UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

MAR - 1 2019

REPLY TO THE ATTENTION OF:
WW-16J

Angela Brown
Chief, Watershed Planning and Restoration Section
Office of Water Quality, Indiana Department of Environmental Management
MC 65-42 Shadeland
100 N. Senate Avenue
Indianapolis, Indiana 46204-2251

Dear Ms. Brown:

The U.S. Environmental Protection Agency has reviewed the recent approval (dated September 10, 2018) of the Lower Salt Creek Watershed Total Maximum Daily Load (TMDL) report and has determined that there was an error within Table 1 of the Decision Document. EPA misidentified two segments (INW0886_T1006 and INW0886_T1007) in the Goose Creek (05120208-08-07) subwatershed. These segments should have been referenced as INW0887_T1006 and INW0887_T1007. EPA confirms that these two segments were correctly identified in Table 6 of the September 10, 2018, Decision Document.

EPA has corrected the segment labels in Table 1 of original Decision Document in a revised Decision Document. Please see Table 1 of the revised Decision Document for the final approved TMDL assessment units. I am enclosing a copy of the revised Decision Document for your records. If you have any questions, please contact Mr. David Werbach, TMDL Coordinator, at 312-886-4242.

Sincerely,

Peter Swenson
Chief, Watersheds and Wetlands Branch

**TMDL:** Lower Salt Creek Watershed in Jackson, Lawrence and Monroe Counties, Indiana
**Date:** March 1, 2019 (revised)

# DECISION DOCUMENT
# FOR THE LOWER SALT CREEK WATERSHED TMDL, INDIANA

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. Part 130 describe the statutory and regulatory requirements for approvable TMDLs. Additional information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable. These TMDL review guidelines are not themselves regulations. They are an attempt to summarize and provide guidance regarding currently effective statutory and regulatory requirements relating to TMDLs. Any differences between these guidelines and EPA's TMDL regulations should be resolved in favor of the regulations themselves.

## 1. Identification of Waterbody, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the waterbody as it appears on the State's/Tribe's 303(d) list. The waterbody should be identified/georeferenced using the National Hydrography Dataset (NHD), and the TMDL should clearly identify the pollutant for which the TMDL is being established. In addition, the TMDL should identify the priority ranking of the waterbody and specify the link between the pollutant of concern and the water quality standard (see Section 2 below).

The TMDL submittal should include an identification of the point and nonpoint sources of the pollutant of concern, including location of the source(s) and the quantity of the loading, e.g., lbs/per day. The TMDL should provide the identification numbers of the NPDES permits within the waterbody. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of the natural background. This information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation.

The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as:

(1) the spatial extent of the watershed in which the impaired waterbody is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and
(5) an explanation and analytical basis for expressing the TMDL through *surrogate measures*, if applicable. *Surrogate measures* are parameters such as percent fines and turbidity for sediment

impairments; chlorophyll a and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

**Comment:**

**Location Description/Spatial Extent:**

The Lower Salt Creek Watershed (LSCW) is in south central Indiana in portions of Jackson, Lawrence and Monroe Counties. The LSCW is approximately 203 square miles in size (approx. 129,920 acres). The LSCW originates near Bloomington, Indiana and flows southwestward where it empties into the White River near Bedford, Indiana. The Indiana Department of Environmental Management (IDEM) subdivided the LSCW into seven smaller subwatersheds at the Hydrologic Unit Code (HUC) twelve scale (HUC-12) (Figure 2 of the final TMDL document). Table 1 of this Decision Document identifies the HUC-12 subwatersheds (e.g., the Jackson Creek HUC-12 subwatershed (05120208-08-01)) and the individual reaches within each of those subwatersheds (ex. INW0881_01) which received bacteria TMDLs as part of the LSCW TMDL efforts.

**Table 1: Summary of Impairments in the Lower Salt Creek Watershed and TMDL Count**

| 2016 AUID | 303(d) Listed Parameter | Impaired Beneficial Use | TMDL |
|---|---|---|---|
| **Jackson Creek (05120208-08-01)** | | | |
| **INW0881_01** | *E. coli* | Recreational Use | bacteria |
| **INW0881_01A** | *E. coli* | Recreational Use | bacteria |
| **INW0881_02** | *E. coli* | Recreational Use | bacteria |
| **INW0881_03** | *E. coli* | Recreational Use | bacteria |
| **INW0881_04** | *E. coli* | Recreational Use | bacteria |
| **INW0881_T1001** | *E. coli* | Recreational Use | bacteria |
| **INW0881_T1002** | *E. coli* | Recreational Use | bacteria |
| **INW0881_T1003** | *E. coli* | Recreational Use | bacteria |
| **INW0881_T1005** | *E. coli* | Recreational Use | bacteria |
| **INW0881_T1006** | *E. coli* | Recreational Use | bacteria |
| **INW0881_T1007** | *E. coli* | Recreational Use | bacteria |
| **INW0881_T1008** | *E. coli* | Recreational Use | bacteria |
| **INW0881_T1009** | *E. coli* | Recreational Use | bacteria |
| **INW0881_T1010** | *E. coli* | Recreational Use | bacteria |
| **May Creek (05120208-08-02)** | | | |
| **INW0882_02** | *E. coli* | Recreational Use | bacteria |
| **INW0882_03** | *E. coli* | Recreational Use | bacteria |
| **INW0882_T1001** | *E. coli* | Recreational Use | bacteria |
| **INW0882_T1003** | *E. coli* | Recreational Use | bacteria |
| **INW0882_T1004** | *E. coli* | Recreational Use | bacteria |
| **INW0882_T1005** | *E. coli* | Recreational Use | bacteria |
| **INW0882_T1006** | *E. coli* | Recreational Use | bacteria |
| **INW0882_T1007** | *E. coli* | Recreational Use | bacteria |
| **Little Clear Creek (05120208-08-03)** | | | |
| **INW0883_01** | *E. coli* | Recreational Use | bacteria |
| **INW0883_02** | *E. coli* | Recreational Use | bacteria |
| **INW0883_T1001** | *E. coli* | Recreational Use | bacteria |
| **INW0883_T1002** | *E. coli* | Recreational Use | bacteria |
| **INW0883_T1003** | *E. coli* | Recreational Use | bacteria |

