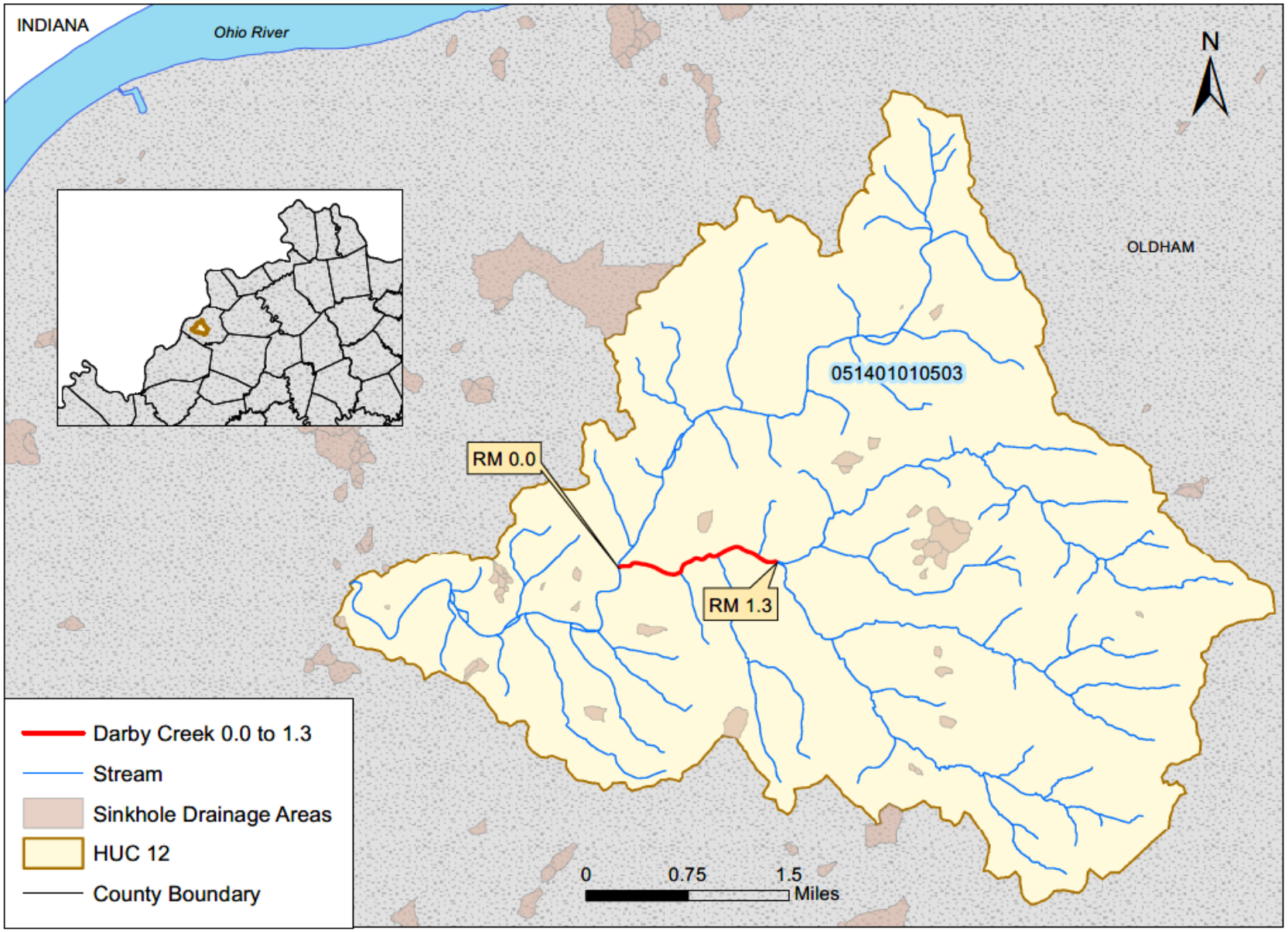

Figure J.13-1 Location of Darby Creek 0.0 to 1.3

Section J.14 Darby Creek 1.3 to 3.4

Waterbody ID: KY-625

Receiving Water: Harrods Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051401010503

County: Oldham

The Division of Water (DOW) and Third Rock Consulting collected samples from station DOW12051003, located near river mile 1.35, for a watershed-based plan in Darby Creek watershed. DOW collected five samples during the PCR season in 2014. Third Rock Consulting collected four samples during the PCR season in 2008. Station DOW12051003 is identified as UDC1 in the Darby Creek watershed-based plan. Table J.14-1 summarizes information about this sampling station; Table J.14-2 provides a summary of the data collected from this station.

Table J.14-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW12051003	38.390564	-85.499998	Darby Creek 1.3 to 3.4	1.35

Table J.14-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW12051003	*E. coli*	9	30	1,986	478

[(1)]The full data set for samples collected at DOW12051003 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Darby Creek 1.3 to 3.4 are presented in Table J.14-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Darby Creek. The location of the segment within the Darby Creek-Harrods Creek watershed is shown in Figure J.14-1.

Table J.14-3 Darby Creek 1.3 to 3.4 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.14-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Darby Creek-Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

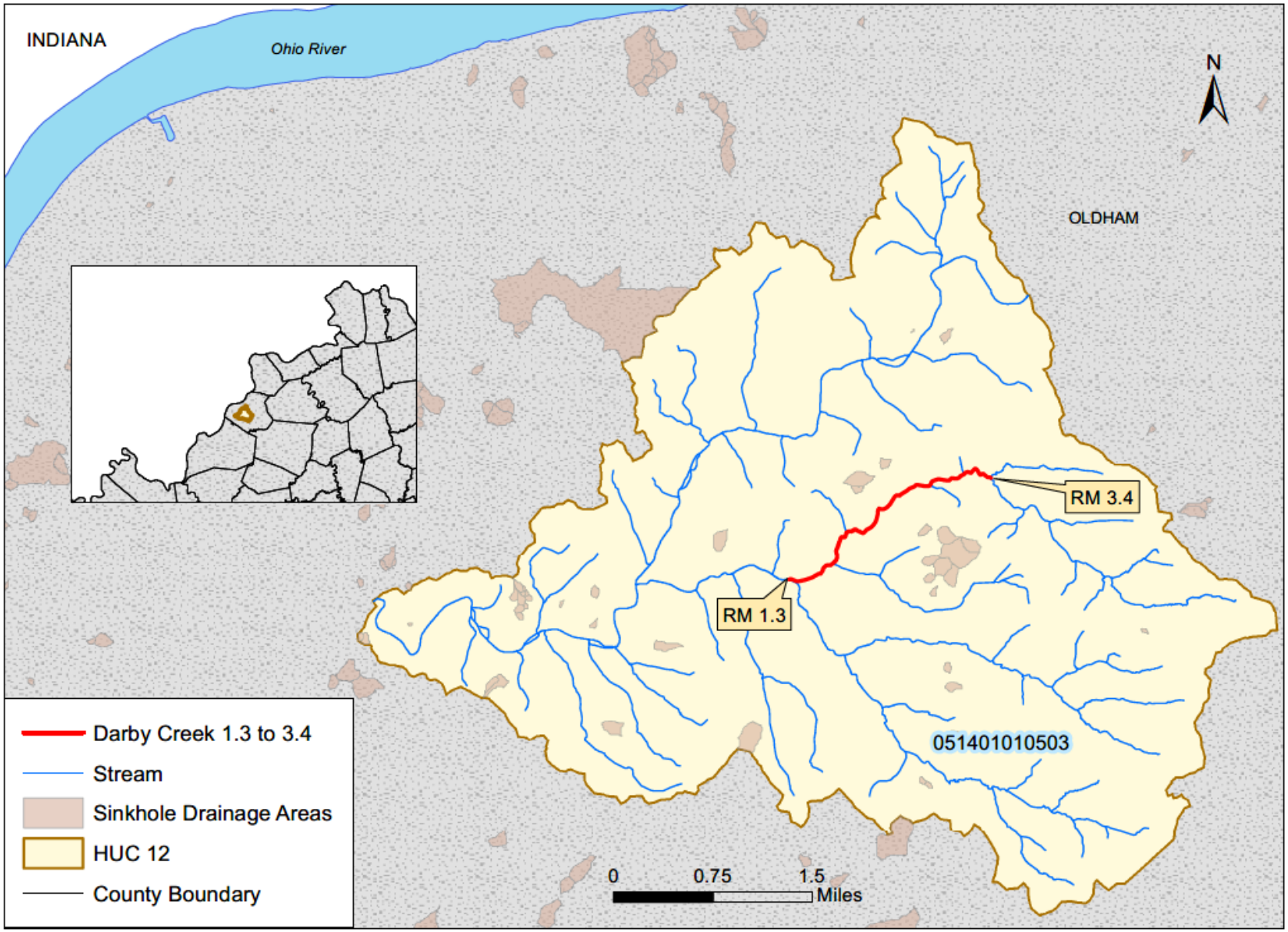

Figure J.14-1 Location of Darby Creek 1.3 to 3.4

Section J.15 Darby Creek 3.4 to 5.9

Waterbody ID: KY-626

Receiving Water: Harrods Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051401010503

County: Oldham

The Division of Water (DOW) and Third Rock Consulting collected samples from station DOW12051004, located near river mile 4.0, for a watershed-based plan in Darby Creek watershed. DOW collected five samples during the PCR season in 2014 and five samples during the PCR season in 2021. Third Rock Consulting collected four samples during the PCR season in 2008. Station DOW12051004 is identified as UDC2 in the Darby Creek watershed-based plan. Table J.15-1 summarizes information about this sampling station; Table J.15-2 provides a summary of the data collected from this station.

Table J.15-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW12051004	38.39702	-85.46482	Darby Creek 3.4 to 5.9	4.0

Table J.15-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW12051004	*E. coli*	14	80	5,600	1,194

[(1)]The full data set for samples collected at DOW12051004 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Darby Creek 3.4 to 5.9 are presented in Table J.15-3.

Table J.15-3 Darby Creek 3.4 to 5.9 *E. coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[(5)]	MOS[(6)]
	MS4-WLA[(3)]	LA[(4)]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[(4)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(5)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(6)]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.15-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Darby Creek-Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

The Oldham County Fiscal Court and Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Darby Creek. Information about MS4 permits is summarized in Table J.15-4. There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 area and the segment within the Darby Creek-Harrods Creek watershed is shown in Figure J.15-1. The MS4 area boundaries are from DOW information last updated in 2016.

Table J.15-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli*/day)
KYG200005	Oldham County Fiscal Court	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

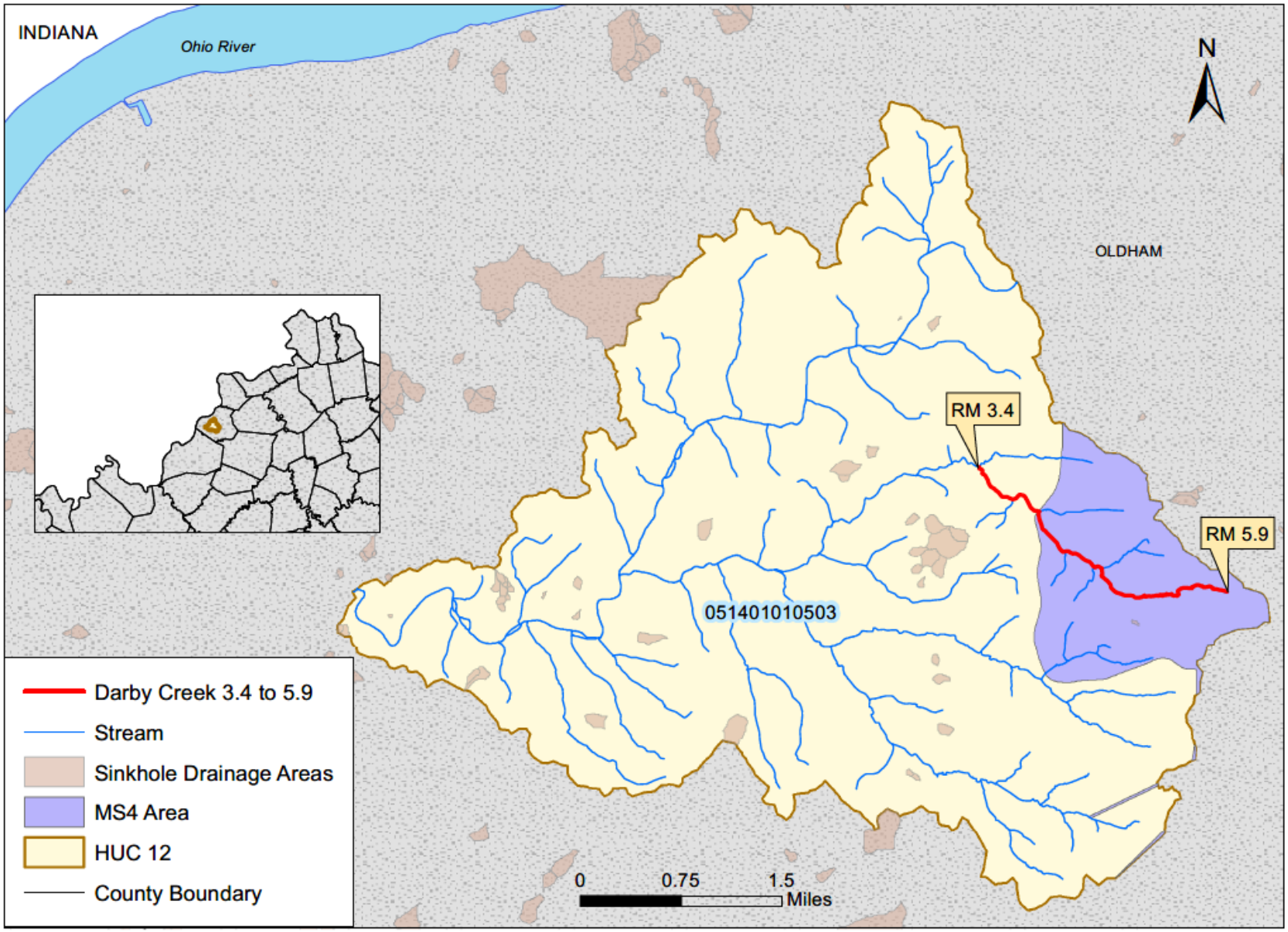

Figure J.15-1 Location of Darby Creek 3.4 to 5.9

Section J.16 Darby Fork 0.0 to 1.55

Waterbody ID: KY-627

Receiving Water: South Fork Darby Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051401010503

County: Oldham

The Division of Water (DOW) and Third Rock Consulting collected samples from station DOW12051005, located near river mile 0.15, for a watershed-based plan in Darby Creek watershed. DOW collected five samples during the PCR season in 2014 and five samples during the PCR season in 2021. Third Rock Consulting collected four samples during the PCR season in 2008. Station DOW12051005 is identified as DF1 in the Darby Creek watershed-based plan. Table J.16-1 summarizes information about this sampling station; Table J.16-2 provides a summary of the data collected from this station.

Table J.16-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW12051005	38.38336	-85.49065	Darby Fork 0.0 to 1.55	0.15

Table J.16-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW12051005	*E. coli*	14	10	1,100	318

[(1)]The full data set for samples collected at DOW12051005 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Darby Fork 0.0 to 1.55 are presented in Table J.16-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Darby Fork. The location within the Darby Creek-Harrods Creek watershed is shown in Figure J.16-1.

Table J.16-3 Darby Fork 0.0 to 1.55 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.16-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Darby Creek-Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

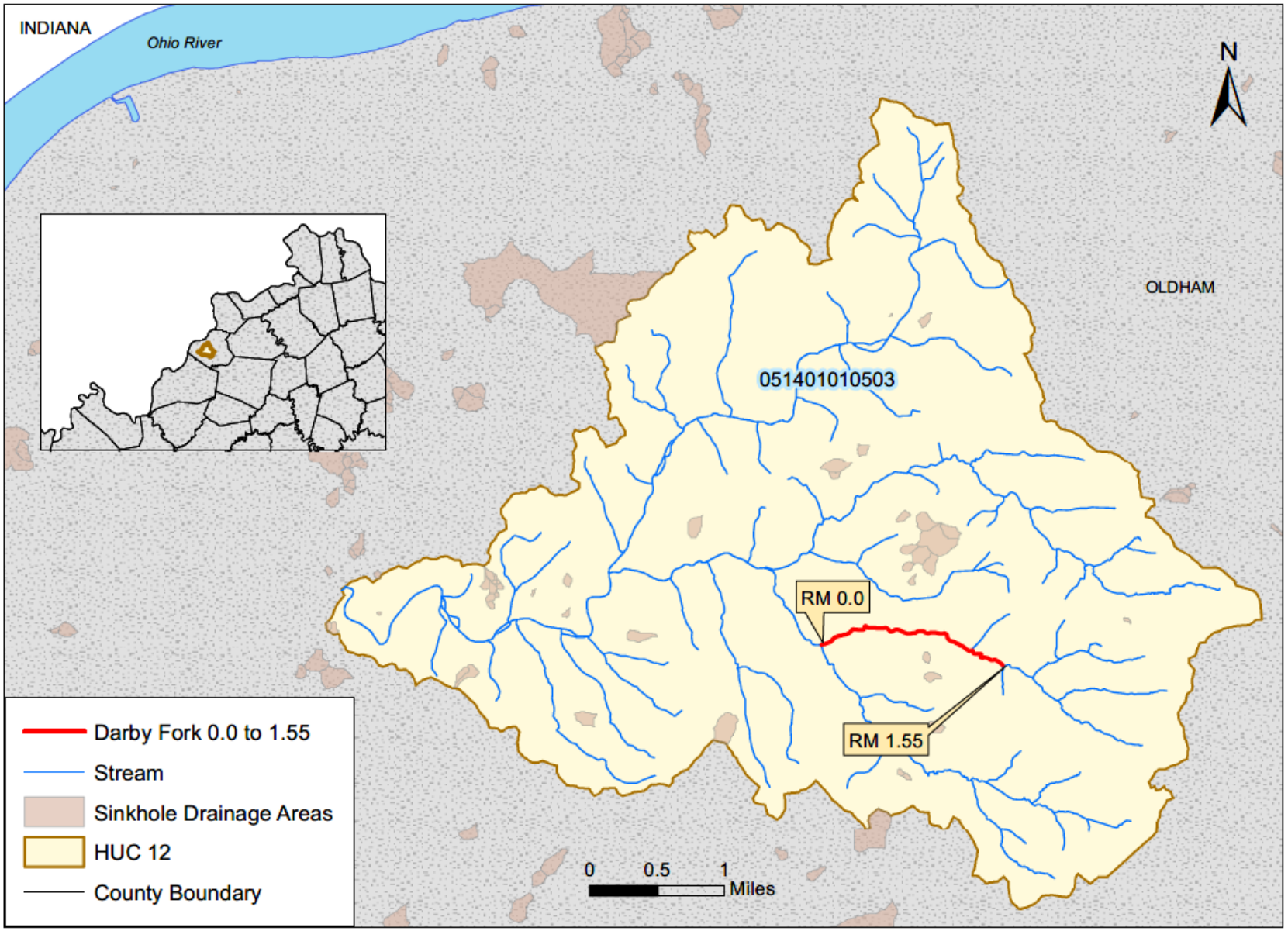

Figure J.16-1 Location of Darby Fork 0.0 to 1.55

Section J.17 Darby Fork 1.55 to 2.85

Waterbody ID: KY-628

Receiving Water: South Fork Darby Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051401010503

County: Oldham

The Division of Water (DOW) and Third Rock Consulting collected samples from station DOW12051006, located near river mile 1.8, for a watershed-based plan in Darby Creek watershed. DOW collected five samples during the PCR season in 2014. Third Rock Consulting collected four samples during the PCR season in 2008. Station DOW12051006 is identified as DF2 (New Site) in the Darby Creek watershed-based plan. Table J.17-1 summarizes information about this sampling station; Table J.17-2 summarizes the data collected from this station.

Table J.17-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW12051006	38.3789100	-85.4649000	Darby Fork 1.55 to 2.85	1.8

Table J.17-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW12051006	*E. coli*	9	<10	816	170

[(1)]The full data set for samples collected from DOW12051006 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Darby Fork 1.55 to 2.85 are presented in Table J.17-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Darby Fork. The location within the Darby Creek-Harrods Creek watershed is shown in Figure J.17-1.

Table J.17-3 Darby Fork 1.55 to 2.85 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.17-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Darby Creek-Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

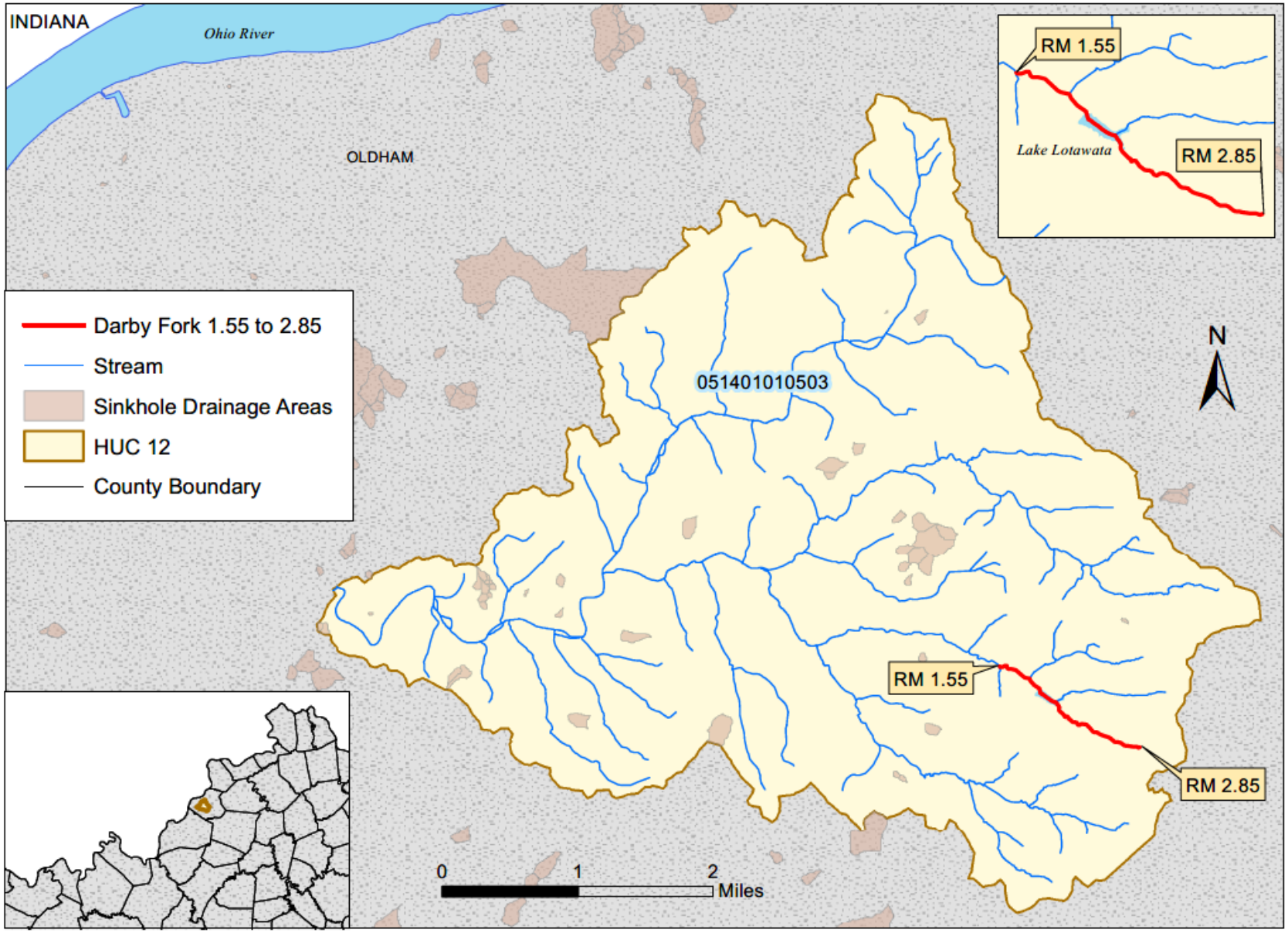

Figure J.17-1 Location of Darby Fork 1.55 to 2.85

Section J.18 Dennis O'Nan Ditch 0.2 to 5.2

Waterbody ID: KY-635

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402030203

County: Union

The Division of Water (DOW) collected samples at an Ambient Monitoring Network Station, GRN001, located near river mile 2.1. The station was sampled every five years during the PCR season from 2001 to 2016. The station has been sampled between four and seven times during a monitoring year. Table J.18-1 summarizes information about this sampling station; Table J.18-2 provides a summary of the data collected from this station.

Table J.18-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
GRN001	37.5789710	-88.0976350	Dennis O'Nan Ditch 0.2 to 5.2	2.1

Table J.18-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
GRN001	*E. coli*	12	17	>2,420	468
GRN001	fecal coliform	11	60	1,200	471

[(1)]The full data set for samples collected from GRN001 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Dennis O'Nan Ditch 0.2 to 5.2 are presented in Table J.18-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Dennis O'Nan Ditch. The location of the segment within the Lower Cypress Creek watershed is shown in Figure J.18-1.

Table J.18-3 Dennis O'Nan Ditch 0.2 to 5.2 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

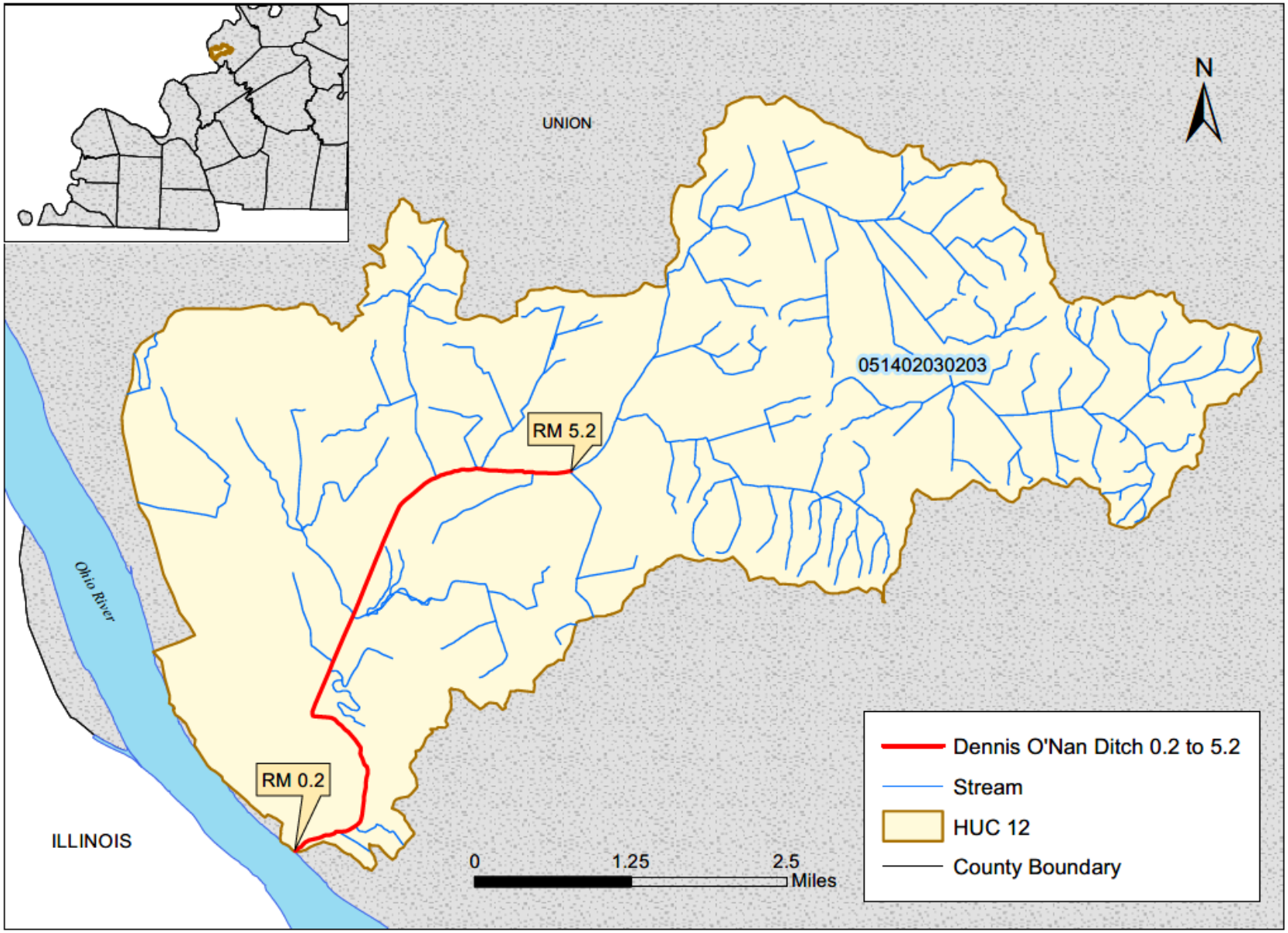

Figure J.18-1 Location of Dennis O'Nan Ditch 0.2 to 5.2

Section J.19 Doe Run 5.2 to 8.3

Waterbody ID: KY-2877

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 051401040106

County: Meade

The Division of Water (DOW) collected samples at an Ambient Monitoring Network Station, SRW011, located near river mile 6.2. The station was sampled during the PCR season in 1999 and 2004. The station was sampled six times during a monitoring year. Table J.19-1 summarizes information about this sampling station; Table J.19-2 provides a summary of the data collected from this station.

Table J.19-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
SRW011	37.9495000	-86.1294000	Doe Run 5.2 to 8.3	6.2

Table J.19-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
SRW011	fecal coliform	12	24	2,700	715

[(1)]The full data set for samples collected from SRW011 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Doe Run 5.2 to 8.3 are presented in Table J.19-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Doe Run. The location of the segment within the Doe Run watershed is shown in Figure J.19-1.

Table J.19-3 Doe Run 5.2 to 8.3 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.19-1 shows the segment occurs in an area with karst features such as springs, sinking streams, and numerous sinkholes. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Doe Run watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

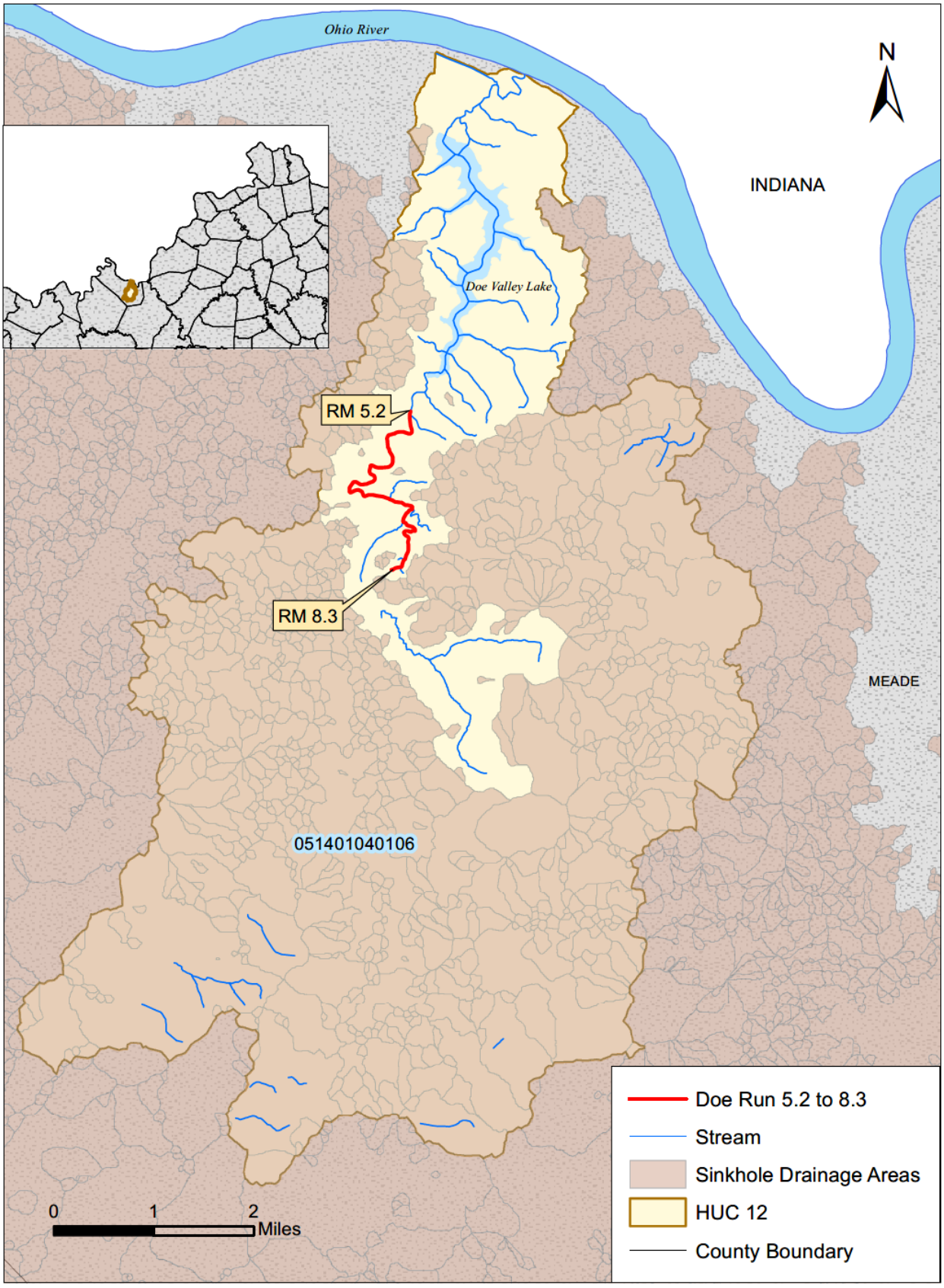

Figure J.19-1 Location of Doe Run 5.2 to 8.3

Section J.20 East Fork Canoe Creek 0.0 to 7.85

Waterbody ID: KY-684

Receiving Water: Canoe Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020404

County: Henderson

The Division of Water (DOW) collected samples from station DOW08023022, located near river mile 5.2, in 2010. The station was sampled three times during the PCR season. Table J.20-1 summarizes information about this sampling station; Table J.20-2 provides a summary of the data collected from this station.

Table J.20-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023022	37.7337100	-87.5343000	East Fork Canoe Creek 0.0 to 7.85	5.2

Table J.20-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023022	*E. coli*	3	308	1,986	1,198

[(1)]The full data set for samples collected from station DOW08023022 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for East Fork Canoe Creek 0.0 to 7.85 are presented in Table J.20-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of East Fork Canoe Creek. The location of the segment within the East Fork Canoe Creek-Canoe Creek watershed is shown in Figure J.20-1.

Table J.20-3 East Fork Canoe Creek 0.0 to 7.85 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

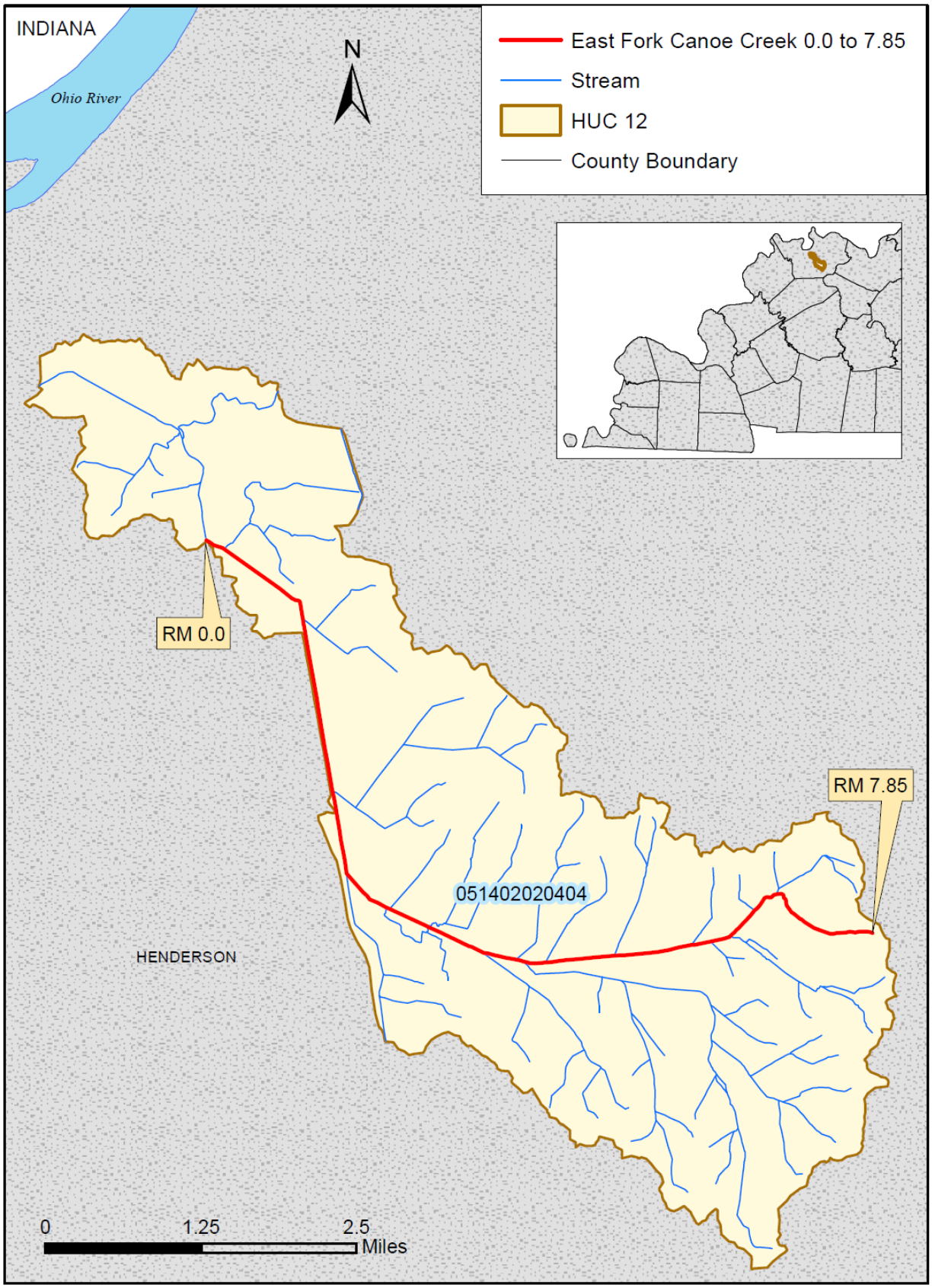

Figure J.20-1 Location of East Fork Canoe Creek 0.0 to 7.85

Section J.21 Elam Ditch 0.0 to 5.3

Waterbody ID: KY-711

Receiving Water: Canoe Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020402

County: Henderson

The Division of Water (DOW) collected samples during the PCR season from two stations in 2010. The station, DOW08023006, was sampled eight times and the station, DOW08023015, was sampled five times. Table J.21-1 summarizes information about these sampling stations; Table J.21-2 provides a summary of the data collected from these stations.

Table J.21-1 DOW Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023006	37.7922000	-87.5648000	Elam Ditch 0.0 to 5.3	1.05
DOW08023015	37.7783700	-87.5079000	Elam Ditch 0.0 to 5.3	4.44

Table J.21-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023006	*E. coli*	8	54	>2,420	714
DOW08023015	*E. coli*	5	142	>2,420	1,229

[(1)]The full data set for samples collected from these stations may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Elam Ditch 0.0 to 5.3 are presented in Table J.21-3.

Table J.21-3 Elam Ditch 0.0 to 5.3 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Henderson County Fiscal Court and the Kentucky Department of Transportation has Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Elam Ditch. Information about MS4 permits is summarized in Table J.21-4. There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 areas and the segment within the North Fork Canoe Creek-Canoe Creek watershed is shown in Figure J.21-1. The MS4 area boundaries are from DOW information last updated in 2016. Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.21-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYG200059	Henderson County Fiscal Court	4/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

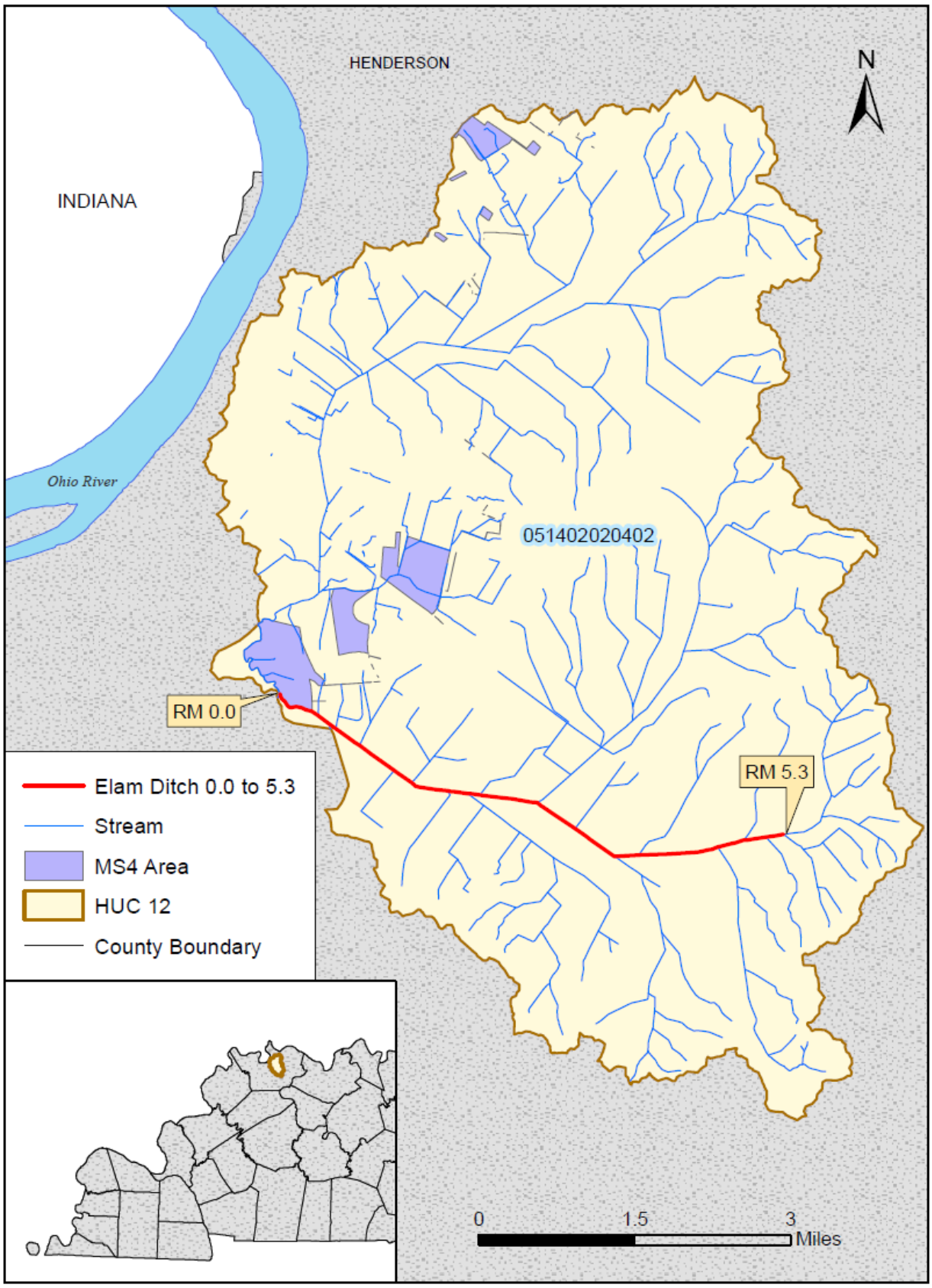

Figure J.21-1 Location of Elam Ditch 0.0 to 5.3

Section J.22 Fourmile Creek 0.2 to 8.3

Waterbody ID: KY-780

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 050902011207

County: Campbell

Morehead State University collected samples at a station located near river mile 0.3 in 1999. The station was sampled six times during the PCR season. Table J.22-1 summarizes information about this sampling station; Table J.22-2 provides a summary of the data collected from this station.

Table J.22-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
ADB_HIST_551	39.0295000	-84.3892000	Fourmile Creek 0.2 to 8.3	0.3

Table J.22-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
ADB_HIST_551	fecal coliform	6	130	1,500	717

[(1)]The full data set for samples collected from station ADB_HIST_551 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Fourmile Creek 0.2 to 8.3 are presented in Table J.22-3.