| | | | |
|---|---|---|---|
| **INW0883_T1004** | *E. coli* | Recreational Use | bacteria |
| **INW0883_T1005** | *E. coli* | Recreational Use | bacteria |
| **Knob Creek (05120208-08-05)** | | | |
| **INW0885_T1007** | *E. coli* | Recreational Use | bacteria |
| **INW0885_T1008** | *E. coli* | Recreational Use | bacteria |
| **INW0885_T1009** | *E. coli* | Recreational Use | bacteria |
| **Wolf Creek (05120208-08-06)** | | | |
| **INW0886_01** | *E. coli* | Recreational Use | bacteria |
| **INW0886_02** | *E. coli* | Recreational Use | bacteria |
| **INW0886_03** | *E. coli* | Recreational Use | bacteria |
| **INW0886_04** | *E. coli* | Recreational Use | bacteria |
| **INW0886_T1009** | *E. coli* | Recreational Use | bacteria |
| **INW0886_T1010** | *E. coli* | Recreational Use | bacteria |
| **INW0886_T1011** | *E. coli* | Recreational Use | bacteria |
| **Goose Creek (05120208-08-07)** | | | |
| **INW0887_02** | *E. coli* | Recreational Use | bacteria |
| **INW0887_03** | *E. coli* | Recreational Use | bacteria |
| **INW0887_T1006** | *E. coli* | Recreational Use | bacteria |
| **INW0887_T1007** | *E. coli* | Recreational Use | bacteria |

IDEM collected water quality monitoring data in the LSCW in 2015-2016. IDEM monitored the health of the stream environments in the LSCW by collecting field data on the chemical, physical and habitat characteristics of individual stream reaches as well as aquatic biological community data. IDEM reviewed water quality data for individual waters and made assessment determinations of which individual water bodies were impaired according to water quality standard (WQS) values (Table 1 of this Decision Document).

## Land Use:

The LSCW watershed encompasses approximately 129,920 acres (203 square miles) in south central Indiana. Land use in the LSCW is comprised of forested lands, hay/pasture lands, developed lands, agricultural lands, open water, shrublands and wetlands. Land use coverages from U.S. Department of Agriculture (USDA) National Agriculture Statistics Service (NASS) and the Indiana Cropland Data Layer (CDL) were used to categorize the land use in the LSCW (Table 2 of this Decision Document).

**Table 2: Land use in the Lower Salt Creek Watershed (IN)**

| Land Use Category Description | Acreage | Square Miles | Distribution (% of the total area in the Lower Salt Creek Watershed) |
|---|---|---|---|
| Forested Lands | 73573.04 | 114.96 | 56.5% |
| Hay/Pasture Land | 29503.99 | 46.1 | 22.7% |
| Developed Lands | 17697.28 | 27.65 | 13.6% |
| Agricultural Lands | 9163.77 | 14.32 | 7.0% |
| Open Water | 233.74 | 0.37 | 0.2% |
| Shrubland | 78.95 | 0.12 | 0.1% |
| Wetlands | 6 | 0.01 | 0.0% |
| **TOTAL** | **130,256.77** | **203.53** | **100%** |

**Problem Identification:**
Bacteria TMDLs: Bacteria exceedances can negatively impact recreational uses (fishing, swimming, wading, boating, etc.) and public health. At elevated levels, bacteria may cause illness within humans who have contact with or ingest bacteria laden water. Recreation-based contact can lead to ear, nose, and throat infections, and stomach illness. *E. coli* is used as an indicator of the presence of bacteria.

**Priority Ranking:**
The LSCW TMDLs were prioritized to be completed based on local interest in addressing water quality deficiencies within the watershed, IDEM's interest in conducting baseline water quality monitoring for local planning, and the willingness of local partners to develop a Section 319 application and a watershed management plan (WMP). The development and adoption of the local WMP will lead to the implementation of best management practices (BMPs) and other mitigation strategies to improve water quality within the LSCW.

**Pollutants of Concern:**
Recreational Use: The pollutant of concern for total body contact recreational use impairment is *E. coli* which is an indicator for pathogenic bacteria.

**Source Identification (point and nonpoint sources):**
***Point Source Identification:*** The potential point sources to the LSCW are:

*National Pollutant Discharge Elimination System (NPDES) permit holders*: NPDES permitted facilities may contribute pollutant loads (bacteria) to surface waters through facility discharges of treated wastewater. Permitted facilities discharge wastewater according to their NPDES permit. IDEM identified eight NPDES permit holders in the LSCW which were assigned a portion of the wasteload allocation (WLA) (Table 3 in this Decision Document).

**Table 3: Permitted NPDES dischargers in the Lower Salt Creek Watershed which received a portion of a WLA**

| Facility Name | Permit Number | Subwatershed | Design Flow (MGD) | *E. Coli* WLA (billions of bacteria / day) |
|---|---|---|---|---|
| WWTP - Bloomington S. Dillman Rd. | IN0035718 | May Creek | 15 | 133 |
| WWTP - South Central RSD Caslon | IN0045187 | Little Clear Creek | 0.3 | 2.67 |
| WWTP - Briarwood Subdivision | IN0038920 | Little Clear Creek | 0.037 | 0.329 |
| WWTP - Pedigo Bay | IN0062154 | Wolf Creek | 0.022 | 0.196 |
| Camp INDI CO SO | IN0042617 | Wolf Creek | 0.01 | 0.0889 |
| WWTP - Stone Crest Golf Community | IN0061093 | Wolf Creek | 0.04 | 0.356 |
| WWTP - Town of Oolitic | IN0023981 | Goose Creek | 0.35 | 3.11 |
| Needmore Elementary School | IN0053741 | Goose Creek | 0.009 | 0.08 |

*Municipal Separate Storm Sewer Systems (MS4):* Stormwater from MS4s can transport bacteria to surface waterbodies during or shortly after storm events. IDEM identified six MS4 permittees in the LSCW (Table 4 of this Decision Document) which were assigned a portion of the WLA (Table 6 of this Decision Document).

**Table 4: MS4 Communities in the Lower Salt Creek Watershed which received a portion of a WLA**

| MS4 Community | Permit Number | Subwatershed | Area in Drainage (acres) | *Percentage of Subwatershed* |
|---|---|---|---|---|
| Monroe County | INR040089 | Jackson Creek | 6325.25 | 39.36% |
| Indiana University Bloomington | INR040123 | Jackson Creek | 954.38 | 5.94% |
| City of Bloomington | INR040136 | Jackson Creek | 8657.22 | 53.88% |
| Monroe County | INR040089 | May Creek | 6996.94 | 36.47% |
| City of Bloomington | INR040136 | May Creek | 347.01 | 1.81% |
| City of Bedford | INR040027 | Wolf Creek | 315.78 | 1.25% |
| City of Bedford | INR040027 | Goose Creek | 1217.11 | 5.51% |

*Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs)*: There are no CSOs or SSOs in the LSCW.

*Concentrated Animal Feeding Operations (CAFOs):* There are no CAFO facilities in the LSCW.