Table J.22-3 Fourmile Creek 0.2 to 8.3 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment			Allocations for Upstream Loads to the Segment[6]	Allocations for Tributary Loads to the Segment[7]	MOS[8]
	MS4-WLA[3]	SWS-WLA[4]	LA[5]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[5]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[6]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[7]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[8]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Three facilities permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharge treated effluent directly into this segment of Fourmile Creek. These directly discharging facilities are sanitary wastewater systems. Two of the facilities are individual family residences with on-site wastewater treatment systems. Sanitation District No.1 of Northern Kentucky (SD1) and the Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Fourmile Creek. Information concerning Alexandria and Silver Grove MS4 permit coverage can be found as a co-permittee of SD1's MS4 permit (Permit number KYG200007). There are no CSOs discharging directly to this segment of Fourmile Creek. The definitions for MS4 and CSO are found in 401 KAR 5:002. The facilities and MS4s are identified in Table J.22-4. The location of these facilities, MS4 areas, and the segment within the Fourmile Creek watershed is shown in Figure J.22-1. The MS4 area boundaries are from DOW information last updated in 2015 (Alexandria and Silver Grove) and 2022 (SD1). Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.22-4 Summary of Active KPDES-permitted Sources as of April 2022

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[1]	WLA[2] (colonies *E. coli* /day)
KYG400268	Residence	0.0005	39.020833	-84.381944	7/31/2018	Q_{SWS}×WQC×CF
KYG400091	Residence	0.0005	39.009722	-84.370278	8/31/2023	Q_{SWS}×WQC×CF
KY0096105	Reitman Auto Parts & Sales Inc	0.0005	38.99536	-84.363991	5/31/2023	Q_{SWS}×WQC×CF
KYG200007	SD1	N/A	N/A	N/A	04/30/2023	Q_{MS4}×WQC×CF
KYG200007	Alexandria	N/A	N/A	N/A	04/30/2023	Q_{MS4}×WQC×CF
KYG200007	Silver Grove	N/A	N/A	N/A	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	N/A	N/A	N/A	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{SWS} is the flow in the segment due to a SWS entity. Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

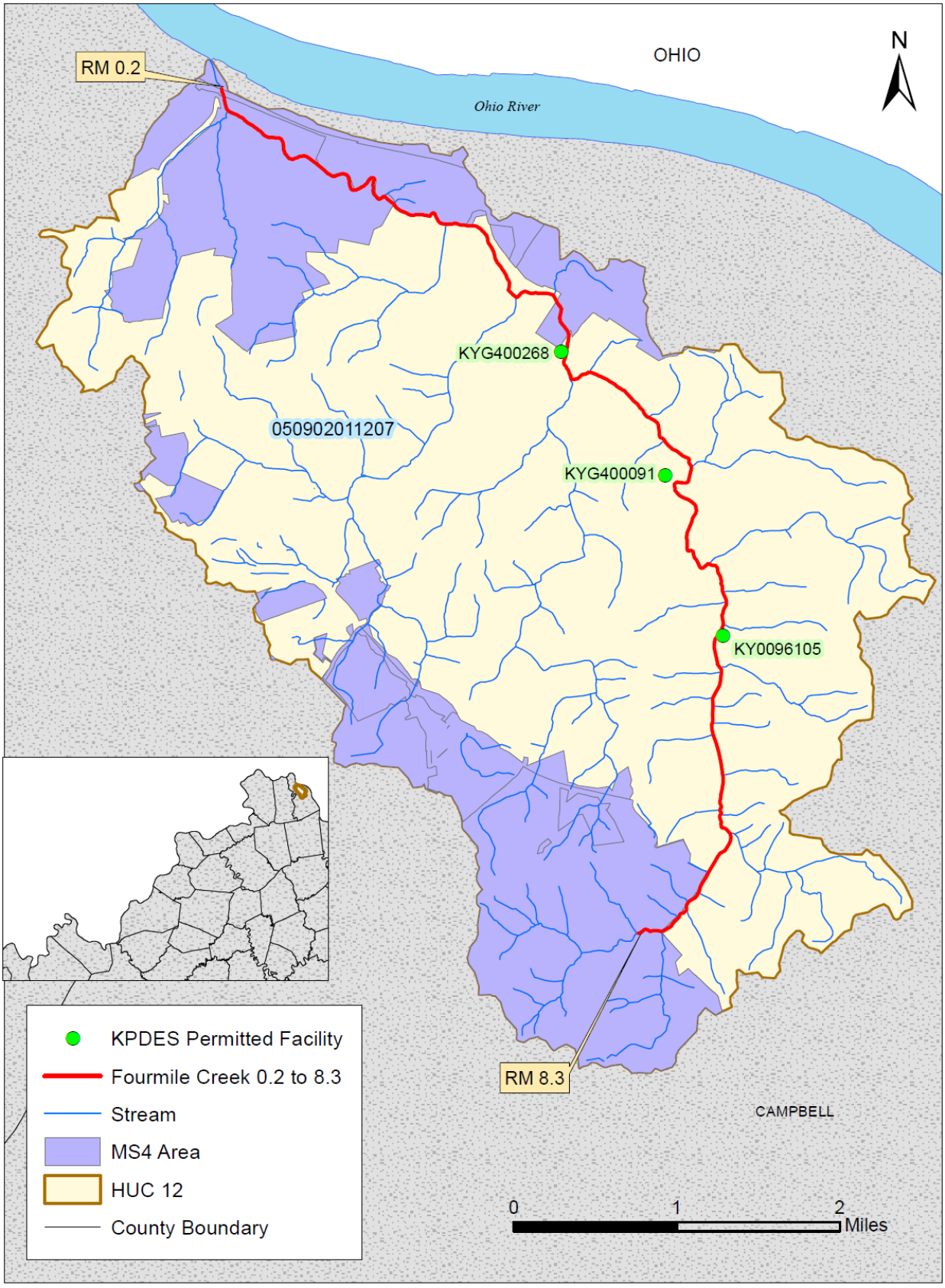

Figure J.22-1 Location of the KPDES-permitted Facilities on Fourmile Creek 0.2 to 8.3

Section J.23 Goose Creek 0.05 to 3.3

Waterbody ID: KY-822

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 051401010605

County: Jefferson

The Division of Water (DOW) collected samples from station DOW08049002, located near river mile 1.0, in 2008. The station was sampled ten times during the PCR season. Table J.23-1 summarizes information about this sampling station; Table J.23-2 provides a summary of the data collected from this station.

Table J.23-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08049002	38.3168100	-85.6394400	Goose Creek 0.05 to 3.3	1.0

Table J.23-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08049002	*E. coli*	10	201	19,860	2,521

[(1)]The full data set for samples collected from station DOW08049002 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Goose Creek 0.05 to 3.3 are presented in Table J.23-3.

Table J.23-3 Goose Creek 0.05 to 3.3 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.23-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lentzier Creek-Ohio River watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

The Metropolitan Sewer District (MSD) and Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Goose Creek. Information about MS4 permits is summarized in Table J.23-4. There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 area and the segment within the Lentzier Creek-Ohio River watershed is shown in Figure J.23-1. The MS4 area boundaries are from DOW information last updated in 2014. Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.23-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYS000001	MSD	01/31/2022	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

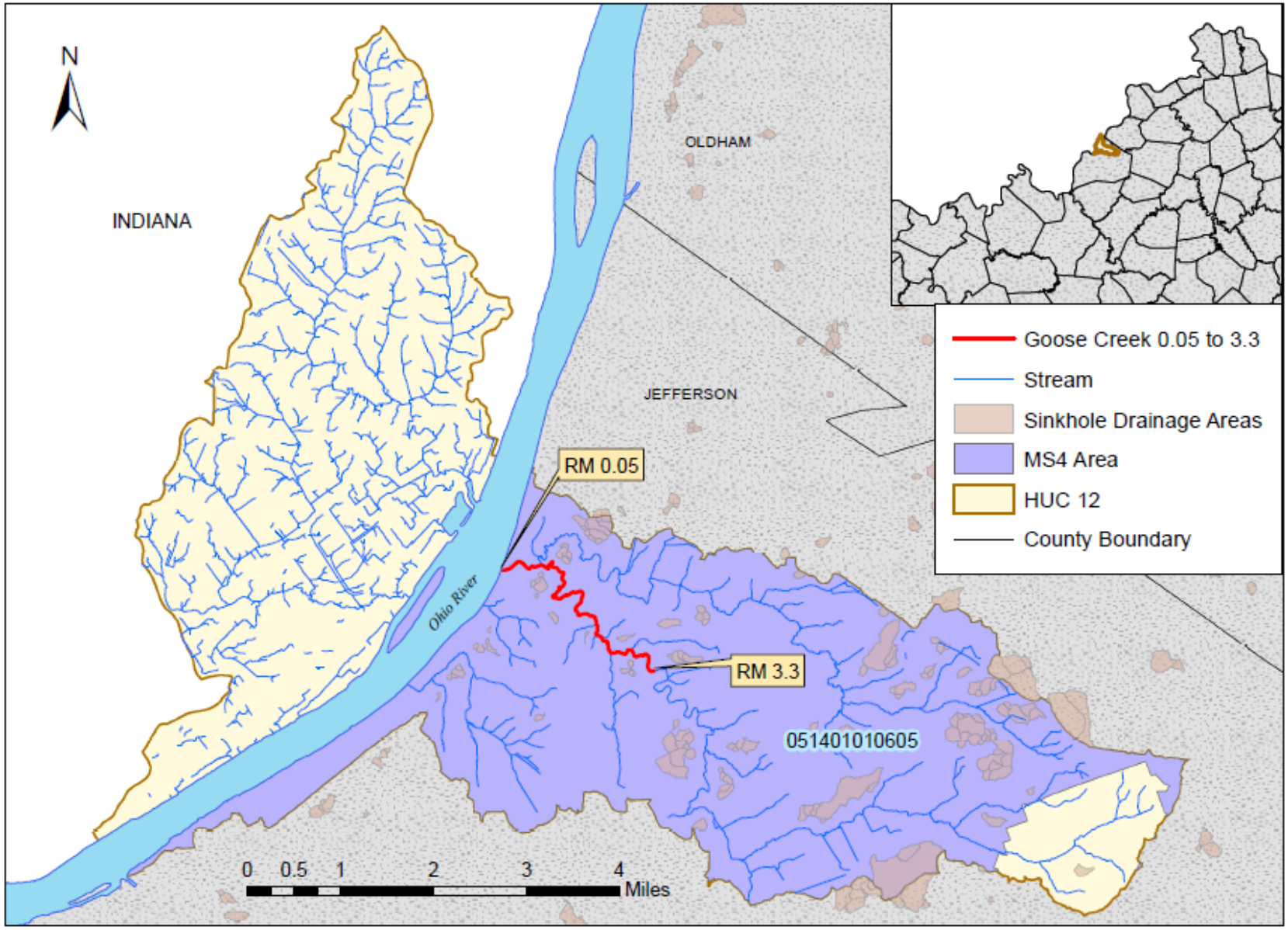

Figure J.23-1 Location of Goose Creek 0.05 to 3.3

Section J.24 Goose Creek 3.3 to 12.85

Waterbody ID: KY-823

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 051401010605

County: Jefferson

The Metropolitan Sewer District (MSD) collected samples from station MSD3292474, located near river mile 7.1, from 1991 to 1998. The station was sampled between three and six times during the PCR season in a monitoring year. Table J.24-1 summarizes information about this sampling station; Table J.24-2 provides a summary of the data collected from this station.

Table J.24-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
MSD3292474	38.273081	-85.604793	Goose Creek 3.3 to 12.85	7.1

Table J.24-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
MSD3292474	fecal coliform	39	1	101,000	8,039

[(1)]The full data set for samples collected from MSD3292474 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Goose Creek 3.3 to 12.85 are presented in Table J.24-3.

Table J.24-3 Goose Creek 3.3 to 12.85 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment			Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	SWS-WLA[4]	LA[5]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[5]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.24-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lentzier Creek-Ohio River watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

Two facilities permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharge treated effluent directly into this segment of Goose Creek. The directly discharging facilities are sanitary wastewater systems. These facilities are individual family residences with on-site wastewater treatment systems. The Metropolitan Sewer District (MSD) and Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Goose Creek. Information concerning Anchorage MS4 permit coverage can be found as a co-permittee of MSD's MS4 permit (Permit number KYS000001). There are no Combined Sewer Overflows (CSOs) discharging directly to this segment of Goose Creek. The definitions for MS4 and CSO are found in 401 KAR 5:002. The facilities and MS4s are identified in Table J.24-4. The location of the facilities, MS4 areas, and the segment within the Lentzier Creek-Ohio River watershed is shown in Figure J.24-1. The MS4 area boundaries are from DOW information last updated in 2014.

Table J.24-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli* /day)
KYG402442	Residence	0.0005	38.270833	-85.540556	8/31/2023	Q_{SWS}×WQC×CF
KYG402838	Residence	0.0005	38.27767	-85.52378	8/31/2023	Q_{SWS}×WQC×CF
KYS000001	MSD	N/A	N/A	N/A	01/31/2022	Q_{MS4}×WQC×CF
KYS000001	Anchorage	N/A	N/A	N/A	01/31/2022	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	N/A	N/A	N/A	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{SWS} is the flow in the segment due to a SWS entity. Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

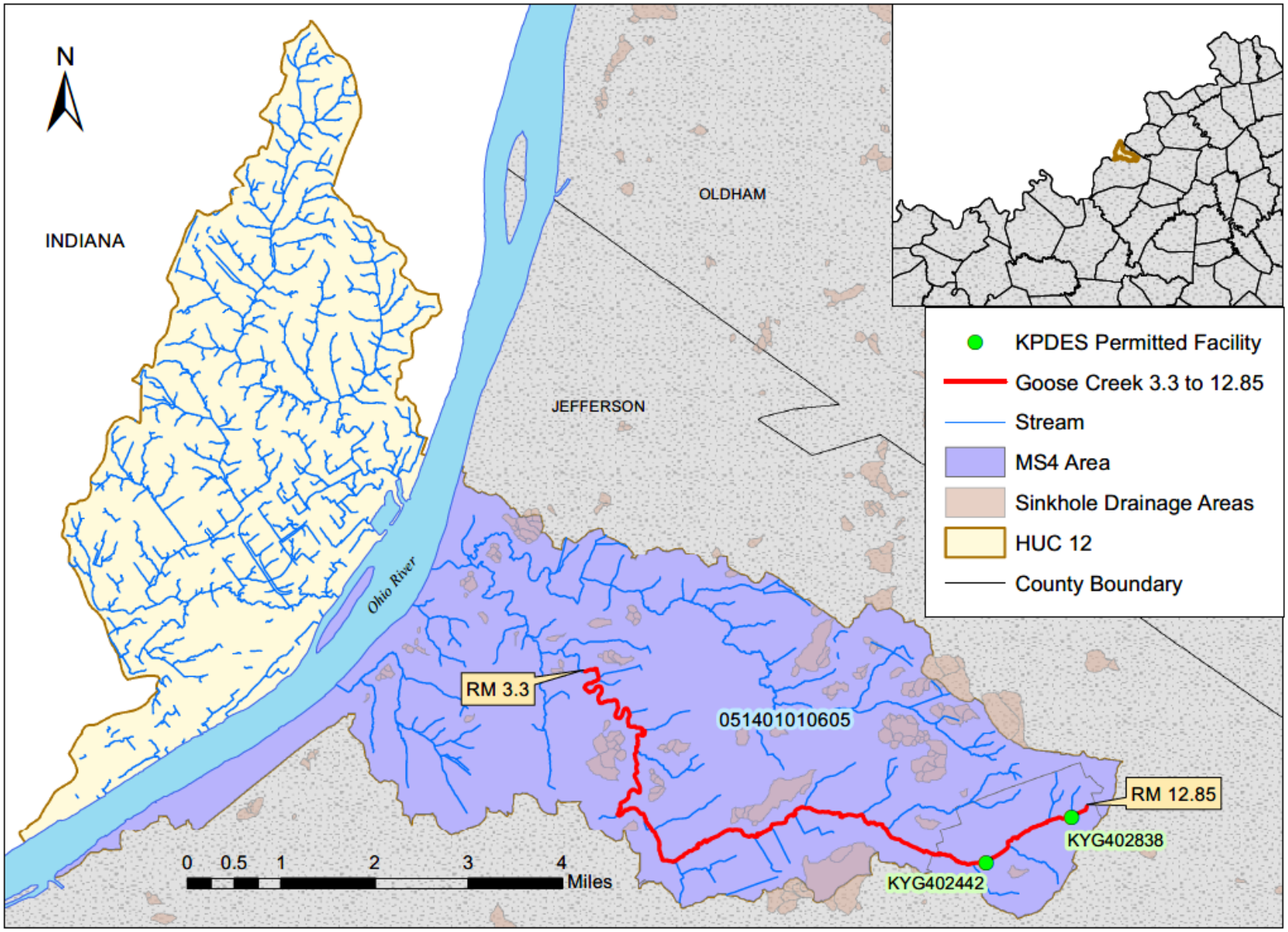

Figure J.24-1 Location of KPDES-permitted Facilities on Goose Creek 3.3 to 12.85

Section J.25 Harrods Creek 0.05 to 3.2

Waterbody ID: KY-905

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 051401010505

County: Jefferson

The Division of Water (DOW) collected samples at an Ambient Monitoring Network Station, SRW006, located near river mile 7.1. The data from that location was used to assess both this segment and the upper segment from river mile 3.2 to 21.4. The station was sampled every five years during the PCR season from 1999 to 2019. The station has been sampled between three to six times during a monitoring year. Table J.25-1 summarizes information about this sampling station; Table J.25-2 provides a summary of the data collected from this station.

Table J.25-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
SRW006	38.3611170	-85.5748050	Harrods Creek 0.05 to 3.2	7.1

Table J.25-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
SRW006	*E. coli*	15	16	>2,420	498
SRW006	fecal coliform	12	10	2,600	391

[(1)]The full data set for samples collected from SRW006 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Harrods Creek 0.05 to 3.2 are presented in Table J.25-3.

Table J.25-3 Harrods Creek 0.05 to 3.2 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment			Allocations for Upstream Loads to the Segment[6]	Allocations for Tributary Loads to the Segment[7]	MOS[8]
	MS4-WLA[3]	SWS-WLA[4]	LA[5]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[5]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[6]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[7]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[8]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.25-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to

correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Wolf Pen Branch-Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Harrods Creek. The directly discharging facility is a sanitary wastewater system (SWS). This SWS is an individual family residence with an on-site wastewater treatment system. The Metropolitan Sewer District (MSD) and Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Harrods Creek. There are no Combined Sewer Overflows (CSOs) discharging directly to this segment of Harrods Creek. The definitions for MS4 and CSO are found in 401 KAR 5:002. The facility and MS4s are identified in Table J.25-4. The location of the facility, MS4 areas, and the segment within the Wolf Pen Branch-Harrods Creek watershed is shown in Figure J.25-1. The MS4 area boundaries are from DOW information last updated in 2014. Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.25-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli* /day)
KYG402648	Residence	0.0005	38.328838	-85.630782	8/31/2023	Q_{SWS}×WQC×CF
KYS000001	MSD	N/A	N/A	N/A	01/31/2022	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	N/A	N/A	N/A	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{SWS} is the flow in the segment due to a SWS entity. Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

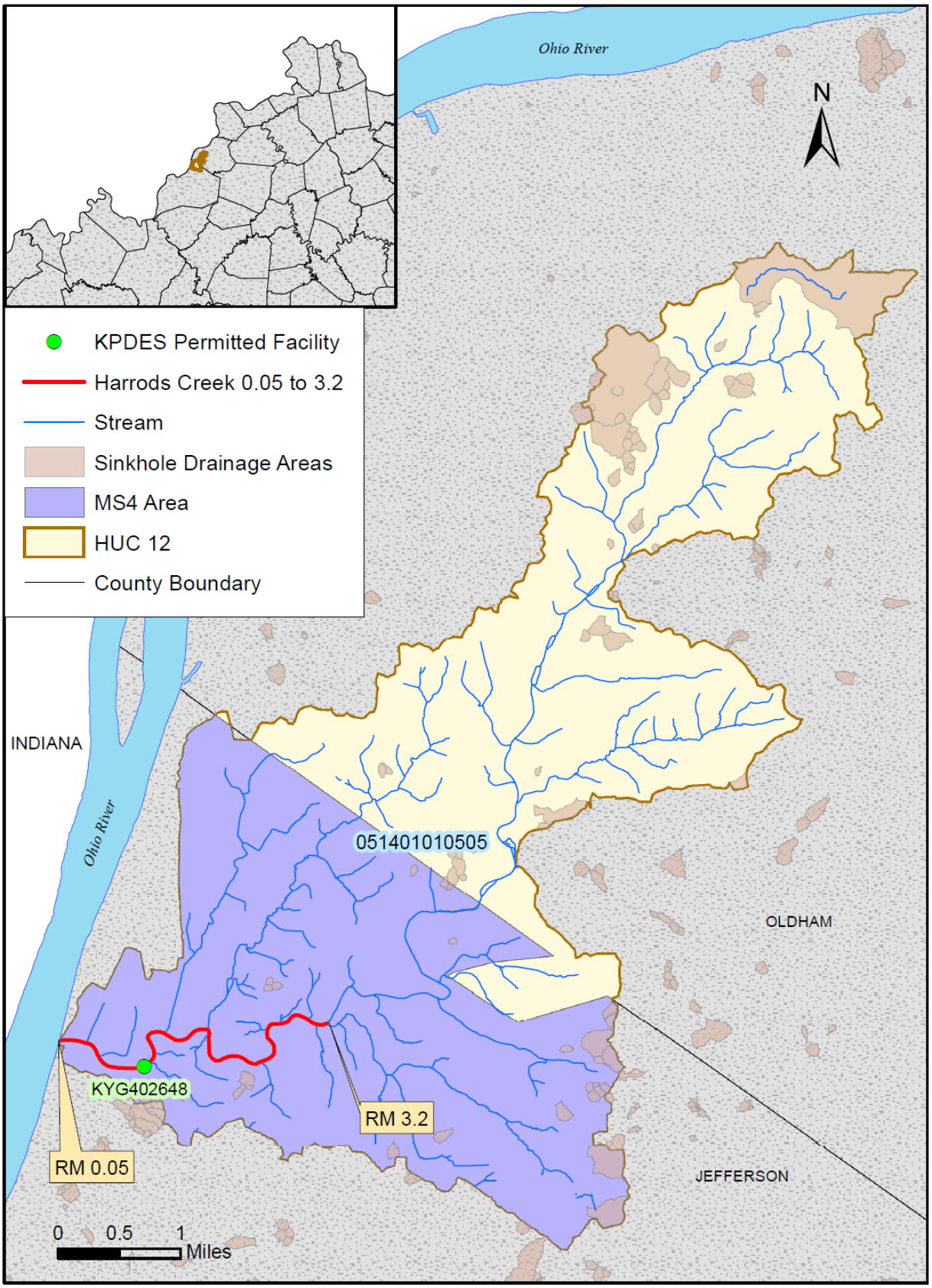

Figure J.25-1 Location of the KPDES-permitted Facility on Harrods Creek 0.05 to 3.2

Section J.26 Harrods Creek 27.3 to 33.3

Waterbody ID: KY-908

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051401010501

Counties: Henry, Oldham

Kentucky Waterways Alliance collected samples from station UH-1, located near river mile 29.0, in 2014 for a monitoring project in the Upper Harrods Creek watershed. The station was sampled five times during the PCR season. Table J.26-1 summarizes information about the sampling station; Table J.26-2 provides a summary of the data collected from this station.

Table J.26-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
UH-1	38.4431000	-85.3317700	Harrods Creek 27.3 to 33.3	29.0

Table J.26-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
UH-1	*E. coli*	5	16	>2,420	667

[(1)]The full data set for samples collected from UH-1 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Harrods Creek 27.3 to 33.3 are presented in Table J.26-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Harrods Creek. The location of the segment within the Headwaters Harrods Creek watershed is shown in Figure J.26-1.