***Nonpoint Source Identification:*** The potential nonpoint sources to the LSCW are:

*Non-regulated urban runoff:* Runoff from urban areas (urban, residential, commercial or industrial land uses) can contribute various bacteria to local water bodies. Stormwater from urban areas, which drain impervious surfaces, may introduce pollutants to surface waters. Potential urban sources of bacteria can also include wildlife or pet wastes.

*Confined feeding operations (CFOs):* CFOs do not meet the definition of a CAFO and are considered by IDEM as a nonpoint source. CFOs have state-issued permits but are not under the jurisdiction of the federal NPDES Program. CFO permits are "no discharge" permits. Therefore, it is prohibited for these facilities to discharge to any water of the State. IDEM identified one CFO within the LSCW (Table 10 of the final TMDL document).

CFOs are agricultural operations where animals are kept and raised in confined spaces. CFOs generate manure which may be spread onto fields. Runoff from fields with spread manure from CFOs can be exacerbated by tile drainage lines, which channelize the stormwater flows and reduce the time available for bacteria to die-off. Tile-lined fields and channelized ditches enable pollutants to move into surface waters.

*Septic systems:* Failing septic systems are a potential source of bacteria within the LSCW. Septic systems generally do not discharge directly into a water body, but their effluents may leach into groundwater or pond at the surface where they can be washed into surface waters via stormwater runoff events. All the counties in the watershed follow the state rules IAC 6-8.3-52 (general sewage disposal requirements) and IAC 6-8.3-55 (violations; permit denial and revocation) regarding septic systems. Failures are typically identified through public complaints and the sale of older properties which have not passed inspection.

*Stormwater runoff from agricultural land use practices:* Runoff from agricultural lands may contain significant amounts of bacteria which may lead to impairments in the LSCW. Manure spread onto fields is often a source of bacteria and can be exacerbated by tile drainage lines, which channelize the stormwater flows and reduce the time available for bacteria to die-off. Tile lined fields and channelized ditches enable particles to move more efficiently into surface waters.

*Unrestricted livestock access to streams:* Livestock with access to stream environments may add bacteria directly to the surface waters or resuspend particles that had settled on the stream bottom. Direct deposition of animal wastes can result in very high localized bacteria counts and may contribute to downstream impairments. Smaller animal facilities may add bacteria to surface waters via wastewater from these facilities or stormwater runoff from near-stream pastures.

*Wildlife:* Deer, geese, ducks, raccoons, turkeys, and other animals are recognized as potential contributors of bacteria to the LSCW.

**Future Growth:**
IDEM determined that the overall population numbers within the counties of the LSCW have been increasing over the past two decades (Section 4.1.4 of the final TMDL document). IDEM explained that it allocated 5% of the loading capacity toward future growth. The WLA and the load allocation (LA) were calculated for all current sources. Any expansion of point or nonpoint sources will need to comply with the respective WLA and LA values in the TMDL.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the first criterion.

## 2. Description of the Applicable Water Quality Standards and Numeric Water Quality Targets

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy (40 C.F.R. §130.7(c)(1)). EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

The TMDL submittal must identify a numeric water quality target(s) – a quantitative value used to measure whether or not the applicable water quality standard is attained. Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. The TMDL expresses the relationship between any necessary reduction of the pollutant of concern and the attainment of the numeric water quality target. Occasionally, the pollutant of concern is different from the pollutant that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as Dissolved Oxygen criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

**<u>Comment:</u>**
**Designated Uses:**
The designated uses for water bodies identified in the LSCW TMDL are for total body contact recreation use.

<u>Recreational use:</u> IDEM explained that *E. coli* is an indicator of the possible presence of pathogenic organisms (e.g., *E. coli*, viruses, and protozoa) which may cause human illness. *E. coli* is a sub-group of fecal coliforms, used as an indicator of potential fecal contamination. Concentrations are typically reported as the count of organisms in 100 milliliters of water (count/100 mL) and may vary at a particular site depending on the baseline *E. coli* level already in the river, inputs from other sources, dilution due to precipitation events, and die-off or multiplication of the organism within the river water and sediments.[1]

The numeric *E. coli* criteria associated with protecting the recreational use are described below. *"The criteria in this subsection are to be used to evaluate waters for full body contact recreational uses, to establish wastewater treatment requirements, and to establish effluent limits during the recreational season, which is defined as the months of April through October, inclusive. E. coli bacteria, shall not exceed one hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period nor exceed two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period. . . However, a single sample shall be used for making beach notification and closure decisions."* [Source: Indiana Administrative Code Title 327 Water Pollution Control Board. Article 2. Section 1-6(d).]

Water bodies are held to recreation use criteria during the time of the year when people are most likely to be engaged in activities such as swimming, wading or boating. The recreation use criteria were established to protect against disease carrying organisms that may be ingested or introduced to the eyes, skin or other body parts during water recreation activities.

<u>*E. coli* TMDL target:</u>
For *E. coli* TMDLs, allocations were calculated based upon the 235 cfu/100 mL portion of the criteria. EPA believes this is protective of both portions of the criteria. The EPA report, "*An Approach for Using Load Duration Curves in the Development of TMDLs*" (EPA, 2007) describes how the monthly geometric mean (in this case, 125 cfu/100 mL for *E. coli*) is likely to be met when the single sample maximum value (in this case, 235 cfu/100 mL for *E. coli*) is used to develop the loading capacity. The process calculates the daily maximum bacteria value that is possible to observe and still attain the monthly geometric mean. If the single sample maximum is set as a never-to-be surpassed value then it becomes the maximum value that can be observed, and all other bacteria values would have to be less than the maximum, i.e., 235 cfu/100 mL. EPA notes that whichever portion of the criteria is used to determine the allocations, both the monthly geometric mean and single sample maximum will be used to assess the extent of implementation by point and nonpoint sources.

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[1] Total Maximum Daily Load Report for the Lower Salt Creek Watershed (August 20, 2018), p. 6.

**Table 5: Water quality standards and targets* utilized within the LSCW TMDLs**

| Parameter | Units | TMDL Targets |
|---|---|---|
| **Numeric Water Quality Standards for addressing the Bacteria (*E. coli*) impaired segments within the LSCW** | | |
| *E. Coli* [1] | # cfu / 100 mL | **235 single sample maximum** |
| | | Geometric mean < 125 [2] |

* = Section 2.2 of the final TMDL document

1 = *E. coli* standards are for the recreation season only (April 1 through October 31).

2 = Geometric mean based on minimum of 5 evenly spaced samples taken over not more than a 30-day period.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the second criterion.

## 3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a waterbody for the applicable pollutant. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

The TMDL submittal should contain documentation supporting the TMDL analysis, including the basis for any assumptions; a discussion of strengths and weaknesses in the analytical process; and results from any water quality modeling. EPA needs this information to review the loading capacity determination, and load and wasteload allocations, which are required by regulation.

TMDLs must take into account *critical conditions* for steam flow, loading, and water quality parameters as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1)). TMDLs should define applicable *critical conditions* and describe their approach to estimating both point and nonpoint source loadings under such *critical conditions*. In particular, the TMDL should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

**Comment:**

IDEM determined the loading capacities for the impaired waterbodies in the LSCW based on the water quality standards and water quality target values. The Load Duration Curve (LDC) approach was selected by IDEM to calculate TMDLs for bacteria. The LDC approach assigns loadings based on flow.

***Bacteria (E. coli) TMDLs:*** For all *E. coli* TMDLs addressed by the LSCW TMDL, the *E. coli* WQS of **235 cfu/100 mL**, was used to set the loading capacity of the TMDL. IDEM believes that the single sample maximum component of the *E. coli* WQS provides the best overall characterization of the status of the watershed. IDEM believes that by setting the bacteria TMDLs to meet the single sample maximum (235 cfu/100 mL) portion of the full body contact recreational use WQS the impaired waterbody will attain its designated full body contact recreational use (Section 2 of this Decision Document). EPA finds this assumption to be reasonable since the allocations of the bacteria TMDLs addressed in the LSCW TMDLs are calculated to meet the WQS of 235 cfu/100 mL on any given day, across all flow conditions within the LSCW.

Typically loading capacities are expressed as a mass per time (e.g., pounds per day). However, for *E. coli* loading capacity calculations, mass is not always an appropriate measure because *E. coli* is expressed in terms of organism counts. This approach is consistent with the EPA's regulations which define "load" as "an amount of matter that is introduced into a receiving water" (40 CFR §130.2). To establish the loading capacities for the LSCW TMDLs, IDEM used the water quality standard for *E. coli* (235 cfu/100 mL). A loading capacity is, "the greatest amount of loading that a water can receive without violating water quality standards." (40 CFR §130.2). Therefore, a loading capacity set at the WQS will assure that the water does not violate WQS. IDEM's *E. coli* TMDL approach is based upon the premise that all point and nonpoint source discharges must meet the WQS when entering the water body. If all sources meet the WQS at discharge, then the water body should meet the WQS and its designated use.

IDEM approached the LSCW TMDLs by calculating loading capacity values for individual HUC-12 subwatersheds. The USGS does not operate any stream gaging stations in the LSCW which necessitated IDEM to use USGS flow data from a neighboring watershed. Flow duration curves (FDC) were created for each of the subwatersheds within the LSCW. The FDC were developed from flow frequency tables based on recorded and scaled flow volumes measured at a USGS gage on the Lick Creek Watershed near Paoli, Indiana (USGS gage ID #03373610) (Figure 23 of the final TMDL document). The daily flow data focused on dates within the recreation season (April 1 to October 31). Dates outside of the recreation season were excluded from the flow record. Flows at USGS gage #03373610 were employed to characterize the flows within the HUC-12 subwatersheds in the LSCW. Daily stream flows were necessary to implement the load duration curve approach. These were estimated using the observed flows available at the USGS gage on the Lick Creek and drainage area weighting using the following equation:

$$Q_{ungaged} = (A_{ungaged} / A_{gaged}) * Q_{gaged}$$

where,

$Q_{ungaged}$ = Flow at the ungaged location
$Q_{gaged}$ = Flow at USGS gage station (#03373610)
$A_{ungaged}$ = Drainage area of the ungaged location
$A_{gaged}$ = Drainage area of the USGS gage location (#03373610)

In this procedure, the drainage area of each monitoring station (or impaired segment) was divided by the drainage area of USGS gage #03373610. The flows for each of the stations were then calculated by multiplying the USGS gage #03373610 flows by the drainage area ratios.

FDC graphs have flow duration interval (percentage of time flow exceeded) on the X-axis and discharge (flow per unit time) on the Y-axis. The FDC were transformed into LDC by multiplying individual flow values by the WQS (235 cfu/100 mL) and then by a conversion factor. The resulting points are plotted onto a load duration curve graph. LDC graphs, for the LSCW bacteria TMDLs, have flow duration interval (percentage of time flow exceeded) on the X-axis and *E. coli* loads (number of bacteria per unit time) on the Y-axis. The LSCW LDC used *E. coli* measurements in billions of bacteria per day. The curved line on a LDC graph represents the TMDL of the respective flow location and the flow conditions observed at that location.

IDEM completed water quality monitoring in the LSCW basin in 2015-2016 and measured *E. coli* concentrations at specific sampling points within the watershed. *E. coli* values from these efforts were converted to individual sampling loads by multiplying the sample concentration by the instantaneous flow measurement observed/estimated at the time of sample collection and then by a conversion factor which allows the individual samples to be plotted on the same figure as the LDCs (e.g., Figure 27 of the final TMDL document). The individual sampling loads were plotted on the same figure with the created LDC.

The LDC plots were subdivided into five flow regimes; very high flows (exceeded 0–10% of the time), moist conditions (exceeded 10–40% of the time), mid-range flows (exceeded 40–60% of the time), dry conditions (exceeded 60–90% of the time), and low flows (exceeded 90–100% of the time). LDC plots can be organized to display individual sampling loads and the calculated LDC. Watershed managers can interpret these plots (individual sampling points plotted with the LDC) to understand the relationship between flow conditions and water quality exceedances within the watershed. Individual sampling loads which plot above the LDC represent violations of the WQS and the allowable load under those flow conditions at those locations. The difference between individual sampling loads plotting above the LDC and the LDC, measured at the same flow is the amount of reduction necessary to meet WQS.

The strengths of using the LDC method are that critical conditions and seasonal variation are considered in the creation of the FDC by plotting hydrologic conditions over the flows measured during the recreation season. Additionally, the LDC methodology is relatively easy to use and cost-effective. The weaknesses of the LDC method are that nonpoint source allocations cannot be assigned to specific sources, and specific source reductions are not quantified. Overall, IDEM believes and EPA concurs that the strengths outweigh the weaknesses for the LDC method.

Implementing the results shown by the LDC requires watershed managers to understand the sources contributing to the water quality impairment and which BMPs may be the most effective for reducing bacteria loads based on flow magnitudes. Different sources will contribute bacteria loads under varying flow conditions. For example, if exceedances are significant during high flow events this would suggest storm events are the cause and implementation efforts can target BMPs that will reduce stormwater runoff and consequently bacteria loading into surface waters. This allows for a more efficient implementation effort.