Table J.26-3 Harrods Creek 27.3 to 33.3 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.26-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Headwaters Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

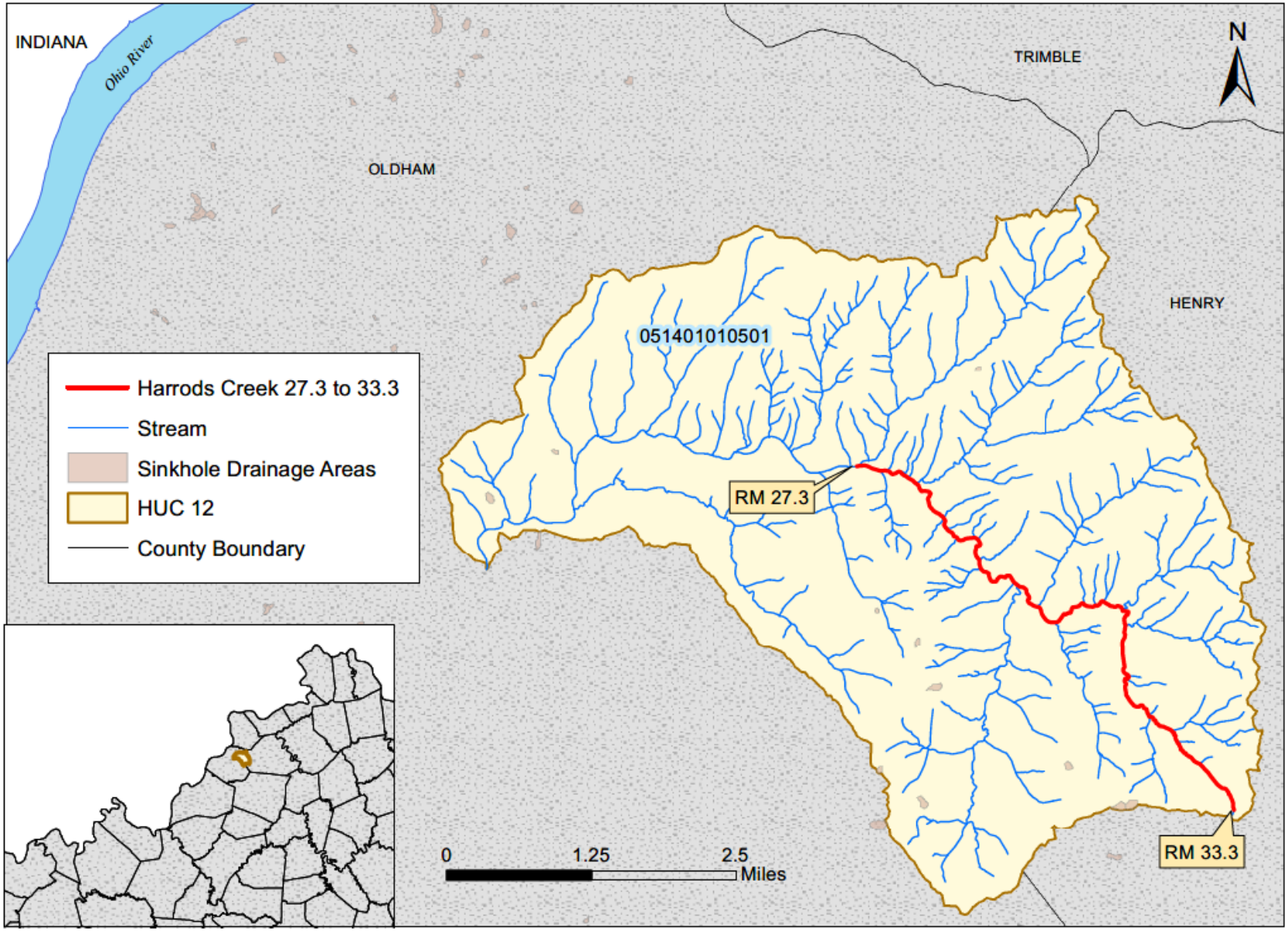

Figure J.26-1 Location of Harrods Creek 27.3 to 33.3

Section J.27 Highland Creek 0.0 to 7.65

Waterbody ID: KY-924

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12s: 051402020702, 051402020703

County: Union

The Division of Water (DOW) collected samples from station PRI071, located near river mile 5.7. The station was sampled during the PCR season from 1999 to 2002 and was subsequently discontinued as an Ambient Monitoring Network Station. The station was sampled one to six times during a monitoring year. Table J.27-1 summarizes information about this sampling station; Table J.27-2 provides a summary of the data collected from this station.

Table J.27-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PRI071	37.7833320	-87.8696100	Highland Creek 0.0 to 7.65	5.7

Table J.27-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PRI071	fecal coliform	12	30	1,367	445

[(1)]The full data set for samples collected from PRI071 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Highland Creek 0.0 to 7.65 are presented in Table J.27-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Highland Creek. The location of the segment within the Hogan Slough-Highland Creek watershed is shown in Figure J.27-1.

Table J.27-3 Highland Creek 0.0 to 7.65 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

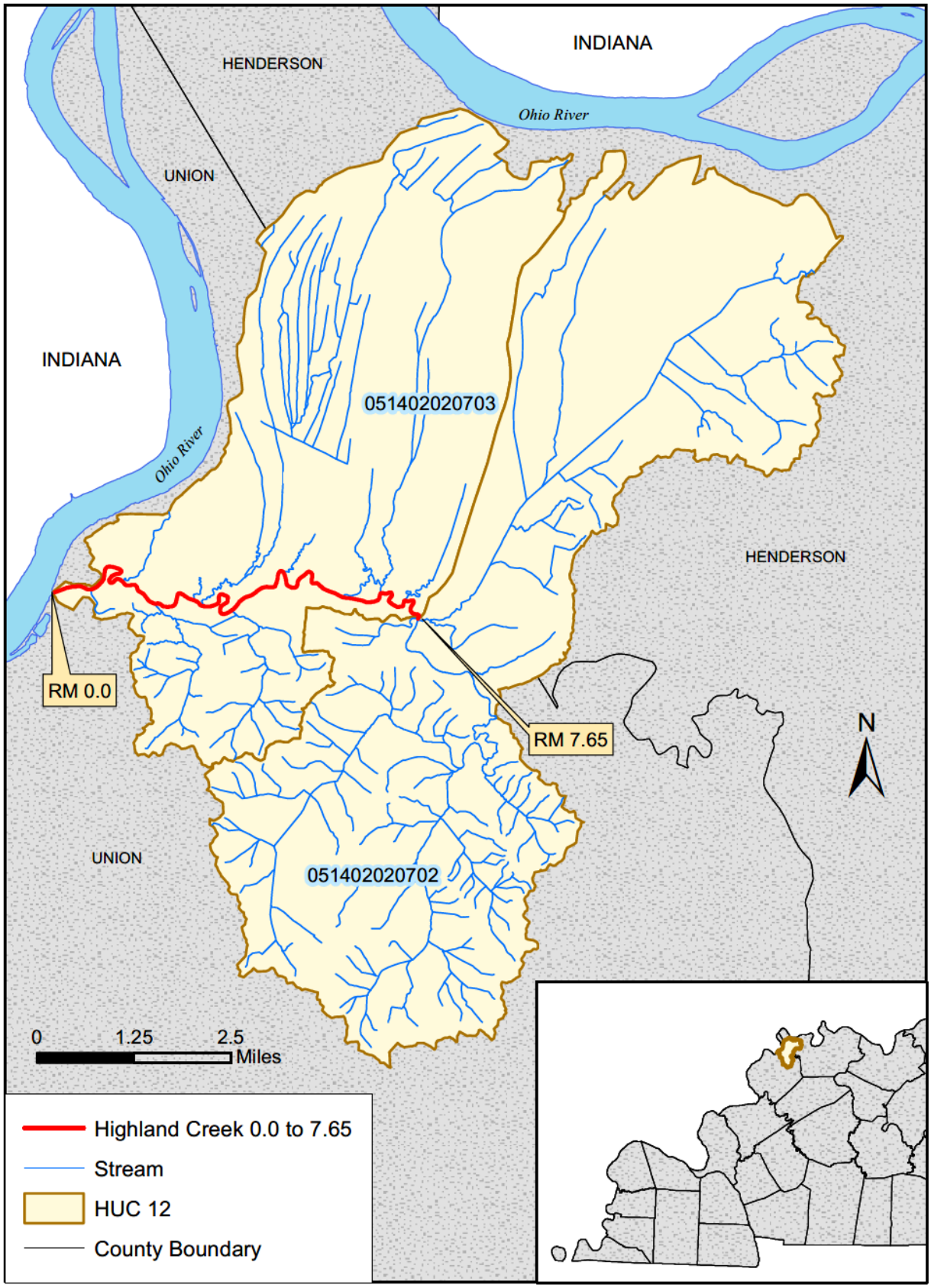

Figure J.27-1 Location of Highland Creek 0.0 to 7.65

Section J.28 Highland Creek 7.65 to 21.15

Waterbody ID: KY-925

Receiving Water: Ohio River

Impaired Use: PCR, SCR

Support Status: nonsupport (both uses)

Listed Pollutant/TMDL Pollutant: *E. coli* (PCR), fecal coliform (SCR)

HUC 12s: 051402020702, 051402020505

Counties: Union, Henderson

The Division of Water (DOW) collected samples from station PRI110, located near river mile 13.7. This station was sampled one to six times during the PCR season for every year between 2003 and 2020 except for 2004. Table J.28-1 summarizes information about this sampling station; Table J.28-2 provides a summary of the data collected from this station.

Table J.28-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
PRI110	37.7569160	-87.7951510	Highland Creek 7.65 to 21.15	13.7

Table J.28-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
PRI110	fecal coliform	16	30	42,000	5,413
PRI110	*E. coli*	49	1	>2,420	321

[(1)]The full data set for samples collected from PRI110 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Highland Creek 7.65 to 21.15 are presented in Table J.28-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Highland Creek. The location of the segment within the Pond Creek-Highland Creek and Rock Creek-Highland Creek watersheds is shown in Figure J.28-1.

Table J.28-3 Highland Creek 7.65 to 21.15 TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli* or fecal coliform. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

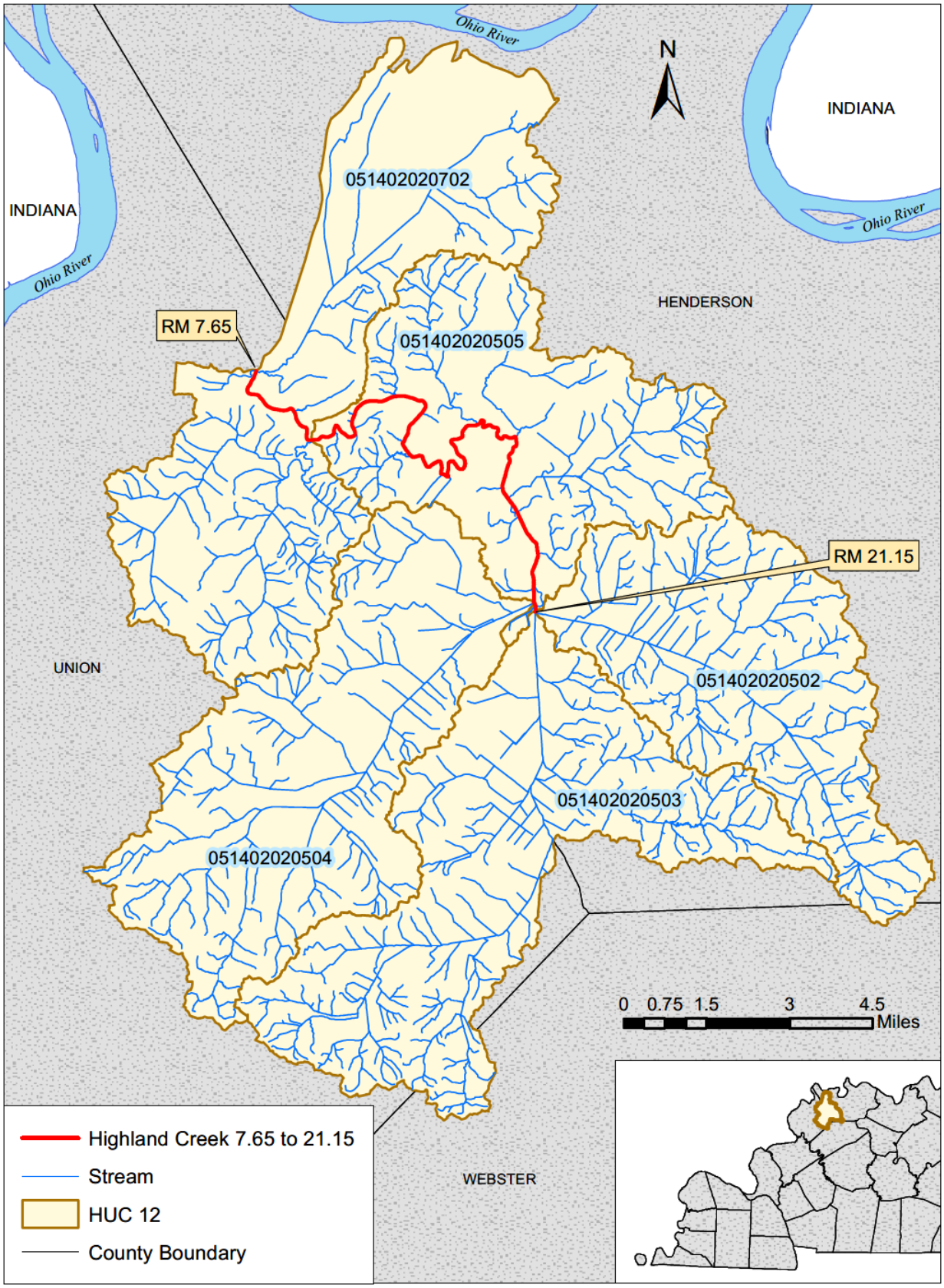

Figure J.28-1 Location of Highland Creek 7.65 to 21.15

Section J.29 Hood Creek 0.8 to 5.3

Waterbody ID: KY-944

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 050901030102

County: Boyd

The Division of Water (DOW) collected samples at an Ambient Monitoring Network Station, BSW011, located near river mile 0.8. The station was sampled every five years during the PCR season from 2002 to 2017. The station has been sampled six times during a monitoring year. Table J.29-1 summarizes information about this sampling station; Table J.29-2 provides a summary of the data collected from this station.

Table J.29-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
BSW011	38.4955080	-82.6707200	Hood Creek 0.8 to 5.3	0.8

Table J.29-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
BSW011	fecal coliform	6	100	290	223
BSW011	*E. coli*	18	16	2,481	736

[(1)]The full data set for samples collected from BSW011 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Hood Creek 0.8 to 5.3 are presented in Table J.29-3.

Table J.29-3 Hood Creek 0.8 to 5.3 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The Kentucky Department of Transportation has Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Hood Creek. Information about MS4 permits is summarized in Table J.29-4. Information concerning Boyd County MS4 permit coverage can be found as a co-permittee of the City of Ashland's MS4 permit (Permit number KYG200002). There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 area and the segment within the Hood Creek watershed is shown in Figure J.29-1. The MS4 area boundaries are from DOW information last updated in 2014. Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.29-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli*/day)
KYG200002	Boyd County	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

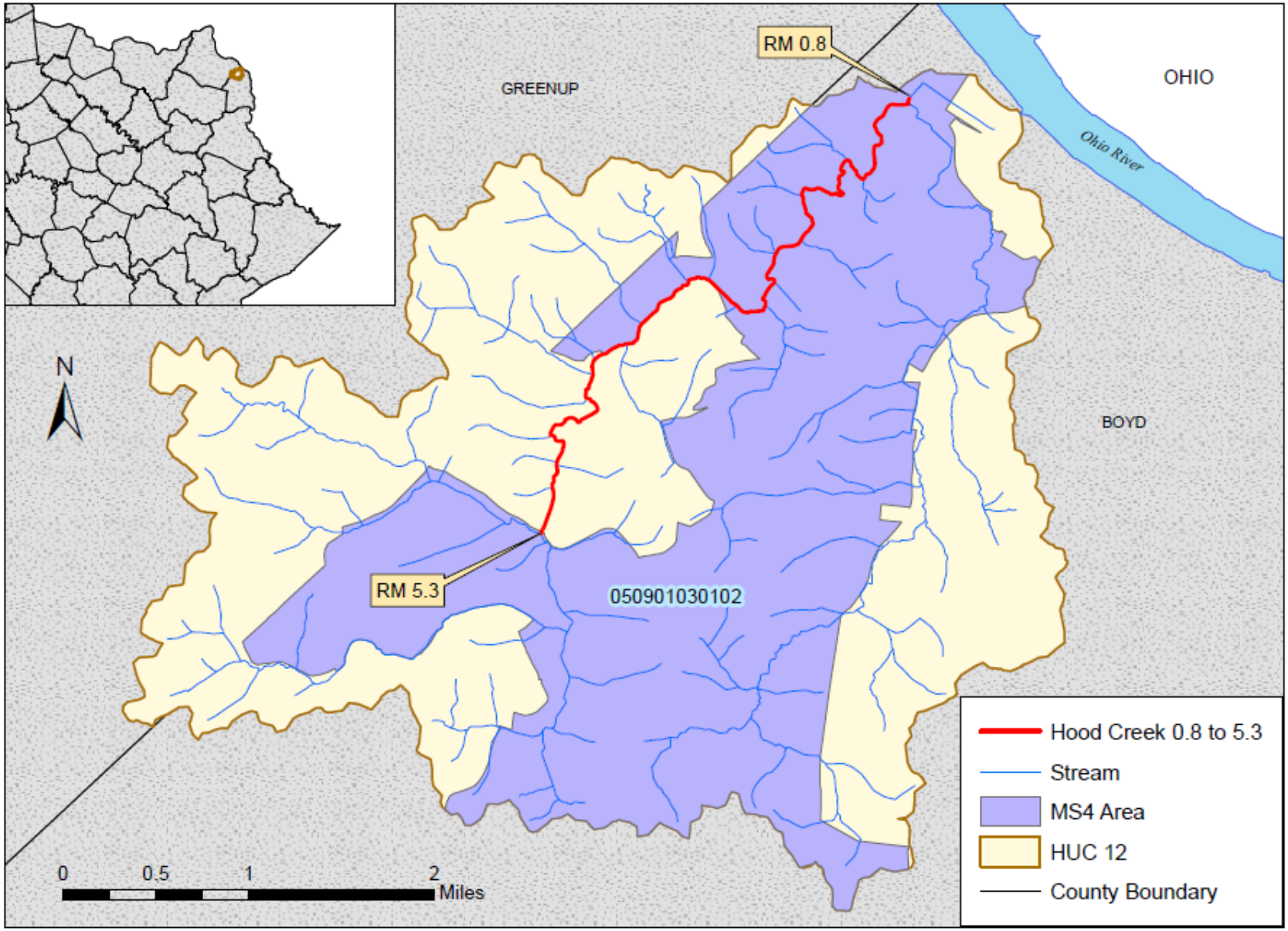

Figure J.29-1 Location of Hood Creek 0.8 to 5.3

Section J.30 Humphrey Creek 3.4 to 11.25

Waterbody ID: KY-959

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12s: 051402060602, 051402060604

County: Ballard

Murray State University collected samples from a station located near river mile 5.9 as part of a 319(h) nonpoint source project conducted in the Lower Cumberland, Tennessee, and Mississippi River watersheds. The station was sampled six times during the PCR season in 2000. Table J.30-1 summarizes information about this sampling station; Table J.30-2 provides a summary of the data collected from this station.

Table J.30-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
ADB_HIST_336	37.11661	-89.0451	Humphrey Creek 3.4 to 11.25	5.9

Table J.30-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
ADB_HIST_336	fecal coliform	6	60	220,000	36,890

[(1)]The full data set for samples collected at ADB_HIST_336 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Humphrey Creek 3.4 to 11.25 are presented in Table J.30-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Humphrey Creek. The location within the Lower Humphrey Creek and Middle Humphrey Creek watersheds is shown in Figure J.30-1.

Table J.30-3 Humphrey Creek 3.4 to 11.25 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

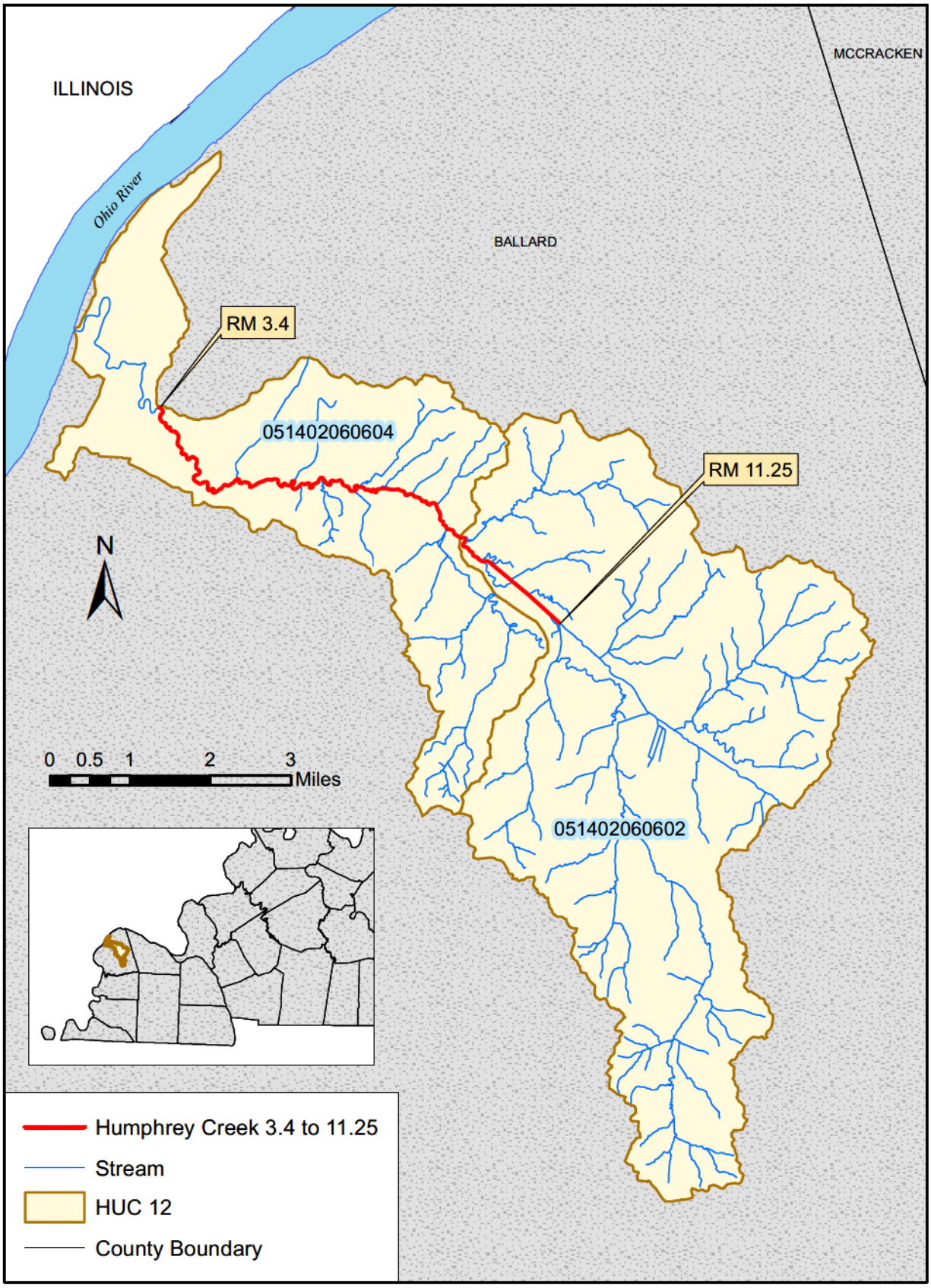

Figure J.30-1 Location of Humphrey Creek 3.4 to 11.25

Section J.31 Little Goose Creek 0.0 to 9.5

Waterbody ID: KY-1126

Receiving Water: Goose Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 051401010605

County: Jefferson

The Metropolitan Sewer District (MSD) collected samples at station MSD-EGCLG001, located near river mile 2.4, in 1999. The station was sampled 27 times during the PCR season. Table J.31-1 summarizes information about this sampling station; Table J.31-2 provides a summary of the data collected from this station.

Table J.31-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
MSD-EGCLG001	38.3125	-85.62583333	Little Goose Creek 0.0 to 9.5	2.4

Table J.31-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
MSD-EGCLG001	fecal coliform	27	3	2,750	400

[(1)]The full data set for samples collected at MSD-EGCLG001 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Little Goose Creek 0.0 to 9.5 are presented in Table J.31-3.

Table J.31-3 Little Goose Creek 0.0 to 9.5 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment			Allocations for Upstream Loads to the Segment[6]	Allocations for Tributary Loads to the Segment[7]	MOS[8]
	MS4-WLA[3]	SWS-WLA[4]	LA[5]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{SWS} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{SWS} is the flow (ft^3/s) in the segment due to a SWS entity. New or expanded SWS sources will be allowed to discharge to the segment contingent upon them meeting the PCR bacterial WQCs found in 401 KAR 10:031. SWS-WLAs will be translated into KPDES permit limits as an *E. coli* effluent gross limit of 130 colonies/100 ml as a monthly average (geometric mean) and 240 colonies/100 ml as a maximum weekly average (geometric mean).

[5]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[6]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[7]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[8]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)Although all sources are provided an allocation at the Water Quality Standard, not all sources discharge at this maximum allocation at the same time.

(c)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.31-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to

correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lentzier Creek-Ohio River watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

One facility permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharges treated effluent directly into this segment of Little Goose Creek. The directly discharging facility is a sanitary wastewater system (SWS). This SWS is an individual family residence with an on-site wastewater treatment system. The Metropolitan Sewer District (MSD) and the Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Little Goose Creek. There are no Combined Sewer Overflows (CSOs) discharging directly to this segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The facility and MS4s are identified in Table J.31-4. The location of the facility, MS4 areas, and the segment within the Lentzier Creek-Ohio River watershed is shown in Figure J.31-1. The MS4 area boundaries are from DOW information last updated in 2014. Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.31-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Design Flow (MGD)	Outfall Latitude	Outfall Longitude	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli*/day)
KYG402926	Residence	0.0005	38.320976	-85.630912	8/31/2023	Q_{SWS}×WQC×CF
KYS000001	MSD	N/A	N/A	N/A	01/31/2022	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	N/A	N/A	N/A	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{SWS} is the flow in the segment due to a SWS entity. Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

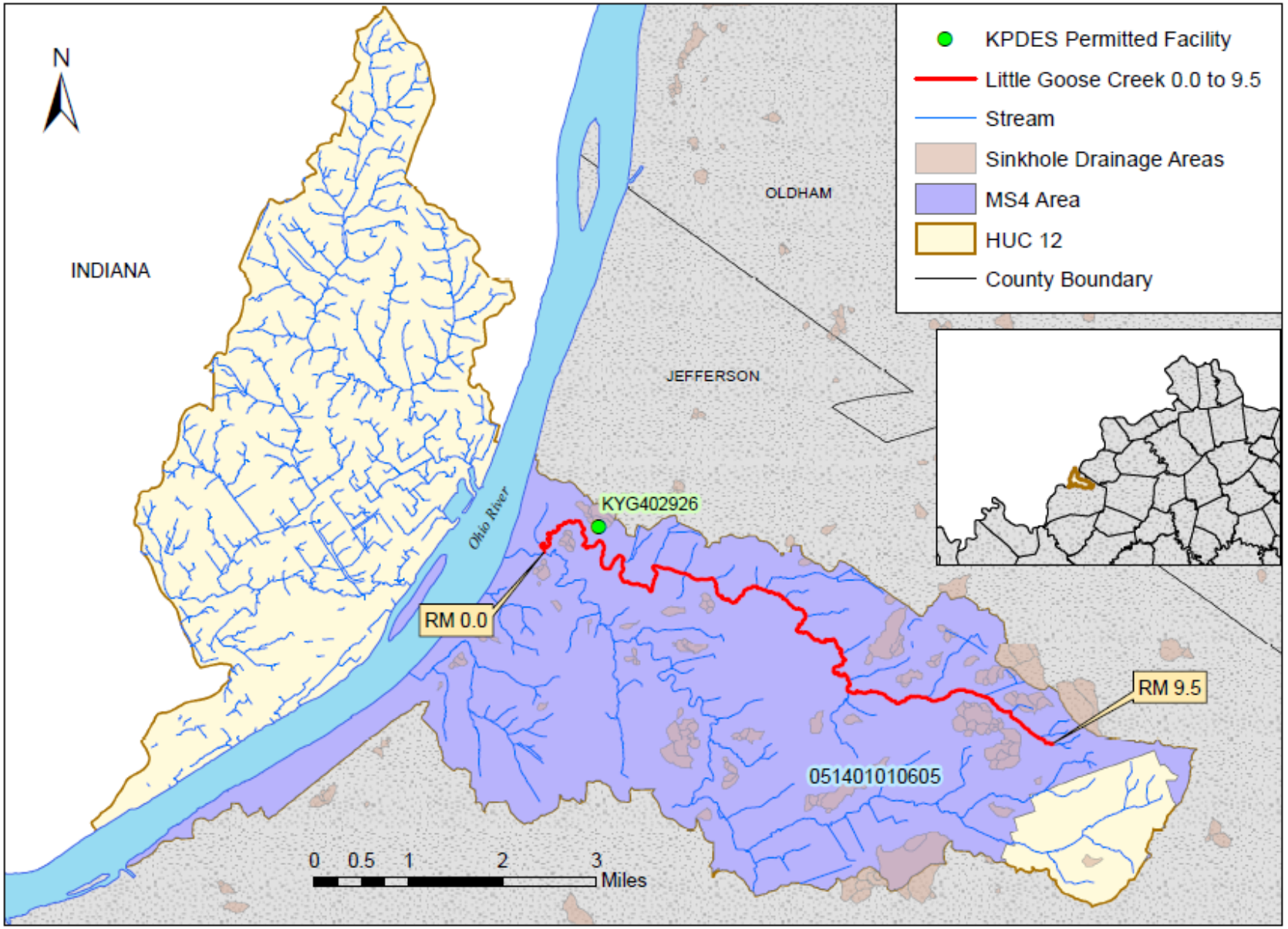

Figure J.31-1 Location of the KPDES-permitted Facility on Little Goose Creek 0.0 to 9.5

Section J.32 Locust Creek 0.0 to 4.25

Waterbody ID: KY-1175

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 050902011105

County: Bracken

The Kentucky Department of Fish and Wildlife Resources (KDFWR) collected samples from station DOW08085002, located near river mile 3.05, in 1999. The station was sampled six times during the PCR season. Table J.32-1 summarizes information about this sampling station; Table J.32-2 provides a summary of the data collected from this station.

Table J.32-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08085002	38.7523	-84.1069	Locust Creek 0.0 to 4.25	3.05

Table J.32-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08085002	fecal coliform	6	45	3,600	1,006

[(1)]The full data set for samples collected at DOW08085002 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Locust Creek 0.0 to 4.25 are presented in Table J.32-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Locust Creek. The location within the Locust Creek watershed is shown in Figure J.32-1.

Table J.32-3 Locust Creek 0.0 to 4.25 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

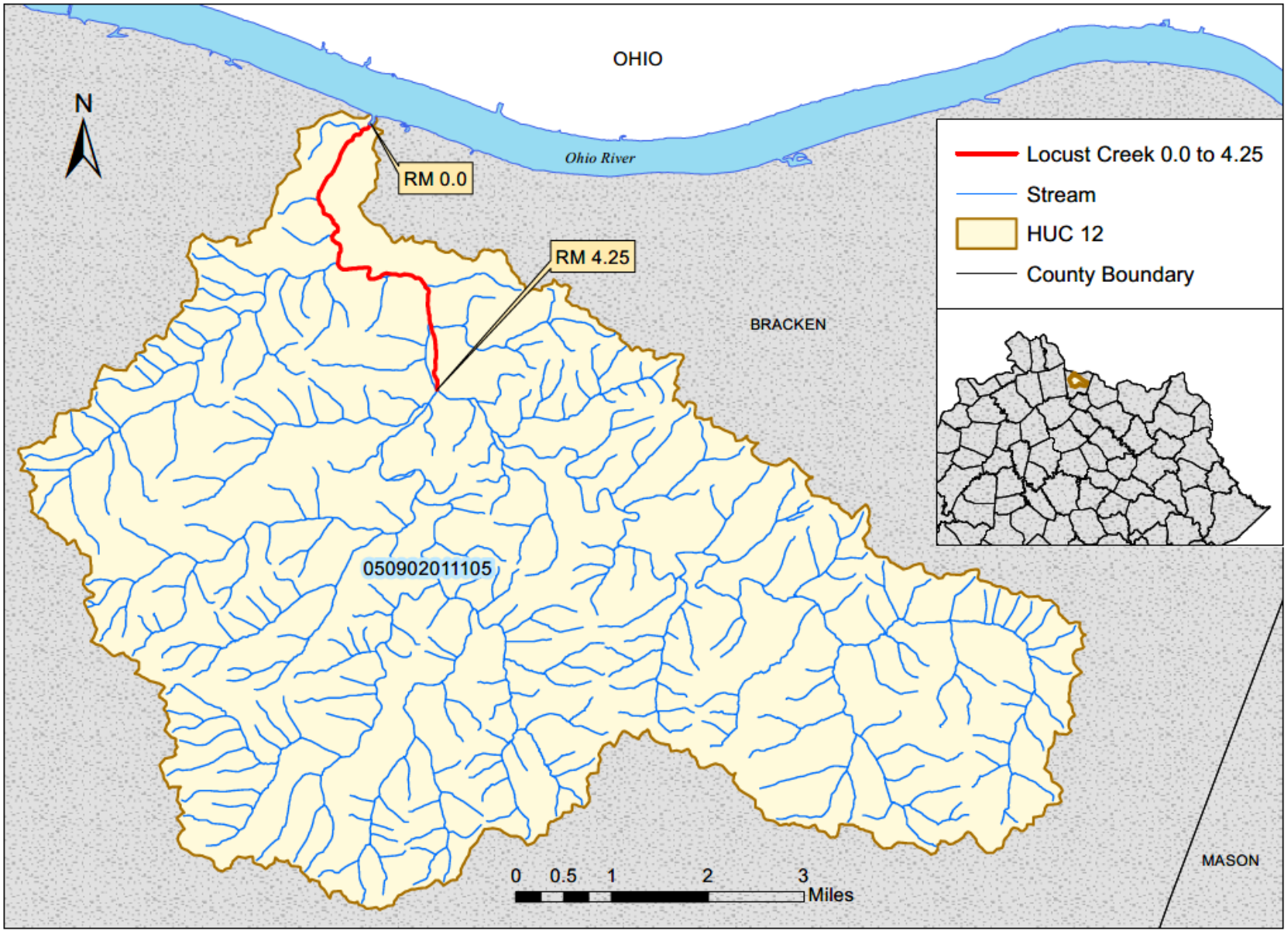

Figure J.32-1 Location of Locust Creek 0.0 to 4.25

Section J.33 Mill Creek 0.0 to 9.8

Waterbody ID: KY-1317

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 051401010906

County: Jefferson

The Metropolitan Sewer District (MSD) collected samples at station MSD-EGCLG001, located near river mile 1.7, in 1999. The station was sampled 25 times during the PCR season. Table J.33-1 summarizes information about this sampling station; Table J.33-2 summarizes the data collected from this station.

Table J.33-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
MSD-EMCMC001	38.0780556	-85.8900000	Mill Creek 0.0 to 9.8	1.7

Table J.33-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
MSD-EMCMC001	fecal coliform	25	3	1,200	106

[(1)]The full data set for samples collected from MSD-EMCMC001 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Mill Creek 0.0 to 9.8 are presented in Table J.33-3.

Table J.33-3 Mill Creek 0.0 to 9.8 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	MS4-WLA[3]	LA[4]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The Metropolitan Sewer District (MSD) and Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Mill Creek. Information about MS4 permits is summarized in Table J.33-4. There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 area and the segment within the Fourmile Creek-Ohio River watershed is shown in Figure J.33-1. The MS4 area boundaries are from DOW information last updated in 2014. Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.33-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYS000001	MSD	01/31/2022	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

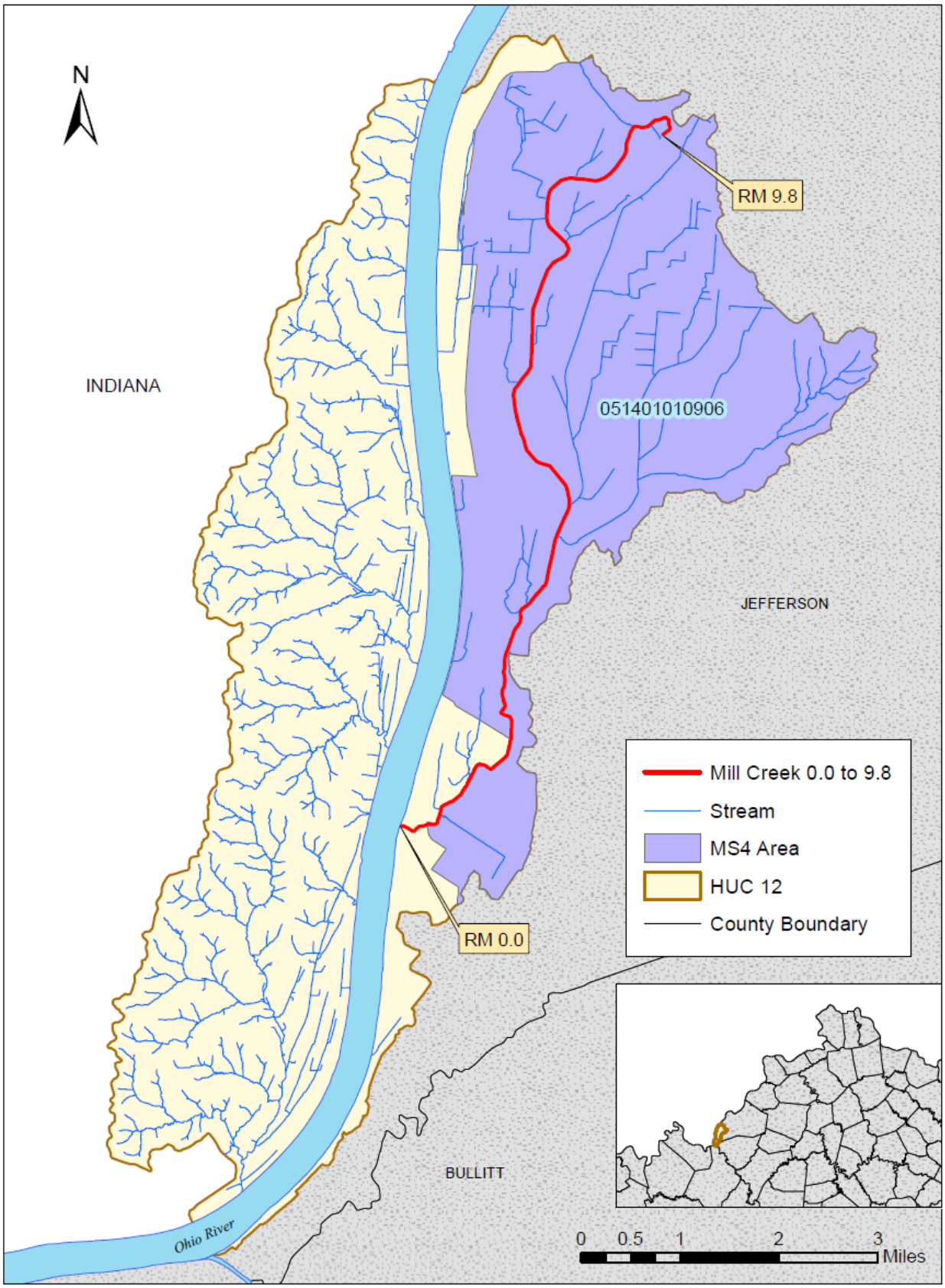

Figure J.33-1 Location of Mill Creek 0.0 to 9.8

Section J.34 Mill Creek Cutoff 0.0 to 2.3

Waterbody ID: KY-1319

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 051401010903

County: Jefferson

The Metropolitan Sewer District (MSD) collected samples at station MSD-EMCMX001, located near river mile 1.5, in 1999. The station was sampled 26 times during the PCR season. Table J.34-1 summarizes information about this sampling station; Table J.34-2 provides a summary of the data collected from this station.

Table J.34-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
MSD-EMCMX001	38.1775000	-85.8669500	Mill Creek Cutoff 0.0 to 2.3	1.5

Table J.34-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
MSD-EMCMX001	fecal coliform	26	3	5,350	302

[(1)]The full data set for samples collected from MSD-EMCMX001 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Mill Creek Cutoff 0.0 to 2.3 are presented in Table J.34-3.

Table J.34-3 Mill Creek Cutoff 0.0 to 2.3 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.34-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Mill Creek Cutoff watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

The Metropolitan Sewer District (MSD) and Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Mill Creek Cutoff. Information about MS4 permits is summarized in Table J.34-4. There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 area and the segment within the Mill Creek Cutoff watershed is shown in Figure J.34-1. The MS4 area boundaries are from DOW information last updated in 2014. Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.34-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYS000001	MSD	01/31/2022	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

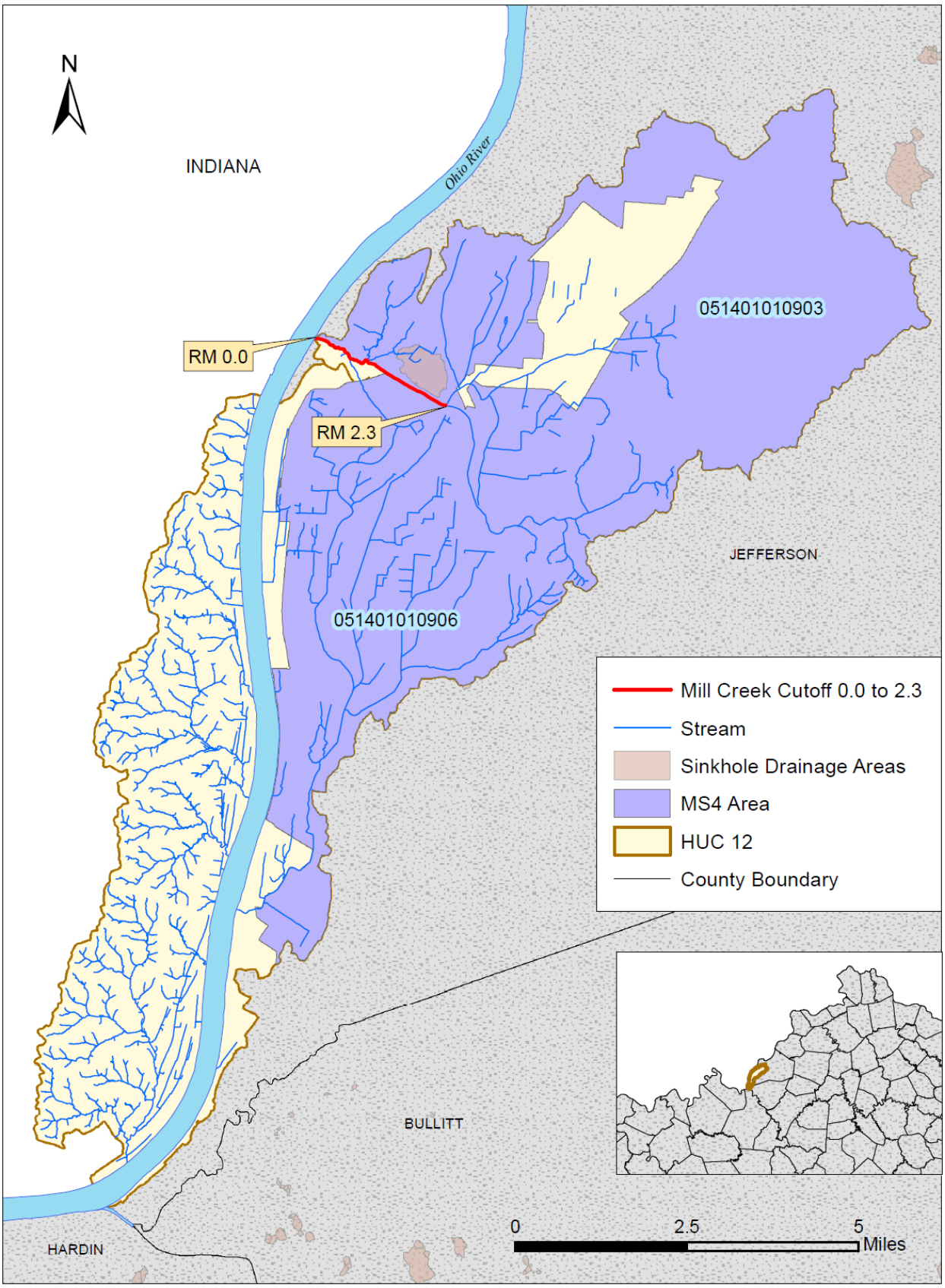

Figure J.34-1 Location of Mill Creek Cutoff 0.0 to 2.3

Section J.35 North Fork Canoe Creek 0.0 to 8.05

Waterbody ID: KY-1389

Receiving Water: Canoe Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020402

County: Henderson

The Division of Water (DOW) collected samples from station DOW08023011, located near river mile 1.3, in 2010. This station was sampled four times during the PCR season. Table J.35-1 summarizes information about this sampling station; Table J.35-2 provides a summary of the data collected from this station.

Table J.35-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023011	37.8224700	-87.5734000	North Fork Canoe Creek 0.0 to 8.05	1.3

Table J.35-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023011	*E. coli*	4	345	>2,420	1,254

[(1)]The full data set for samples collected from DOW08023011 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for North Fork Canoe Creek 0.0 to 8.05 are presented in Table J.35-3.

Table J.35-3 North Fork Canoe Creek 0.0 to 8.05 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment			Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	CSO-WLA[4]	LA[5]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{CSO} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{CSO} is the flow (ft^3/s) in the segment due to a CSO entity. Dry weather CSO flows are prohibited. During wet weather events, a CSO entity is compliant with its CSO-WLA if it is compliant with its Long Term Control Plan and KPDES permit.

[5]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Henderson and Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of North Fork Canoe Creek. Two Combined Sewer Overflows (CSOs) permitted under the Kentucky Pollutant Discharge Elimination System (KPDES) discharge directly into this segment of North Fork Canoe Creek. CSOs are permitted by KPDES and managed under consent judgments with the state or joint federal/state consent decrees. CSO management plans include enforceable schedules for eliminating or minimizing the impact of the CSOs on water quality. There are no other KPDES-permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The MS4 areas and CSOs are identified in Table J.35-4. The CSO outfall locations are identified in Table J.35-5. The location of the MS4 areas, CSOs, and the segment within the North Fork Canoe Creek-Canoe Creek watershed is shown in Figure J.35-1. The MS4 area boundaries are from DOW information last updated in 2014. Only those MS4s with coverage areas that include direct drainage to the impaired segment are shown on the map, and boundaries between individual systems are not shown.