Subwatersheds in the LSCW contain multiple impaired segments which are upstream of the HUC-12 subwatershed outlet point. Instead of calculating individual loads for each upstream impaired reach, IDEM chose to calculate TMDLs at the subwatershed outlet point of HUC-12 subwatersheds. IDEM explained the calculation of TMDLs at the subwatershed outlet addresses the entire subwatershed, including the upstream impaired segments. For bacteria impaired segments, IDEM employed a LDC based TMDL which determined bacteria loads for each of the five flow regimes of the LDC.

IDEM explained that consistency in both land use and nonpoint source contributions of bacteria across the subwatershed provided confidence that TMDL calculations at the outlet point of subwatershed would address impaired reaches upstream of the outlet point of the subwatershed. The similarities in land use and source contributions across the subwatershed will also aid post-TMDL implementation efforts. EPA anticipates that implementation efforts will be undertaken across all waters within bacteria impaired HUC-12 subwatersheds.

TMDLs were calculated for each HUC-12 subwatershed in the LSCW with bacteria impairments. WLA were assigned to NPDES permitted facilities where appropriate in each individual subwatershed. Load allocations were calculated after the determination of the WLA, the Margin of Safety (10% of the loading capacity) and the allocation for future growth (5 % of the loading capacity). Load allocations were not split amongst individual nonpoint contributors (ex. stormwater runoff from agricultural land use practices, failing septic systems, non-regulated urban stormwater runoff etc.). Instead, load allocations were represented as one value for each TMDL.

Table 6 of this Decision Document reports five points (the midpoints of the designated flow regime) on the loading capacity curve. However, the components of the TMDL equation could be illustrated for any point on the entire loading capacity curve. The load duration curve method can be used to display collected bacteria monitoring data and allows for the estimation of load reductions necessary for attainment of the bacteria water quality standard. Using this method, daily loads were developed based upon the flow in the water body. Loading capacities were determined for the segment for multiple flow regimes. This allows the TMDL to be represented by an allowable daily load across all flow conditions. Table 6 of this Decision Document identifies the loading capacity for the water body at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved for this TMDL.

**Table 6: Bacteria (*E. coli*) TMDLs for the Lower Salt Creek Watershed**

| **Flow Regime TMDL analysis *E. coli* (billions of bacteria/day)** | **High Flows** | **Moist Conditions** | **Mid-Range Flows** | **Dry Conditions** | **Low Flows** |
|---|---|---|---|---|---|
| Duration Interval | 0 - 10 % | 10 - 40 % | 40 - 60 % | 60 - 90 % | 90 - 100 % |
| ***Jackson Creek (05120208-08-01)*** | | | | | |
| **14 segments: INW0881_01, INW0881_01a, INW0881_02, INW0881_03, INW0881_04, INW0881_T1001, INW0881_T1002, INW0881_T1003, INW0881_T1005, INW0881_T1006, INW0881_T1007, INW0881_T1008, INW0881_T1009 & INW0881_T1010** | | | | | |
| **Bacteria TMDL (billions of bacteria/day)** | **1749.60** | **315.97** | **114.42** | **28.48** | **9.11** |
| ***Wasteload Allocation (WLA): Total*** | 1475.00 | 267.00 | 0.00 | 0.00 | 0.00 |
| MS4 - Monroe County (INR040089) | 585.00 | 104.00 | -- | -- | -- |
| MS4 - Indiana University Bloomington (INR040123) | 90.00 | 20.00 | -- | -- | -- |
| MS4 - City of Bloomington (INR040136) | 800.00 | 143.00 | -- | -- | -- |
| ***Load Allocation (LA)*** | 12.20 | 2.17 | 97.30 | 24.20 | 7.74 |
| ***Margin Of Safety (MOS) (10%)*** | 175.00 | 31.20 | 11.40 | 2.85 | 0.91 |
| ***Future Growth (5%)*** | 87.40 | 15.60 | 5.72 | 1.43 | 0.46 |
| ***May Creek (05120208-08-02)*** | | | | | |
| **8 segments: INW0882_02, INW0882_03, INW0882_T1001, INW0882_T1003, INW0882_T1004, INW0882_T1005, INW0882_T1006 & INW0882_T1007** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| **Bacteria TMDL (billions of bacteria/day)** | **3923.40** | **809.31** | **381.09** | **194.80** | **152.73** |
| ***Wasteload Allocation (WLA): Total*** | 797.40 | 251.61 | 133.00 | 133.00 | 133.00 |
| WWTP - Bloomington S. Dillman Rd (IN0035718) | 133.00 | 133.00 | 133.00 | 133.00 | 133.00 |
| MS4 - Monroe County (INR040089) | 633.00 | 113.00 | -- | -- | -- |
| MS4 - City of Bloomington (INR040136) | 31.40 | 5.61 | -- | -- | -- |
| ***Load Allocation (LA)*** | 1070.00 | 191.00 | 114.00 | 28.30 | 9.04 |
| ***Upstream Drainage Input (Jackson Creek subwatershed 05120208-08-01)*** | 1750.00 | 312.00 | 114.00 | 28.50 | 9.10 |
| ***Margin Of Safety (MOS) (10%)**** | 204.00 | 36.50 | 13.40 | 3.33 | 1.06 |
| ***Future Growth (5%)**** | 102.00 | 18.20 | 6.69 | 1.67 | 0.53 |
| ***Little Clear Creek (05120208-08-03)*** | | | | | |
| **7 segments: INW0883_01, INW0883_02, INW0883_T1001, INW0883_T1002, INW0883_T1003, INW0883_T1004 & INW0883_T1005** | | | | | |
| **Bacteria TMDL (billions of bacteria/day)** | **5359.00** | **1070.00** | **479.17** | **221.46** | **163.48** |
| ***Wasteload Allocation (WLA): Total*** | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| WWTP - South Central RSD Caslon (IN0045187) | 2.67 | 2.67 | 2.67 | 2.67 | 2.67 |
| WWTP - Briarwood Subdivision (IN0038920) | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| ***Load Allocation (LA)*** | 1220.00 | 218.00 | 79.60 | 19.50 | 5.91 |
| ***Upstream Drainage Input (May Creek subwatershed 05120208-08-02)*** | 3920.00 | 810.00 | 382.00 | 195.00 | 153.00 |
| ***Margin Of Safety (MOS) (10%)**** | 144.00 | 26.00 | 9.71 | 2.64 | 1.05 |
| ***Future Growth (5%)**** | 72.00 | 13.00 | 4.86 | 1.32 | 0.52 |
| ***Knob Creek (05120208-08-05)*** | | | | | |
| **3 segments: INW0885_T1007, INW0885_T1008 & INW0885_T1009** | | | | | |
| **Bacteria TMDL (billions of bacteria/day)** | **3710.30** | **662.70** | **243.05** | **60.48** | **19.27** |
| ***Wasteload Allocation (WLA): Total*** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ***Load Allocation (LA)*** | 1420.00 | 253.00 | 92.70 | 23.10 | 7.37 |
| ***Upstream Drainage Input (Hunter Creek subwatershed 05120208-08-04)*** | 2040.00 | 365.00 | 134.00 | 33.30 | 10.60 |
| ***Margin Of Safety (MOS) (10%)**** | 167.00 | 29.80 | 10.90 | 2.72 | 0.87 |
| ***Future Growth (5%)**** | 83.30 | 14.90 | 5.45 | 1.36 | 0.43 |
| ***Wolf Creek (05120208-08-06)*** | | | | | |
| **7 segments: INW0886_01, INW0886_02, INW0886_03, INW0886_04, INW0886_T1009, INW0886_T1010 & INW0886_T1011** | | | | | |
| **Bacteria TMDL (billions of bacteria/day)** | **41677.24** | **7557.63** | **2853.08** | **815.04** | **353.11** |
| ***Wasteload Allocation (WLA): Total*** | 30.24 | 5.93 | 0.64 | 0.64 | 0.64 |
| WWTP - Pedigo Bay (IN0062154) | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| WWTP - Stone Crest Golf Community (IN0031093) | 0.36 | 0.36 | 0.36 | 0.36 | 0.36 |
| WWTP - Camp INDI CO SO (IN0042617) | 0.09 | 0.09 | 0.09 | 0.09 | 0.09 |
| MS4 - City of Bedford (INR040027) | 29.60 | 5.29 | -- | -- | -- |
| ***Load Allocation (LA)*** | 2330.00 | 417.00 | 155.00 | 38.50 | 12.20 |
| ***Upstream Drainage Input (Little Clear Creek, Knob Creek, Lake Monroe subwatersheds)*** | 38900.00 | 7060.00 | 2670.00 | 769.00 | 338.00 |
| ***Margin Of Safety (MOS) (10%)**** | 278.00 | 49.80 | 18.30 | 4.60 | 1.51 |
| ***Future Growth (5%)**** | 139.00 | 24.90 | 9.14 | 2.30 | 0.76 |