Table J.35-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[1]	WLA[2] (colonies *E. coli*/day)
KYG200019	City of Henderson	4/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF
KY0020711	Henderson STP	12/31/2014	Q_{CSO}×WQC×CF

[1]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[2]Q_{MS4} is the flow in the segment due to an MS4 entity. Q_{CSO} is the flow in the segment due to a CSO entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

Table J.35-5 CSO Outfall Locations as of March 2022

KPDES Permit Number	CSO ID	Facility Name	Outfall Latitude	Outfall Longitude
KY0020711	KY0020711-013	Henderson STP	37.825278	-87.572222
KY0020711	KY0020711-015	Henderson STP	37.833889	-87.573889

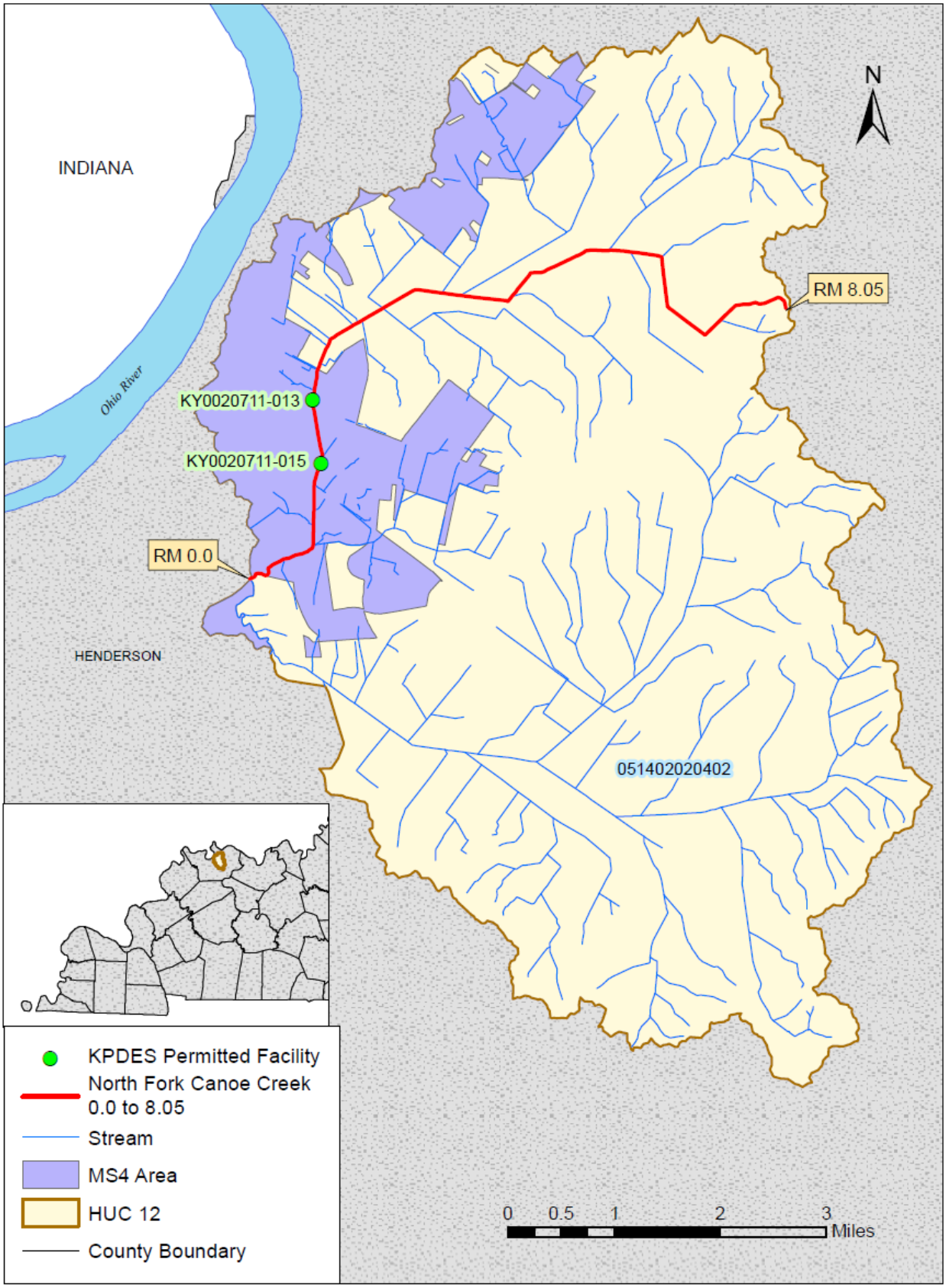

Figure J.35-1 Location of the KPDES-permitted Facility on North Fork Canoe Creek 0.0 to 8.05

Section J.36 Otter Creek 0.0 to 8.5

Waterbody ID: KY-2925

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 51401040105

County: Meade

The Metropolitan Sewer District (MSD) collected samples at a station located near river mile 3.4 from 1994 to 1999. Only the data from 1999 could be located. The station was sampled 22 times during the PCR season in 1999. The segment, Otter Creek 0.0 to 10.7, was the original segment assessed using these data and that segment has been subsequently split into 3 segments: Otter Creek 0.0 to 8.5, Otter Creek 8.5 to 9.7, and Otter Creek 9.7 to 10.9. Therefore, the same data is shown in the data summary tables for all three segments (J.36, J.37, and J.38). Table J.36-1 summarizes information about this sampling station; Table J.36-2 provides a summary of the data collected from this station.

Table J.36-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
ADB_HIST_265	37.9436111	-86.0297222	Otter Creek 0.0 to 8.5	3.4

Table J.36-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
ADB_HIST_265	fecal coliform	22	3	3,000	212

[(1)]The full data set for samples collected from station ADB_HIST_265 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Otter Creek 0.0 to 8.5 are presented in Table J.36-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Otter Creek. The location of the segment within the Lower Otter Creek watershed is shown in Figure J.36-1.

Table J.36-3 Otter Creek 0.0 to 8.5 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.36-1 shows the segment occurs in an area with karst features such as springs, sinking streams, and numerous sinkholes. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower Otter Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

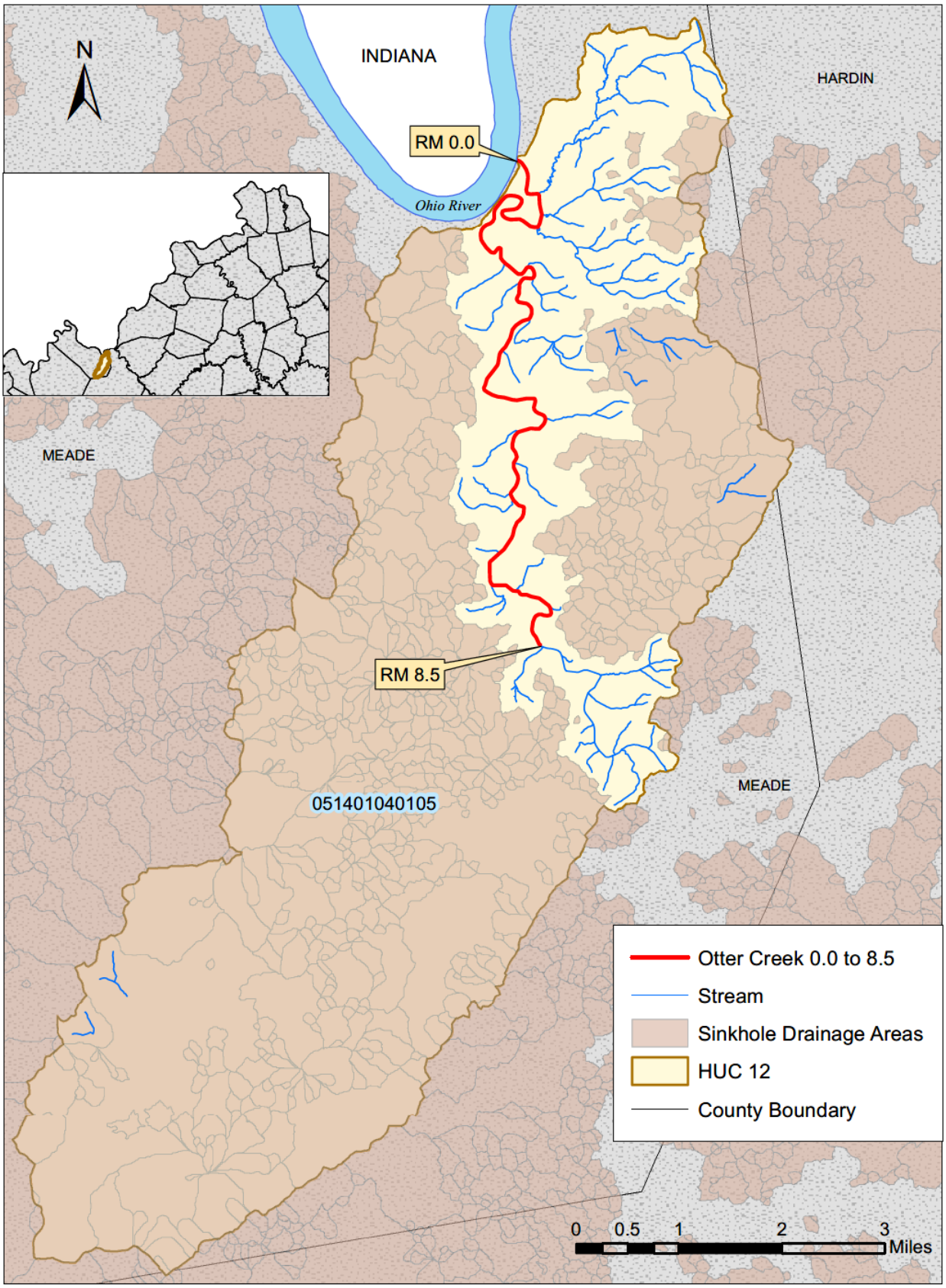

Figure J.36-1 Location of Otter Creek 0.0 to 8.5

Section J.37 Otter Creek 8.5 to 9.7

Waterbody ID: KY-2926

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 051401040105

County: Meade

The Metropolitan Sewer District (MSD) collected samples at a station located near river mile 3.4 from 1994 to 1999. Only the data from 1999 could be located. The station was sampled 22 times during the PCR season in 1999. The segment, Otter Creek 0.0 to 10.7, was the original segment assessed using these data and that segment has been subsequently split into 3 segments: Otter Creek 0.0 to 8.5, Otter Creek 8.5 to 9.7, and Otter Creek 9.7 to 10.9. Therefore, the same data is shown in the data summary tables for all three segments (J.36, J.37, and J.38). Table J.37-1 summarizes information about this sampling station; Table J.37-2 provides a summary of the data collected from this station.

Table J.37-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
ADB_HIST_265	37.9436111	-86.0297222	Otter Creek 8.5 to 9.7	3.4

Table J.37-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
ADB_HIST_265	fecal coliform	22	3	3,000	212

[(1)]The full data set for samples collected from station ADB_HIST_265 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Otter Creek 8.5 to 9.7 are presented in Table J.37-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Otter Creek. The location of the segment within the Lower Otter Creek watershed is shown in Figure J.37-1.

Table J.37-3 Otter Creek 8.5 to 9.7 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.37-1 shows the segment occurs in an area with karst features such as springs, sinking streams, and numerous sinkholes. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower Otter Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

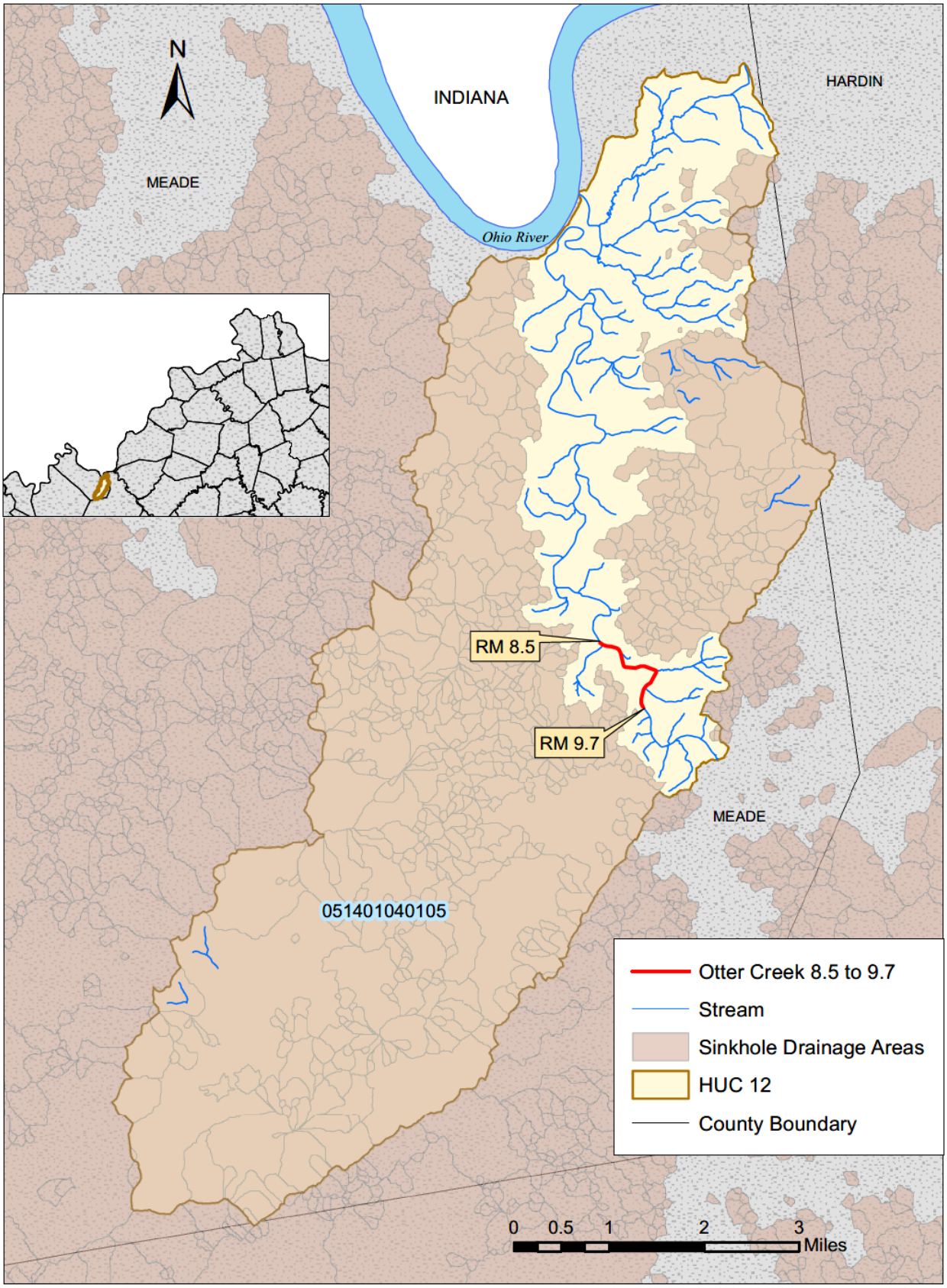

Figure J.37-1 Location of Otter Creek 8.5 to 9.7

Section J.38 Otter Creek 9.7 to 10.9

Waterbody ID: KY-2883

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 051401040105

County: Meade

The Metropolitan Sewer District (MSD) collected samples at a station located near river mile 3.4 from 1994 to 1999. Only the data from 1999 could be located. The station was sampled 22 times during the PCR season in 1999. The segment, Otter Creek 0.0 to 10.7, was the original segment assessed using these data and that segment has been subsequently split into 3 segments: Otter Creek 0.0 to 8.5, Otter Creek 8.5 to 9.7, and Otter Creek 9.7 to 10.9. Therefore, the same data is shown in the data summary tables for all three segments (J.36, J.37, and J.38). Table J.38-1 summarizes information about this sampling station; Table J.38-2 provides a summary of the data collected from this station.

Table J.38-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
ADB_HIST_265	37.9436111	-86.0297222	Otter Creek 9.7 to 10.9	3.4

Table J.38-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
ADB_HIST_265	fecal coliform	22	3	3,000	212

[(1)]The full data set for samples collected from station ADB_HIST_265 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Otter Creek 9.7 to 10.9 are presented in Table J.38-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Otter Creek. The location of the segment within the Lower Otter Creek watershed is shown in Figure J.38-1.

Table J.38-3 Otter Creek 9.7 to 10.9 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.38-1 shows the segment occurs in an area with karst features such as springs, sinking streams, and numerous sinkholes. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Lower Otter Creek and Middle Otter Creek watersheds. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

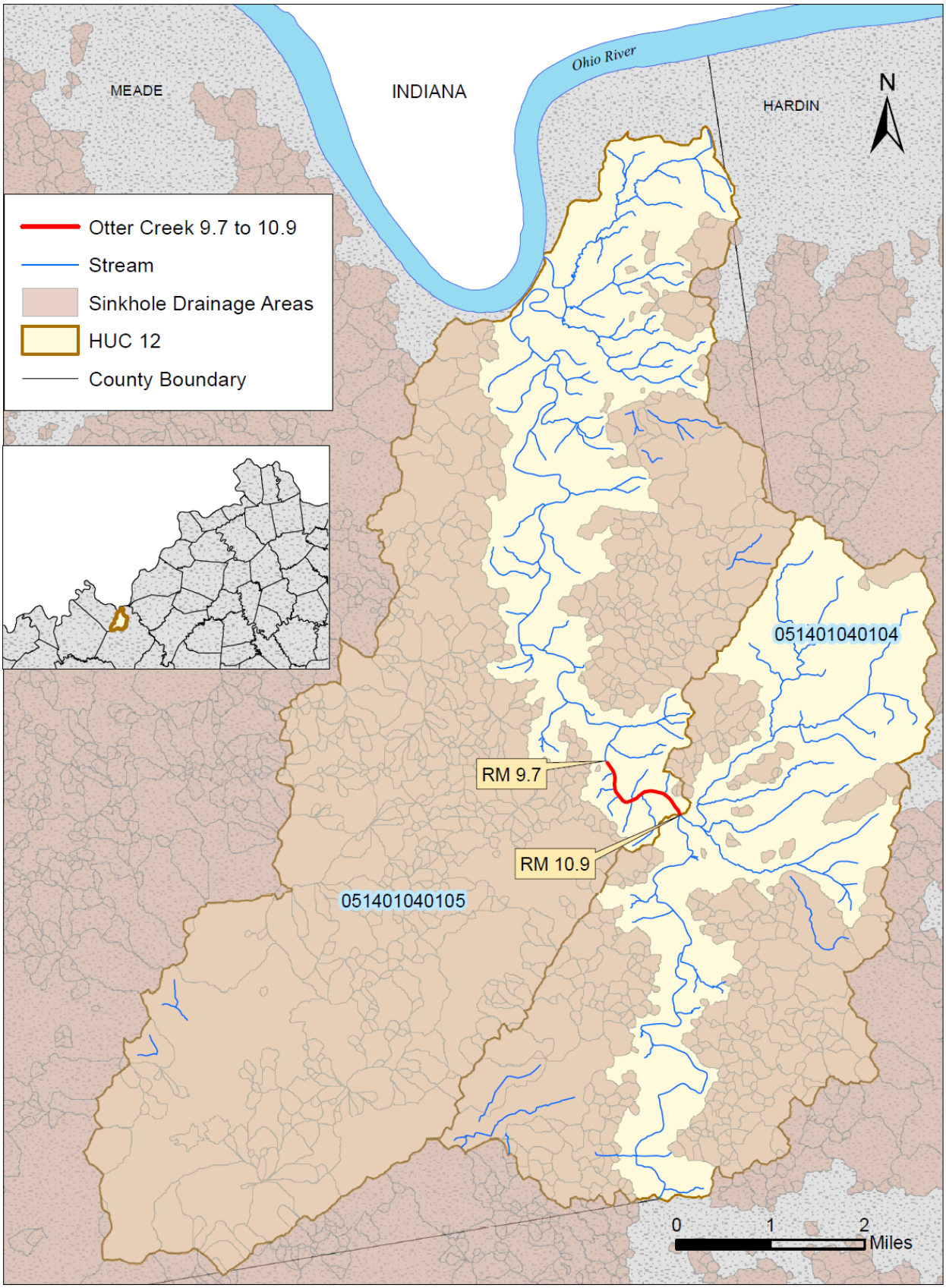

Figure J.38-1 Location of Otter Creek 9.7 to 10.9

Section J.39 Sellers Ditch 0.0 to 1.4

Waterbody ID: KY-1690

Receiving Water: Canoe Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020404

County: Henderson

The Division of Water (DOW) collected samples from station DOW08023013, located near river mile 1.2, in 2010. The station was sampled five times during the PCR season. Table J.39-1 summarizes information about this sampling station; Table J.39-2 provides a summary of the data collected from this station.

Table J.39-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023013	37.7947000	-87.5959000	Sellers Ditch 0.0 to 1.4	1.2

Table J.39-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023013	*E. coli*	5	326	>2,420	1,489

[(1)]The full data set for samples collected from station DOW08023013 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Sellers Ditch 0.0 to 1.4 are presented in Table J.39-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Sellers Ditch. The location of the segment within the East Fork Canoe Creek-Canoe Creek watershed is shown in Figure J.39-1.

Table J.39-3 Sellers Ditch 0.0 to 1.4 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

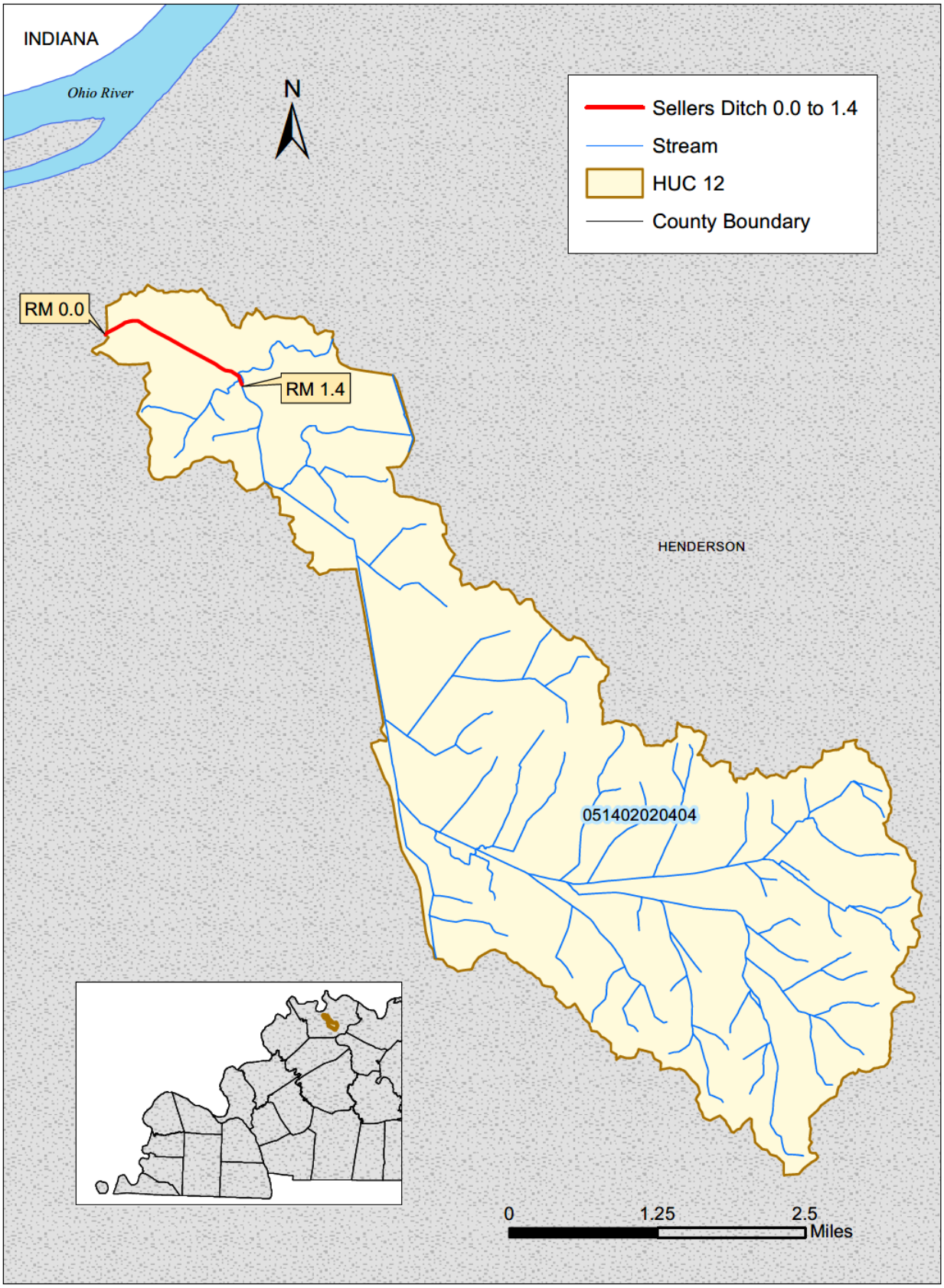

Figure J.39-1 Location of Sellers Ditch 0.0 to 1.4

Section J.40 Sinking Creek 8.85 to 15.5

Waterbody ID: KY-2543

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051401041304

County: Breckinridge

The Division of Water (DOW) collected samples at an Ambient Monitoring Network Station, SRW005, located near river mile 14.7. The station was sampled during the PCR season in 1999 and 2004. The station was sampled five to six times during a monitoring year. Table J.40-1 summarizes information about this sampling station; Table J.40-2 provides a summary of the data collected from this station.

Table J.40-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
SRW005	37.8687590	-86.3879250	Sinking Creek 8.85 to 15.5	14.7

Table J.40-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
SRW005	fecal coliform	11	29	1,000	269

[(1)]The full data set for samples collected from SRW005 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Sinking Creek 8.85 to 15.5 are presented in Table J.40-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Sinking Creek. The location of the segment within the Norton Valley-Sinking Creek watershed is shown in Figure J.40-1.

Table J.40-3 Sinking Creek 8.85 to 15.5 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.40-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Norton Valley-Sinking Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

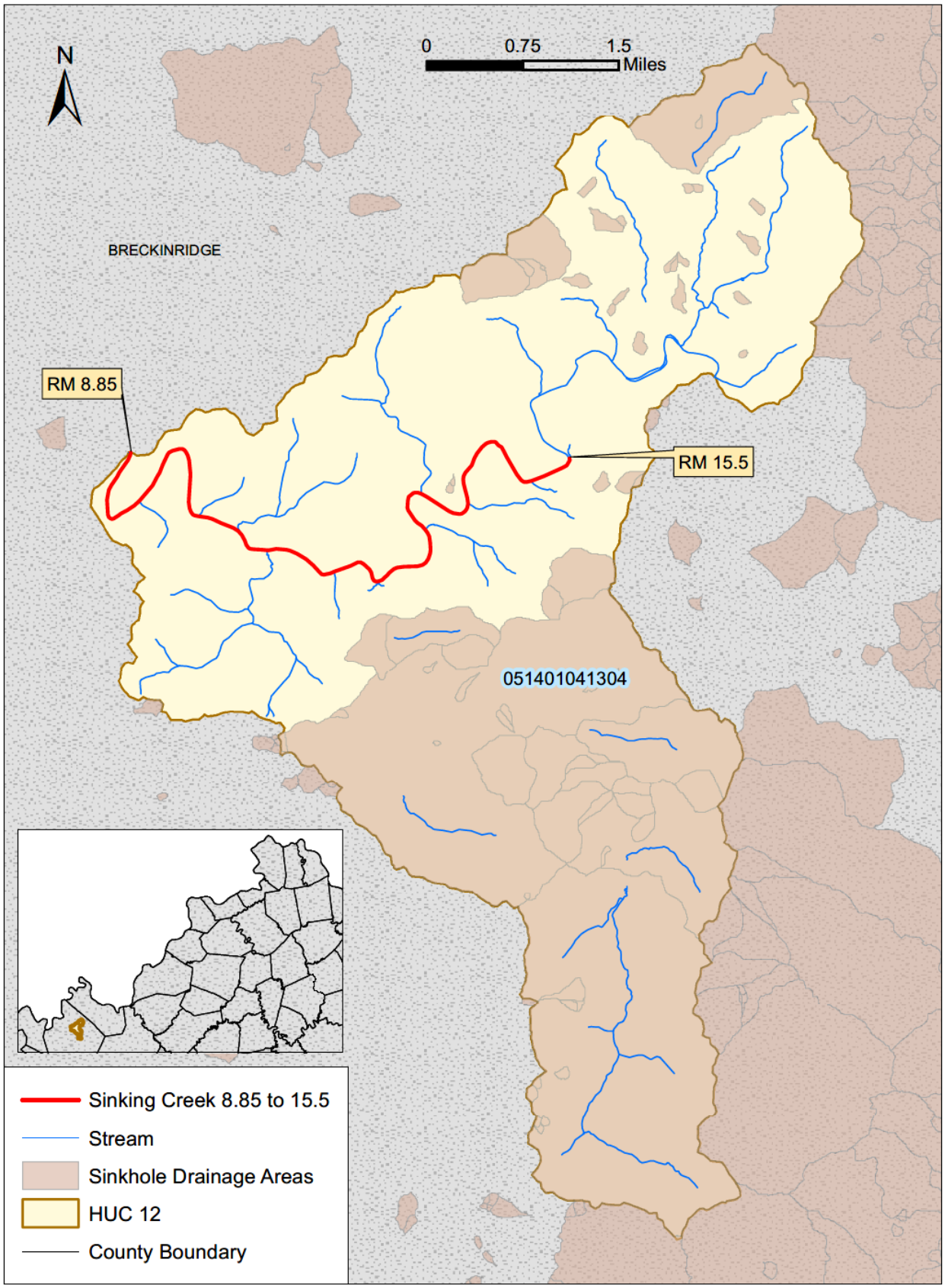

Figure J.40-1 Location of Sinking Creek 8.85 to 15.5

Section J.41 Sinking Creek 15.5 to 39.9

Waterbody ID: KY-2544

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: partial support

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12s: 051401041302, 051401041303, 051401041304

County: Breckinridge

The Division of Water (DOW) collected samples at an Ambient Monitoring Network Station, SRW005, located near river mile 14.7. The station was sampled during the PCR season in 1999 and 2004. The station was sampled five to six times during a monitoring year.

At the time of data collection and assessment in 1999, Sinking Creek 8.85 to 15.5 (Section J.40) and Sinking Creek 15.5 to 39.9 were one segment. These segments were split in 2011. Therefore, the data collected at station SRW005 was used for both the upper segment, Sinking Creek 15.5 to 39.9, and the lower segment, Sinking Creek 8.85 to 15.5. Table J.41-1 summarizes information about this sampling station; Table J.41-2 provides a summary of the data collected from this station.

Table J.41-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
SRW005	37.7837000	-86.2678000	Sinking Creek 15.5 to 39.9	14.7

Table J.41-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
SRW005	fecal coliform	11	29	1,000	269

[(1)]The full data set for samples collected from SRW005 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Sinking Creek 15.5 to 39.9 are presented in Table J.41-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Sinking Creek.

The location of the segment within the Norton Valley-Sinking Creek, City of Irvington-Sinking Creek, and Pilot Ridge-Sinking Creek watersheds is shown in Figure J.41-1.

Table J.41-3 Sinking Creek 15.5 to 39.9 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.41-1 shows the segment occurs in an area with karst features such as springs, sinking streams, and numerous sinkholes. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Norton Valley-Sinking Creek, City of Irvington-Sinking Creek, Pilot Ridge-Sinking Creek, and Blue Fork watersheds. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

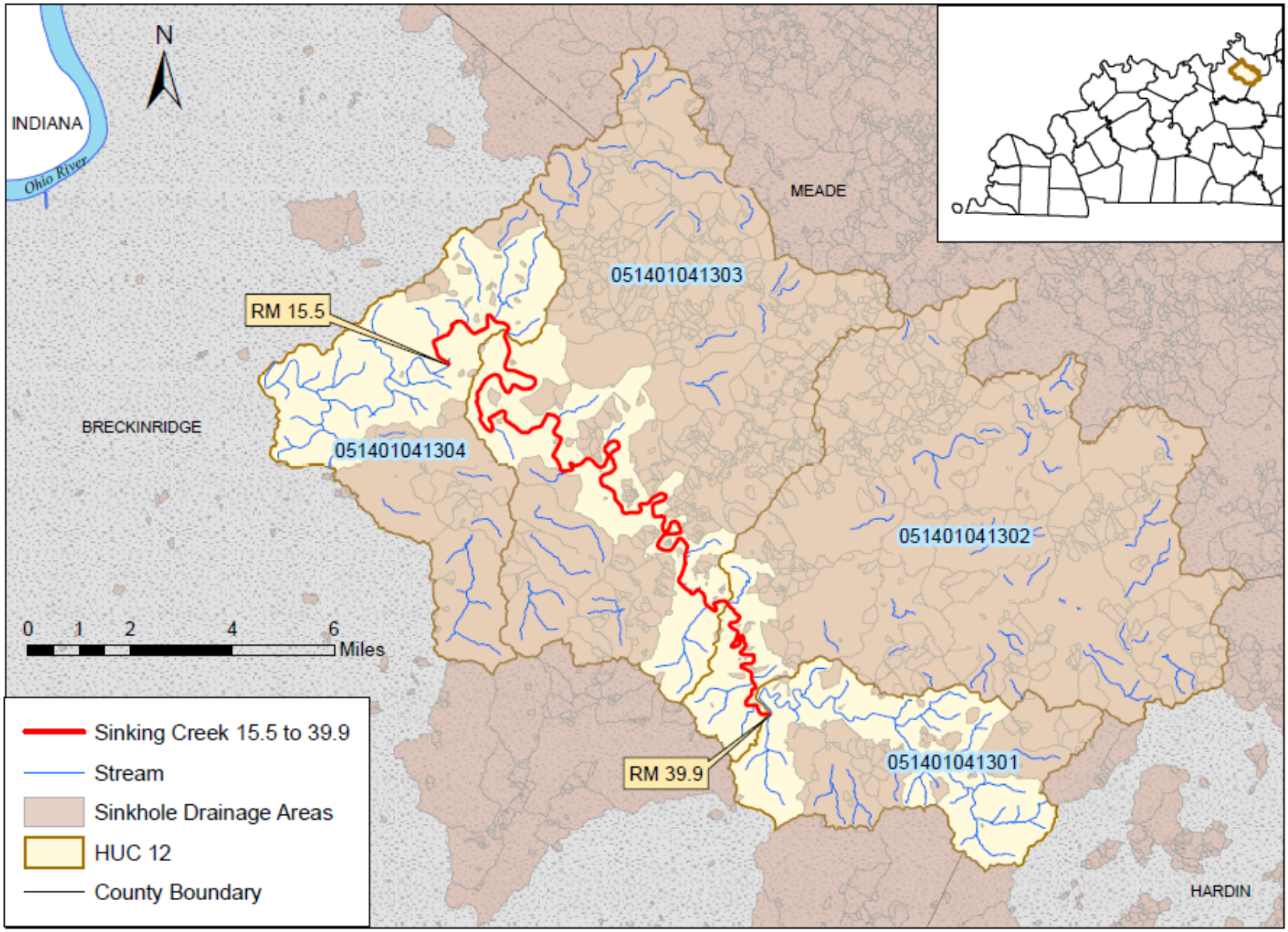

Figure J.41-1 Location of Sinking Creek 15.5 to 39.9

Section J.42 Snag Creek 1.1 to 6.55

Waterbody ID: KY-1743

Receiving Water: Ohio River

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant: Pathogens **TMDL Pollutant:** *E. coli*

HUC 12: 050902011106

County: Bracken

Morehead State University collected samples from a station located near river mile 1.4 in 1999. The station was sampled six times during the PCR season. Table J.42-1 summarizes information about the sampling station; Table J.42-2 provides a summary of the data collected from this station.

Table J.42-1 Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
ADB_HIST_218	38.7730556	-84.1666667	Snag Creek 1.1 to 6.55	1.4

Table J.42-2 Sample Data Summary[1]

Station Name	Indicator Bacteria[2]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
ADB_HIST_218	fecal coliform	6	190	5,000	1,248

[1]The full data set for samples collected from ADB_HIST_218 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[2]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Snag Creek 1.1 to 6.55 are presented in Table J.42-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Snag Creek. The location of the segment within the Bear Creek-Ohio River watershed is shown in Figure J.42-1.

Table J.42-3 Snag Creek 1.1 to 6.55 *E. coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[(4)]	MOS[(5)]
	LA[(3)]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(5)]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

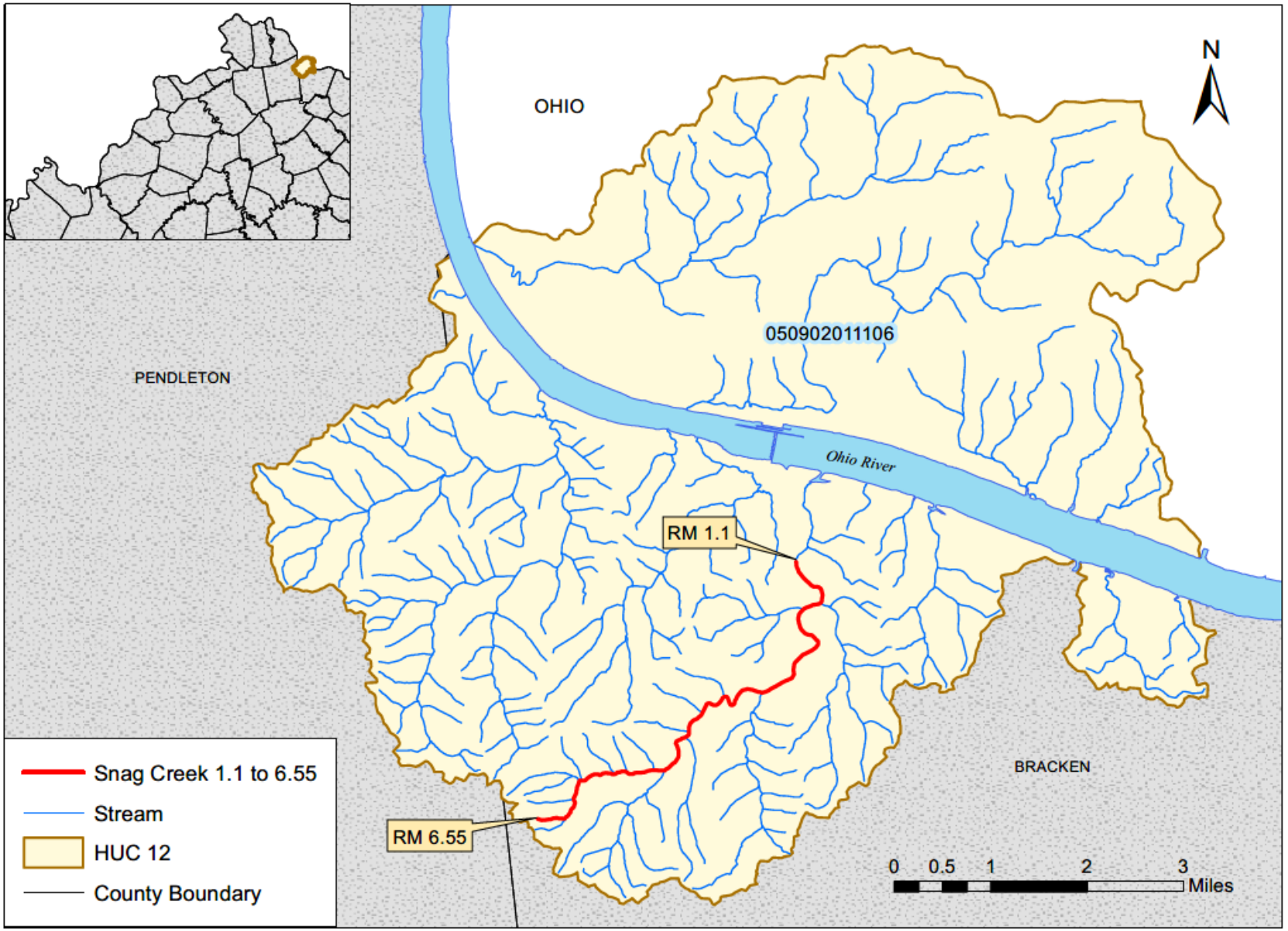

Figure J.42-1 Location of Snag Creek 1.1 to 6.55

Section J.43 South Fork Darby Creek 0.0 to 3.95

Waterbody ID: KY-1760

Receiving Water: Darby Creek

Impaired Use: PCR

Support Status: partial support

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051401010503

County: Oldham

The Division of Water (DOW) and Third Rock Consulting collected samples during the PCR season from two stations on this segment for a watershed-based plan in Darby Creek watershed. DOW sampled each station five times in 2014. DOW sampled station DOW12051007 four times in 2021. Third Rock Consulting collected four samples at station DOW12051007 and three samples at station DOW12051008 in 2008. The Darby Creek watershed-based plan identifies station DOW12051007 as USF1 and station DOW12051008 as USF2. Table J.43-1 summarizes information about these sampling stations; Table J.43-2 provides a summary of the data collected from these stations.

Table J.43-1 Sample Site Locations

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW12051007	38.3817600	-85.4930600	South Fork Darby Creek 0.0 to 3.95	0.85
DOW12051008	38.3691300	-85.4793000	South Fork Darby Creek 0.0 to 3.95	2.10

Table J.43-2 Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW12051007	*E. coli*	13	30	>2,420	422
DOW12051008	*E. coli*	8	120	>2,420	827

[(1)]The full data set for samples collected from these stations may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for South Fork Darby Creek 0.0 to 3.95 are presented in Table J.43-3.

Table J.43-3 South Fork Darby Creek 0.0 to 3.95 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Tributary Loads to the Segment[5]	MOS[6]
	MS4-WLA[3]	LA[4]		
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.43-1 shows some karst features such as sinkholes exist in this watershed. The sink features may capture surface drainage and channel it underground to resurface later at one or more springs. These discharging springs may occur outside the watershed where the drainage originated. However, unless karst dye trace studies indicate otherwise, groundwater catchment is presumed to correspond to the topographic watershed boundaries of surface drainage. No dye tracing information is available from the area of the Darby Creek-Harrods Creek watershed. For more detailed information about karst geology, see Section 3.2, Karst, of the Core TMDL.

The Oldham County Fiscal Court and Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of South Fork Darby Creek. Information about MS4 permits is summarized in Table J.43-4. There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 area and the segment within the Darby Creek-Harrods Creek watershed is shown in Figure J.43-1. The MS4 area boundaries are from DOW information last updated in 2016.

Table J.43-4 Summary of Active KPDES-permitted Sources as of May 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies *E. coli*/day)
KYG200005	Oldham County Fiscal Court	04/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

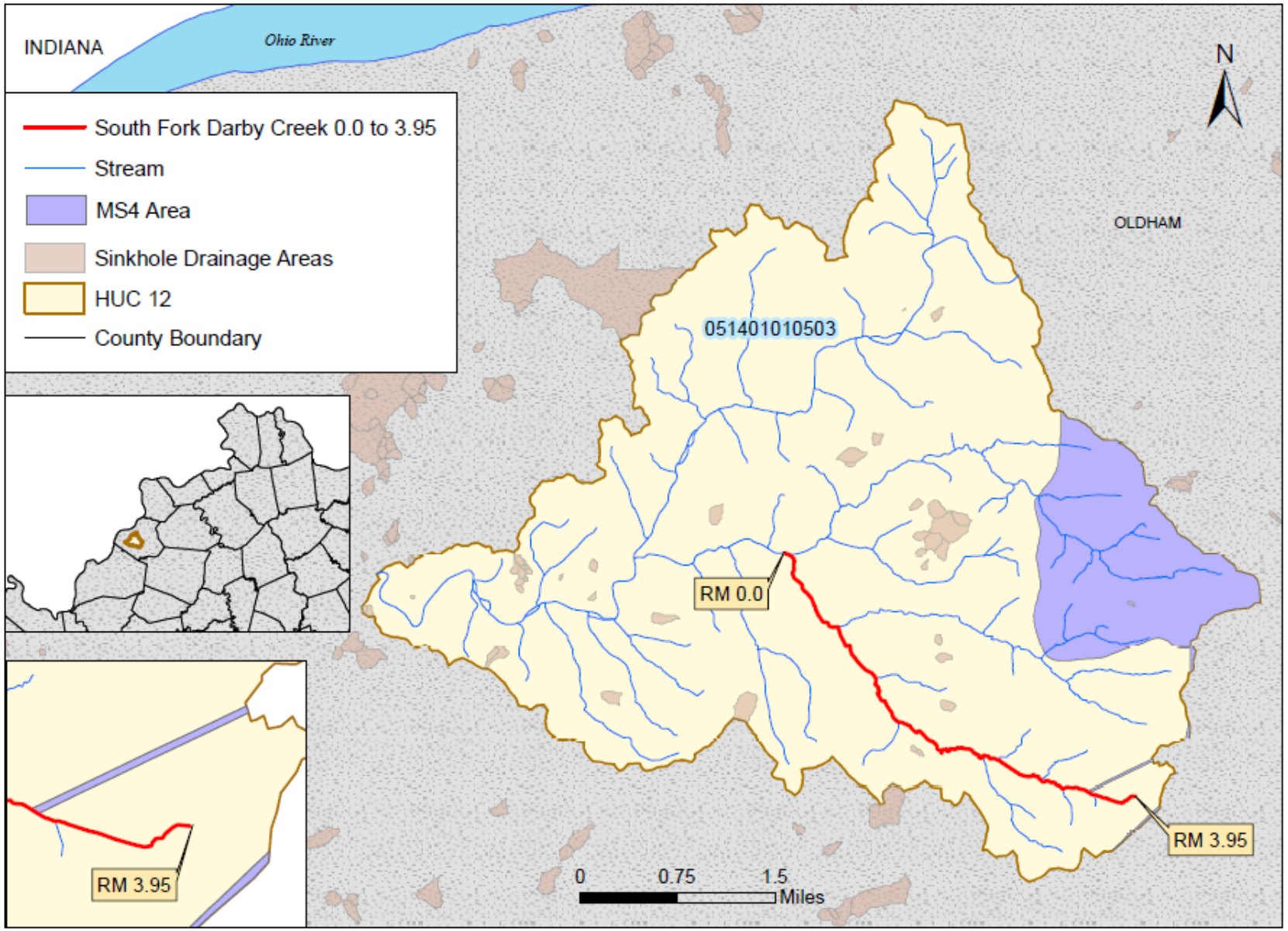

Figure J.43-1 Location of South Fork Darby Creek 0.0 to 3.95

Section J.44 Tiger Ditch 0.0 to 0.8

Waterbody ID: KY-1390

Receiving Water: North Fork Canoe Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020402

County: Henderson

The Division of Water (DOW) collected samples from station DOW08023012, located near river mile 0.7, in 2010. The station was sampled five times during the PCR season. Table J.44-1 summarizes information about this sampling station; Table J.44-2 provides a summary of the data collected from this station.

Table J.44-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023012	37.8157100	-87.5614000	Tiger Ditch 0.0 to 0.8	0.7

Table J.44-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023012	*E. coli*	5	260	>2,420	1,559

[(1)]The full data set for samples collected from DOW08023012 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Tiger Ditch 0.0 to 0.8 are presented in Table J.44-3.

Table J.44-3 Tiger Ditch 0.0 to 0.8 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment		Allocations for Upstream Loads to the Segment[5]	Allocations for Tributary Loads to the Segment[6]	MOS[7]
	MS4-WLA[3]	LA[4]			
$Q_S \times WQC \times CF$	$\sum(Q_{MS4} \times WQC \times CF)$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{MS4} is the flow (ft^3/s) in the segment due to an MS4 entity. The MS4-WLA is not an end-of-pipe limit. The MS4-WLA is an aggregate of the in-stream contribution of all MS4 outfalls within the MS4 jurisdiction, not the storm water contribution from individual MS4 outfalls. The MS4-WLA will be addressed through the MS4 permit and implemented through the Storm Water Quality Management Plan (SWQMP). An MS4 permittee is compliant with its MS4-WLA if it is compliant with its KPDES permit.

[4]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[5]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[6]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[7]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

The City of Henderson, Henderson County Fiscal Court, and the Kentucky Department of Transportation have Municipal Separate Storm Sewer System (MS4) permit coverage for this segment of Tiger Ditch. Information about MS4 permits is summarized in Table J.44-4. There are no other Kentucky Pollutant Discharge Elimination System (KPDES) permitted discharges of bacteria into the segment. The definitions for MS4 and CSO are found in 401 KAR 5:002. The location of the MS4 areas and the segment within the North Fork Canoe Creek-Canoe Creek watershed is shown in Figure J.44-1. The MS4 area boundaries are from DOW information last updated in 2014 (City of Henderson) and 2016 (Henderson County Fiscal Court).