| *Goose Creek (05120208-08-07)* | | | | | |
|---|---|---|---|---|---|
| **4 segments: INW0887_02, INW0887_03, INW0887_T1006 & INW0887_T1007** | | | | | |
| **Bacteria TMDL (billions of bacteria/day)** | **44094.19** | **7989.69** | **3019.17** | **857.11** | **368.63** |
| ***Wasteload Allocation (WLA): Total*** | 115.19 | 23.19 | 3.19 | 3.19 | 3.19 |
| WWTP - City of Oolitic (IN0023981) | 3.11 | 3.11 | 3.11 | 3.11 | 3.11 |
| Needmore Elementary School (IN0053741) | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| MS4 - City of Bedford (INR040027) | 112.00 | 20.00 | -- | -- | -- |
| ***Load Allocation (LA)*** | 1920.00 | 342.00 | 132.00 | 32.60 | 10.10 |
| ***Upstream Drainage Input (Wolf Creek subwatershed 05120208-08-06)*** | 41700.00 | 7560.00 | 2860.00 | 815.00 | 353.00 |
| ***Margin Of Safety (MOS) (10%)**** | 239.00 | 43.00 | 16.00 | 4.21 | 1.56 |
| ***Future Growth (5%)**** | 120.00 | 21.50 | 7.98 | 2.11 | 0.78 |

* = For those subwatersheds with Upstream Drainage Inputs (e.g., May Creek (05120208-08-02)) the Margin of Safety and Future Growth calculations were based on the Final Bacteria TMDL (i.e., the Loading Capacity) value minus the Upstream Drainage Input value for that subwatershed in all flow regimes

IDEM included the LDCs for each individual subwatershed in Figures 27, 31, 35, 39, 43, 47 & 51 of the final TMDL document. IDEM explained that, for most of the subwatersheds, measured bacteria concentration measurements exceed the bacteria WQS within the higher flow condition flow regime and the lower flow condition flow regime. IDEM concluded that bacteria inputs to waters of the LSCW likely occur across all flow conditions. Therefore, the bacteria implementation efforts should aim to reduce bacteria contributions during times of high flows and times of lower flows within the LSCW.

Table 7 of the Decision Document discusses IDEM's estimates of loading reductions for each subwatershed in the LSCW. These loading reductions (i.e., the percent reduction column) were calculated from field sampling data collected in the LSCW by IDEM in 2015-2016 (Section 6 of the final TMDL document). IDEM has communicated that the loading reductions in Table 6 of this Decision Document are conservative load reduction estimates based on a limited water quality data set. IDEM would need to collect a more robust water quality data set over a variety of flow conditions for IDEM to characterize, with greater confidence, expected load reductions in the LSCW when the TMDLs are achieved.

**Table 7: Estimated concentration reductions for the TMDLs in the Lower Salt Creek Watershed**

| Subwatershed | Estimated *E. coli* concentration reductions |
|---|---|
| Jackson Creek (05120208-08-01) | 91% |
| May Creek (05120208-08-02) | 89% |
| Little Clear Creek (05120208-08-03) | 85% |
| Knob Creek (05120208-08-05) | 71% |
| Wolf Creek (05120208-08-06) | 95% |
| Goose Creek (05120208-08-07) | 62% |

EPA concurs with the data analysis and LDC approach utilized by IDEM in their calculation of wasteload allocations, load allocations, the margin of safety and the future growth calculation for the

LSCW TMDLs. The methods used for determining the TMDL are consistent with U.S. EPA technical memos.[2]

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the third criterion.

## 4. Load Allocations (LA)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity attributed to existing and future nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)). Where possible, load allocations should be described separately for natural background and nonpoint sources.

**Comment:**
LAs for nonpoint sources were calculated in the TMDL development process, along with the calculations for the load assigned to the WLA and the margin of safety. IDEM determined the load allocation calculations for each of the subwatershed TMDLs based on the *E. coli* WQS (235 cfu/100 mL). The WQS were applicable across all flow conditions in the subwatershed (Table 6 of this Decision Document).