Table J.44-4 Summary of Active KPDES-permitted Sources as of March 2022

KPDES Permit Number	Facility Name	Permit Expiration Date[(1)]	WLA[(2)] (colonies/day)
KYG200019	City of Henderson	4/30/2023	Q_{MS4}×WQC×CF
KYG200059	Henderson County Fiscal Court	4/30/2023	Q_{MS4}×WQC×CF
KYS000003	Kentucky Department of Transportation	09/30/2017	Q_{MS4}×WQC×CF

[(1)]Permit expiration dates identify the permits in effect when the draft TMDL was written, including any permits that may be expired (but not terminated) or in administrative continuance. Permits issued after the approval of this TMDL will address the TMDL.

[(2)]Q_{MS4} is the flow in the segment due to an MS4 entity. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day).

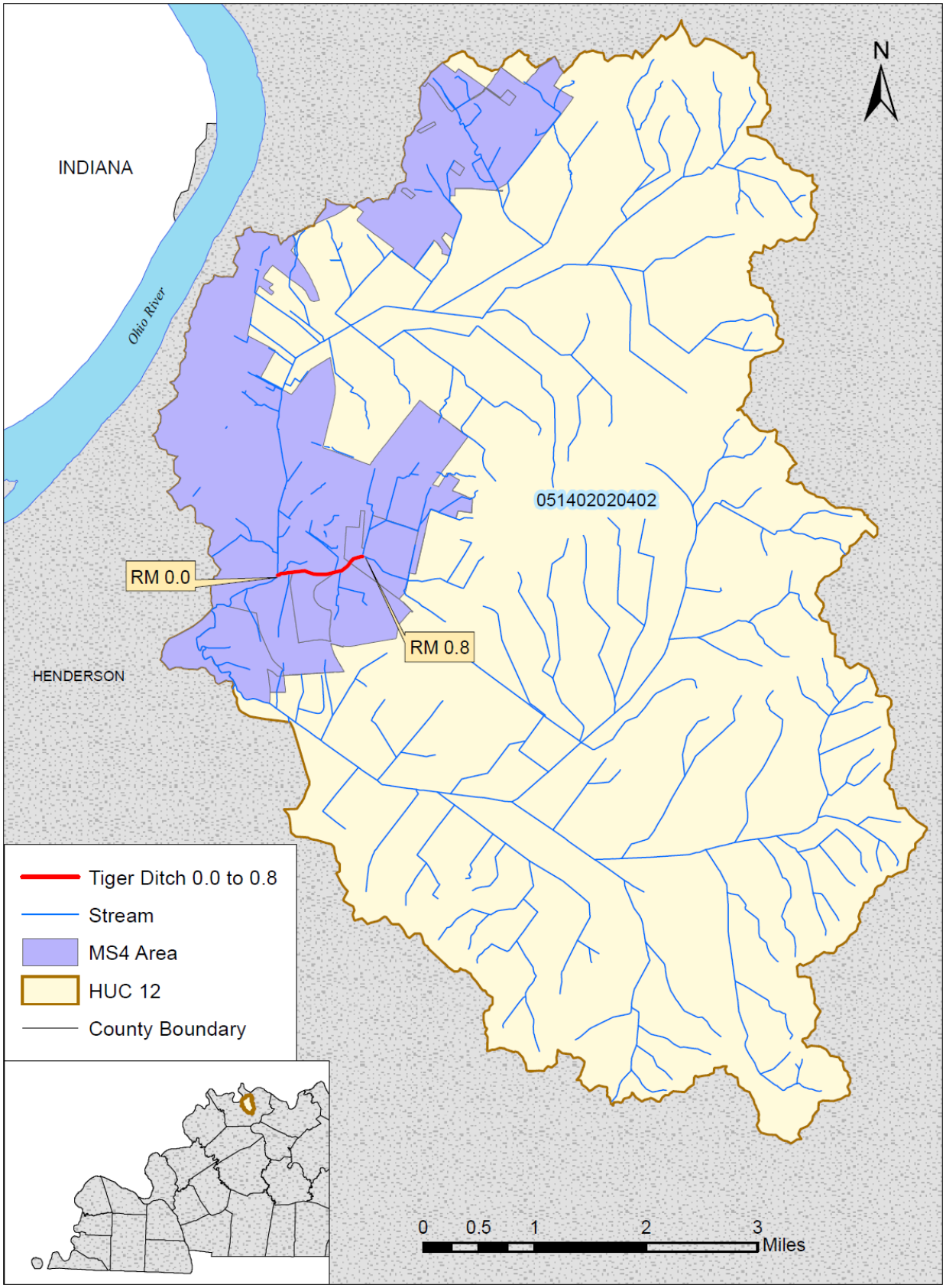

Figure J.44-1 Location of Tiger Ditch 0.0 to 0.8

Section J.45 UT of Canoe Creek 0.0 to 1.0

Waterbody ID: KY-433

Receiving Water: Canoe Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020403

County: Henderson

The Division of Water (DOW) collected samples from station DOW08023020, located near river mile 0.65, in 2010. The station was sampled four times during the PCR season. Table J.45-1 summarizes information about this sampling station; Table J.45-2 provides a summary of the data collected from this station.

Table J.45-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023020	37.71431	-87.5618	UT of Canoe Creek 0.0 to 1.0	0.65

Table J.45-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023020	*E. coli*	4	517	>2,420	1,144

[(1)]The full data set for samples collected at DOW08023020 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for UT of Canoe Creek 0.0 to 1.0 are presented in Table J.45-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of UT of Canoe Creek. The location of the segment within the West Fork Canoe Creek-Canoe Creek watershed is shown in Figure J.45-1.

Table J.45-3 UT of Canoe Creek 0.0 to 1.0 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

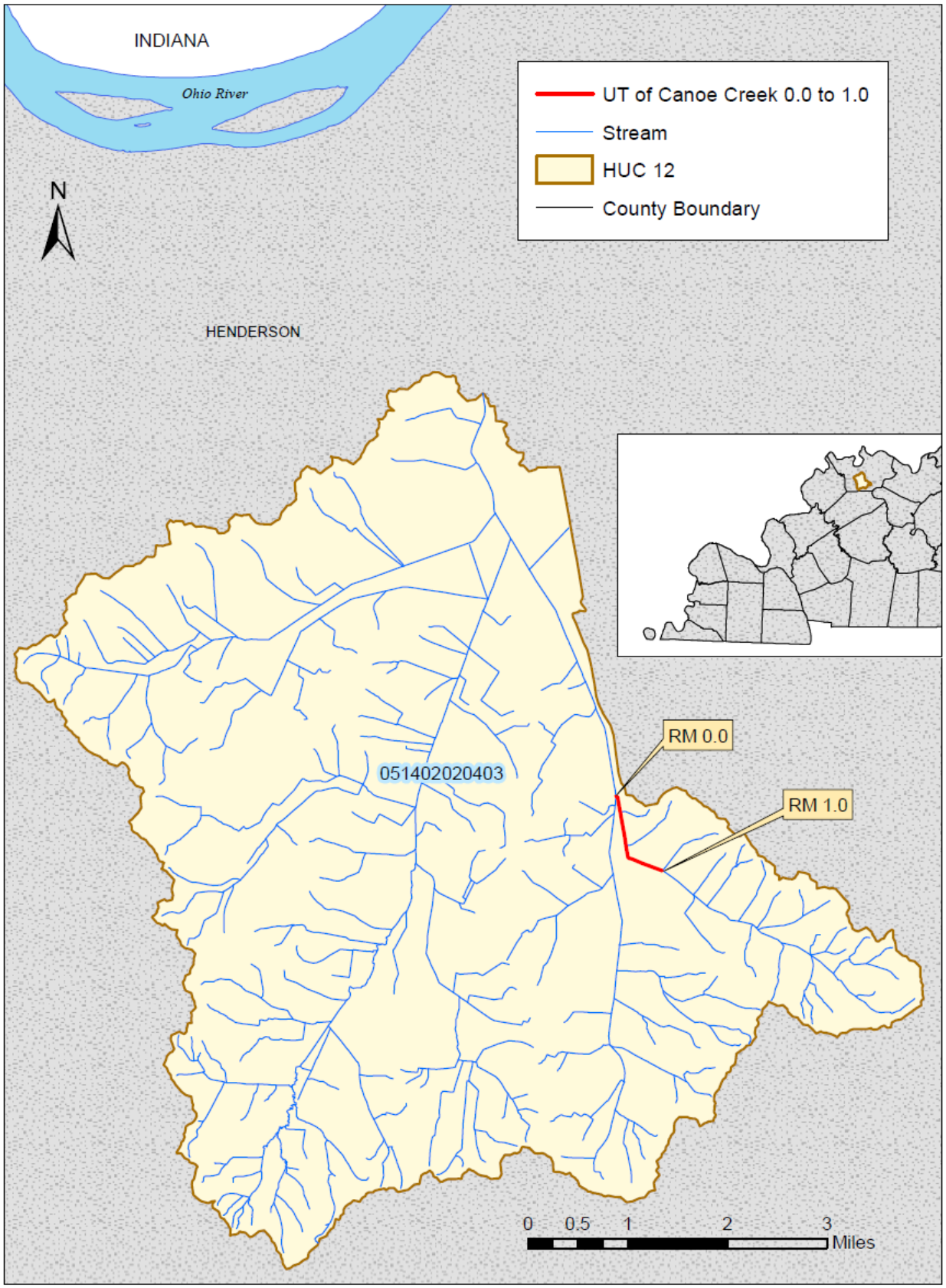

Figure J.45-1 Location of UT of Canoe Creek 0.0 to 1.0

Section J.46 UT of Elam Ditch 0.0 to 0.82

Waterbody ID: KY-712

Receiving Water: Elam Ditch

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020402

County: Henderson

The Division of Water (DOW) collected samples from station DOW08023014, located near river mile 0.7, in 2010. The station was sampled four times during the PCR season. Table J.46-1 summarizes information about this sampling station; Table J.46-2 provides a summary of the data collected from this station.

Table J.46-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023014	37.79178	-87.5247	UT of Elam Ditch 0.0 to 0.82	0.7

Table J.46-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023014	*E. coli*	4	435	1,733	1,249

[(1)]The full data set for samples collected at DOW08023014 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for UT of Elam Ditch 0.0 to 0.82 are presented in Table J.46-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of UT of Elam Ditch. The location within the North Fork Canoe Creek-Canoe Creek watershed is shown in Figure J.46-1.

Table J.46-3 UT of Elam Ditch 0.0 to 0.82 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[4]	Allocations for Tributary Loads to the Segment[5]	MOS[6]
	LA[3]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[5]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[6]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.46-1 Location of UT of Elam Ditch 0.0 to 0.82

Section J.47 UT of West Fork Canoe Creek 0.0 to 2.2

Waterbody ID: KY-1975

Receiving Water: West Fork Canoe Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020403

County: Henderson

The Division of Water (DOW) collected samples from station DOW08023018, located near river mile 0.7, in 2010. The station was sampled five times during the PCR season. Table J.47-1 summarizes information about this sampling station; Table J.47-2 provides a summary of the data collected from this station.

Table J.47-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023018	37.70468	-87.598	UT of West Fork Canoe Creek 0.0 to 2.2	0.7

Table J.47-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023018	*E. coli*	5	365	>2,420	1,497

[(1)]The full data set for samples collected at DOW08023018 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for UT of West Fork Canoe Creek 0.0 to 2.2 are presented in Table J.47-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of UT of West Fork Canoe Creek. The location of the segment within the West Fork Canoe Creek-Canoe Creek watershed is shown in Figure J.47-1.

Table J.47-3 UT of West Fork Canoe Creek 0.0 to 2.2 *E. coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Upstream Loads to the Segment[(4)]	Allocations for Tributary Loads to the Segment[(5)]	MOS[(6)]
	LA[(3)]			
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Upstream} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Upstream}$ is the flow contribution (ft^3/s) from upstream of the segment. This load includes both WLA and LA sources upstream of the impaired segment.

[(5)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(6)]The following assumptions provide an implicit MOS:

(a)Upstream and tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

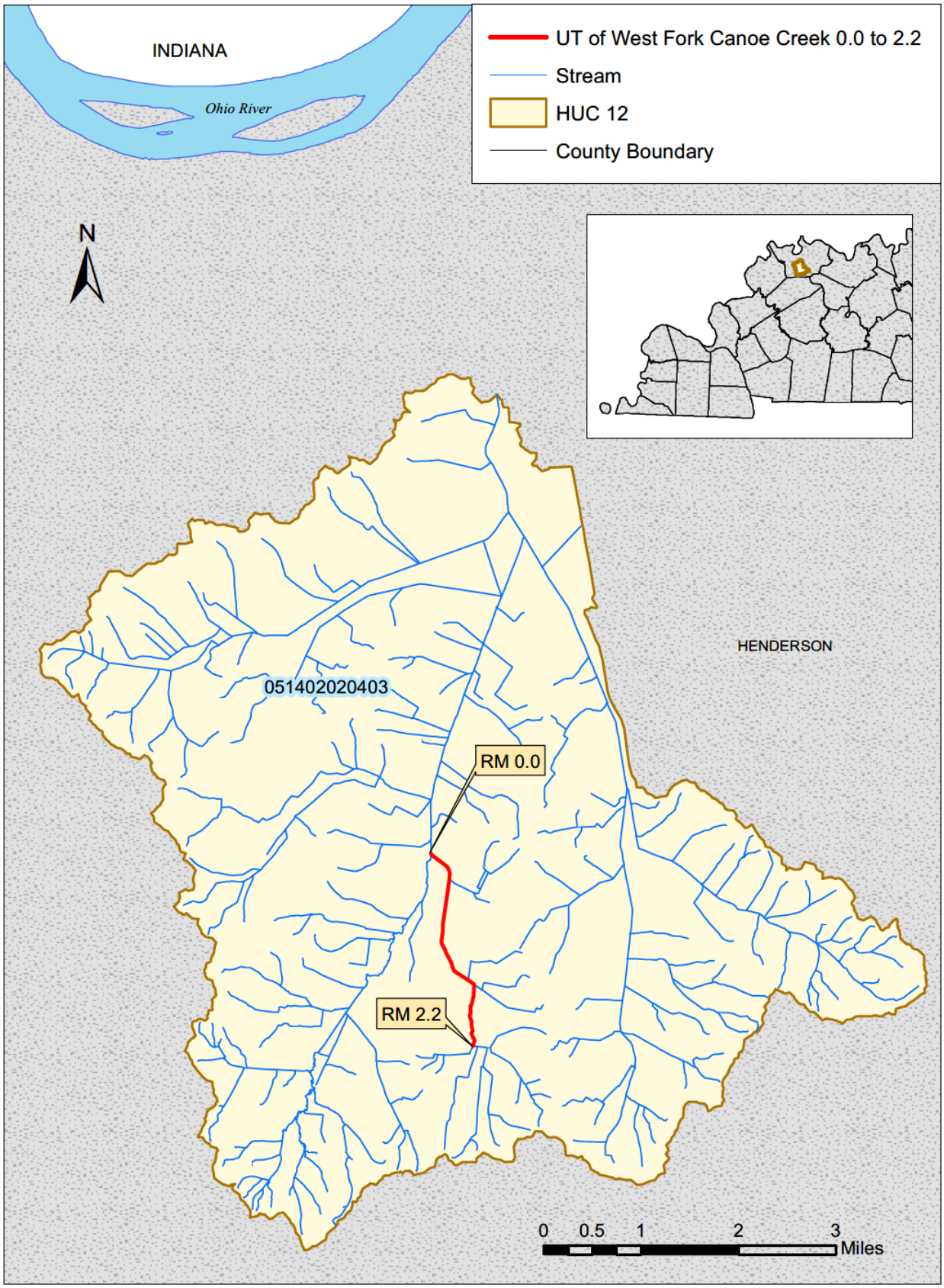

Figure J.47-1 Location of UT of West Fork Canoe Creek 0.0 to 2.2

Section J.48 West Fork Canoe Creek 0.0 to 7.75

Waterbody ID: KY-1974

Receiving Water: Canoe Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020403

County: Henderson

The Division of Water (DOW) collected samples from station, DOW08023017, located near river mile 3.9, in 2010. This station was sampled five times during the PCR season. Table J.48-1 summarizes information about this sampling station; Table J.48-2 provides a summary of the data collected from this station.

Table J.48-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023017	37.7064200	-87.6021000	West Fork Canoe Creek 0.0 to 7.75	3.9

Table J.48-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023017	*E. coli*	5	579	>2,420	1,644

[(1)]The full data set for samples collected from DOW08023017 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for West Fork Canoe Creek 0.0 to 7.75 are presented in Table J.48-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of West Fork Canoe Creek. The location of the segment within the West Fork Canoe Creek-Canoe Creek watershed is shown in Figure J.48-1.

Table J.48-3 West Fork Canoe Creek 0.0 to 7.75 *E. coli* TMDL Allocations[1]

TMDL[2]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[4]	MOS[5]
	LA[3]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[1]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[2]Q_S is the flow (ft^3/s) in the segment.

[3]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[4]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[5]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

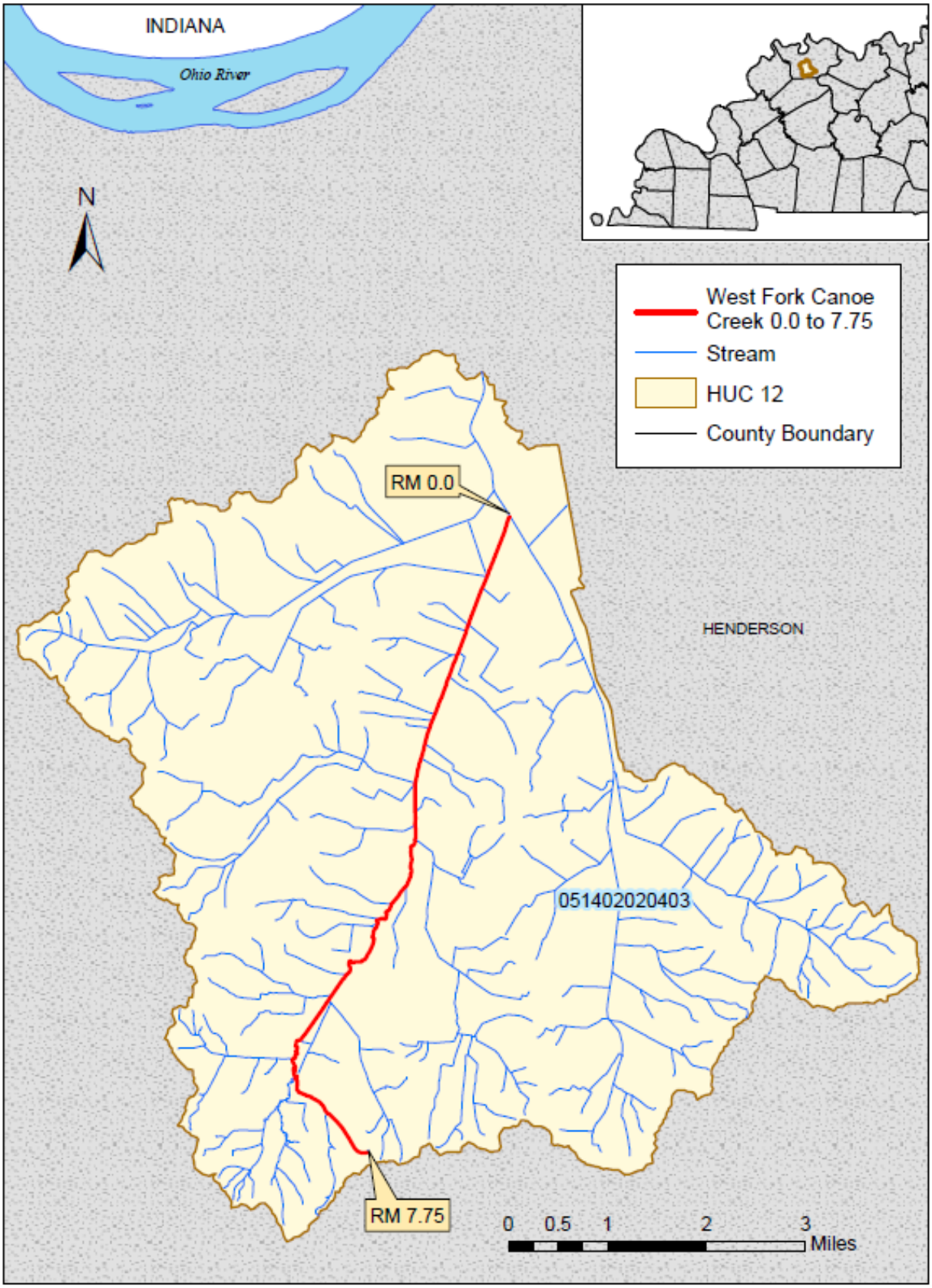

Figure J.48-1 Location of West Fork Canoe Creek 0.0 to 7.75

Section J.49 Wilson Creek 0.0 to 6.9

Waterbody ID: KY-2033

Receiving Water: Canoe Creek

Impaired Use: PCR

Support Status: nonsupport

Listed Pollutant/TMDL Pollutant: *E. coli*

HUC 12: 051402020405

County: Henderson

The Division of Water (DOW) collected samples from station, DOW08023005, located near river mile 1.2, in 2010. The station was sampled five times during the PCR season. Table J.49-1 summarizes information about this sampling station; Table J.49-2 provides a summary of the data collected from this station.

Table J.49-1 DOW Sample Site Location

Station Name	Latitude	Longitude	Stream Segment	River Mile
DOW08023005	37.789	-87.6232	Wilson Creek 0.0 to 6.9	1.2

Table J.49-2 DOW Sample Data Summary[(1)]

Station Name	Indicator Bacteria[(2)]	Number of Observations	Minimum (colonies/ 100 ml)	Maximum (colonies/ 100 ml)	Average (colonies/ 100 ml)
DOW08023005	*E. coli*	5	435	>2,420	1,418

[(1)]The full data set for samples collected at DOW08023005 may be obtained by submitting a request of records under the Kentucky Open Records Act (KORA) to EEC.KORA@ky.gov.
[(2)]The numeric water quality criteria (WQC) for indicator bacteria can be found in Section 1.3 of this document.

The TMDL allocations for Wilson Creek 0.0 to 6.9 are presented in Table J.49-3. As of March 2022, there are no KPDES-permitted discharges of bacteria into this segment of Wilson Creek. The location within the Wilson Creek-Canoe Creek watershed is shown in Figure J.49-1.

Table J.49-3 Wilson Creek 0.0 to 6.9 *E. coli* TMDL Allocations[(1)]

TMDL[(2)]	Allocations for Direct Loads to the Segment	Allocations for Tributary Loads to the Segment[(4)]	MOS[(5)]
	LA[(3)]		
$Q_S \times WQC \times CF$	$\sum(Q_{LA} \times WQC \times CF)$	$\sum(Q_{Tributary} \times WQC \times CF)$	Implicit

[(1)]All loads are colonies/day of *E. coli*. The recreational use bacterial WQCs are found in 401 KAR 10:031. CF is the conversion factor (24,465,758.4 s-ml/ft^3-day) to change the product of bacterial concentration (colonies/100 ml) and flow (ft^3/s) into a load (colonies/day). The symbol "∑" indicates that the total allocation is the sum of all the individual allowable loads.

[(2)]Q_S is the flow (ft^3/s) in the segment.

[(3)]Q_{LA} is the flow (ft^3/s) in the segment due to a LA source.

[(4)]$Q_{Tributary}$ is the flow contribution (ft^3/s) from a tributary to the segment. This load includes both WLA and LA sources on tributaries to the impaired segment.

[(5)]The following assumptions provide an implicit MOS:

(a)Tributary bacterial concentrations are at the maximum allowable limit; there is no dilution capacity from these areas.

(b)There is no bacteria die-off; in reality bacteria concentrations diminish downstream from their source. Thus, bacteria loads to the upper portion of a segment will diminish prior to reaching the lower portion of the segment.

Figure J.49-1 Location of Wilson Creek 0.0 to 6.9