IDEM identified several diverse nonpoint sources in the TMDL including; urban stormwater runoff, failing septic systems, stormwater runoff from agricultural land use practices, livestock with access to stream areas, stream channelization and stream erosion, and wildlife (deer, geese, ducks, raccoons, turkeys and other animals). IDEM did not determine individual load allocation values for each of these potential nonpoint source considerations.

The implementation strategies outlined by IDEM in the LSCW TMDL will aid local partners in determining appropriate mitigation strategies for these nonpoint source inputs. Additional sources of information which may be called upon by IDEM to aid in setting mitigation strategies are field observations made during the collection of water quality monitoring data in 2015-2016. These observations (e.g., land use, housing density, location of livestock facilities and proximity to sampling locations) may assist watershed managers in identifying potential nonpoint sources of bacteria. EPA finds the IDEM's approach for calculating the LA to be reasonable.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the fourth criterion.

## 5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to individual existing and future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In

[2] U.S. Environmental Protection Agency. August 2007. *An Approach for Using Load Duration Curves in the Development of TMDLs*. Office of Water. EPA-841-B-07-006. Washington, D.C.

some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit.

The individual WLAs may take the form of uniform percentage reductions or individual mass based limitations for dischargers where it can be shown that this solution meets WQSs and does not result in localized impairments. These individual WLAs may be adjusted during the NPDES permitting process. If the WLAs are adjusted, the individual effluent limits for each permit issued to a discharger on the impaired water must be consistent with the assumptions and requirements of the adjusted WLAs in the TMDL. If the WLAs are not adjusted, effluent limits contained in the permit must be consistent with the individual WLAs specified in the TMDL. If a draft permit provides for a higher load for a discharger than the corresponding individual WLA in the TMDL, the State/Tribe must demonstrate that the total WLA in the TMDL will be achieved through reductions in the remaining individual WLAs and that localized impairments will not result. All permittees should be notified of any deviations from the initial individual WLAs contained in the TMDL. EPA does not require the establishment of a new TMDL to reflect these revised allocations as long as the total WLA, as expressed in the TMDL, remains the same or decreases, and there is no reallocation between the total WLA and the total LA.

**Comment:**

IDEM identified eight NPDES permit holders which were assigned a WLA to mitigate bacteria inputs (Table 6 of the Decision Document). Individual WLAs were developed as part of the TMDL development process for these facilities. WWTP's WLAs were based on each facility's design flow and the TMDL bacteria (*E. coli* WQS of 235 cfu/100 mL) target (Section 6.1 of the final TMDL document).

IDEM identified MS4 jurisdictional areas within the LSCW and completed an areal ratio calculation for MS4 communities within individual subwatersheds. This ratio allowed IDEM to estimate potential MS4 contributing areas on a subwatershed-by-subwatershed basis. This value was then multiplied by the loading capacity, minus the summation of non-stormwater WLAs, MOS and AFG (Section 6.1 of the final TMDL document). MS4 were assigned a portion of the WLA in the High and Moist flow regimes. MS4 WLA were not assigned to the Mid-Range, Dry or Low flow regimes. IDEM's calculation for the MS4 WLA was based on the proportional area of the MS4 community within the selected subwatershed, upstream of the outlet point of the subwatershed).

IDEM expects each NPDES permitted facility to meet the bacteria target assigned via the WLA calculation across all flow conditions. EPA expects that IDEM permit writers will work with R5 NPDES staff to revise individual NPDES permits as necessary, based on the bacteria targets identified in this TMDL during the next permitting cycle. EPA notes that permit limits and permit conditions will be determined through the NPDES permit process. EPA's November 15, 2006 memorandum states that 40 CFR. § 122.44(d)(1)(vii) requires the permitting authority to ensure that "*...effluent limitations developed to protect a narrative water quality criterion, a numeric water quality criterion, or both, are consistent with the assumptions and requirements of any available waste load allocation for the discharge prepared by the State and approved by EPA pursuant to 40 CFR. 130.7. This provision does not require that effluent limits in NPDES permits be expressed in a form that is identical to the form in which an available waste load allocation for the discharge is expressed in a TMDL. Rather, permit* limits need only be consistent with the assumptions and requirements of a TMDL's waste load allocation." [3]

EPA finds the IDEM's approach for calculating the WLA to be reasonable.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the fifth criterion.

## 6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)). EPA's 1991 TMDL Guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

**Comment:**
The LSCW bacteria (*E. coli*) TMDLs incorporated an explicit Margin of Safety (MOS). The explicit MOS was applied by reserving approximately 10% of the total loading capacity, and then allocating the remaining loads to point (WLA), nonpoint sources and future growth (Table 6 of this Decision Document). The use of the LDC approach minimized variability associated with the development of the LSCW TMDLs because the calculation of the loading capacity was a function of flow multiplied by the target value. The MOS was set at 10% to account for uncertainty due to field sampling error, basing assumptions on water quality monitoring with low sample sizes, and an imperfect WQS. A 10% MOS was considered appropriate, because the target values used in this TMDL had a firm technical basis and the estimated flows are believed to be relatively accurate because they were estimated based on a USGS gage located just outside of the watershed.

The MOS for the LSCW bacteria TMDLs also incorporated certain conservative assumptions in the calculation of the TMDLs. No rate of decay, or die-off rate of pathogen species, was used in the LSCW bacteria TMDL calculations or in the creation of load duration curves for *E. coli*. Bacteria have a limited capability of surviving outside their hosts, and normally a rate of decay would be incorporated. IDEM determined that it was more conservative to use the WQS (235 cfu/100 mL) and not to apply a rate of decay, which could result in a loading capacity greater than the WQS.

As stated in *EPA's Protocol for Developing Pathogen TMDLs* (EPA 841-R-00-002), many different factors affect the survival of pathogens, including the physical condition of the water. These factors include, but are not limited to sunlight, temperature, salinity, and nutrient deficiencies. These factors vary depending on the environmental condition/circumstances of the water, and therefore it would be difficult to assert that the rate of decay caused by any given combination of these environmental

[3] EPA Memorandum 'Establishing TMDL "Daily" Loads in Light of the Decision by the U.S. Court of Appeals for the D.C. Circuit *in Friends of the Earth Inc. v. EPA, et al.*, No. 05-5015, (April 25, 2006) and implications for NPDES permits (November 15, 2006)

variables was sufficient enough to meet the WQS of 235 cfu/100 mL and 125 cfu/100ml. Thus, it is more conservative to apply the State's WQS in determining bacteria TMDLs, because this standard must be met at all times under all environmental conditions.

The U.S. EPA finds that the TMDL document submitted by IDEM contains an appropriate MOS satisfying the requirements of the sixth criterion.

## 7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variations. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1)).

**Comment:**
The LSCW bacteria (*E. coli*) TMDLs incorporated seasonal variation into the development of the TMDLs via the following methods:

***Bacteria (E. coli) TMDLs:*** Bacterial loads vary by season, typically reaching higher numbers in the dry summer months when low flows and bacterial growth rates contribute to their abundance, and reaching relatively lower values in colder months when bacterial growth rates attenuate and loading reduces as agricultural activity slows. Bacterial WQS need to be met during the recreational season (April 1st to October 31st), regardless of the flow condition. The development of the LDCs utilized flow measurements from a local USGS gage. These flow measurements were collected over a variety of flow conditions observed during the recreation season. LDCs developed from these flow records represented a range of flow conditions within the LSCW and thereby accounted for seasonal variability over the recreation season. TMDL loads were based on sampling that occurred during the recreational season in 2015-2016. Seasonal variability was accounted for by taking multiple samples per month during the recreational season.

Critical conditions for *E. coli* loading occur in the dry summer months. This is typically when stream flows are lowest, and bacterial growth rates can be high. The State of Indiana does not have an applicable full body contact *E. coli* water quality standard for the remainder of the calendar year (November 1 through March 31). By meeting the WQS during the summer recreation season, it can reasonably be assumed that the loading capacity values would be protective of water quality during the remainder of the calendar year (November through March).

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of the seventh criterion.

## 8. Reasonable Assurances

When a TMDL is developed for waters impaired by point sources only, the issuance of a NPDES permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL.

When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

EPA's August 1997 TMDL Guidance also directs Regions to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that LAs will be achieved, because such a showing is not required by current regulations.

**Comment:**

The LSCW TMDL provides a discussion of reasonable assurance in Section 7 of the final TMDL document. Many of the activities and actions identified in the implementation strategy will be applied to attain the loading capacities and allocations calculated for the impaired reaches within the LSCW. The recommendations made by IDEM will be successful at improving water quality if appropriate groups work to implement these recommendations. Those mitigation suggestions, which fall outside of regulatory authority, will require commitment from state agencies and local stakeholders to carry out the suggested actions.

IDEM has identified several local partners which have expressed interest in working to improve water quality within the LSCW. These partners are: the Jackson County Soil and Water Conservation District (SWCD), Lawrence County SWCD, Monroe County SWCD, the Nature Conservancy, U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS), the Indiana State Department of Agriculture (ISDA) and the Indiana Department of Natural Resource (IDNR).

The Lawrence County SWCD has received Clean Water Indiana (CWI) grants in the previous few years to implement cost share programming which targets the use of cover crops, pasture management and soil sampling/soil testing. Local stakeholders can apply for cost share funding and assistance from agricultural technicians employed by the SWCD to help develop a localized conservation plan, analysis of how the stakeholder is using their farmable lands and which conservation practices would be appropriate to employ on their property to reduce nonpoint sources of water pollution. In 2017, the Lawrence County SWCD received funding from a CWI grant to implement additional cost-share programming aimed at educating and working with stakeholders to use nutrient management systems to better manage manure application.

The Monroe County SWCD in partnership with the Monroe County Stormwater Utility Board has received funding from the Conservation Reserve Program (CRP), the Conservation Reserve Enhancement Program (CREP) and the Environmental Quality Incentives Program (EQIP) to provide opportunities for county residents to address soil and water concerns on their property via cost-share opportunities. The Monroe SWCD champions cropland practices (e.g., cover crops, comprehensive nutrient management, precision agricultural equipment modifications, no-till equipment modifications, etc.[4] The Monroe County SWCD also encourages interested members of the community to contact it to set up education and outreach events where members of the Monroe County SWCD can share educational materials, make presentations or host discussions with local stakeholders in the farming community.

Continued water quality monitoring within the basin is supported by IDEM. Additional water quality monitoring results will provide understanding of the success or failure of BMP systems designed to reduce bacteria loading into the surface waters of the watershed. Local watershed managers will be able to reflect on the progress or lack of progress of the various pollutant removal strategies and will have the opportunity to change course if observed progress is unsatisfactory.

Reasonable assurance that the WLA set forth will be implemented is provided by regulatory actions. According to 40 CFR 122.44(d)(1)(vii)(B), NPDES permit effluent limits must be consistent with assumptions and requirements of all WLAs in an approved TMDL.

Reasonable assurances that nonpoint source reductions will be achieved for bacteria (*E. coli*) are described in Section 7 of the TMDL. The LSCW TMDL implementation efforts will be achieved through federal, state and local action. Federal funding, via the Section 319 grants program, can provide money to implement voluntary nonpoint source programs within the watershed. IDEM indicated that the Lawrence, Monroe or Jackson County SWCD are likely to pursue Indiana Section 319 grant monies to develop a comprehensive WMP for the watershed in the near future. It is anticipated that the WMP will focus on developing and installing BMPs (e.g., cover crop usage, tillage management, wetland restoration, etc.), working with local partners to identify potential partners and sites for BMP demonstration projects, and education and outreach efforts.

Other state led efforts will be via NPDES permit enforcement, the IDEM Nonpoint Source program and various other land and water resource protection efforts sponsored by state agencies.

The U.S. EPA finds that this criterion has been adequately addressed.

## 9. Monitoring Plan to Track TMDL Effectiveness

EPA's 1991 document, *Guidance for Water Quality-Based Decisions: The TMDL Process* (EPA 440/4-91-001), recommends a monitoring plan to track the effectiveness of a TMDL, particularly when a TMDL involves both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur. Such a TMDL should provide assurances that nonpoint source controls will achieve expected load reductions and, such TMDL should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring and leading to attainment of water quality standards.

**Comment:**

IDEM completed a comprehensive biological, physical and chemical survey of streams within the LSCW in 2015-2016 as part of its basin monitoring schedule. Water quality data were collected at various locations within the LSCW and those assessments were utilized to develop the TMDLs in this

[4] Monroe County SWCD webpage, https://www.monroecoswcd.org/local-conservation-projects/ (last visited 7/25/18).

report. Water quality monitoring in the LSCW is anticipated to continue by voluntary monitoring efforts organized at the local level. Future monitoring in the LSCW will also occur on IDEM's nine-year rotating basin schedule or once TMDL implementation BMPs are incorporated in the watershed. The IDEM monitoring efforts are designed to assess water quality improvements with respect to bacteria (*E. coli*) concentrations. Monitoring will be adjusted as needed to assist in continued source identification and elimination and will also test the efficiency of pollution reduction strategies.

During the monitoring period, watershed managers will determine the appropriate monitoring cycle for the LSCW. The monitoring schedule will be adjusted, as needed, to improve source identification and source elimination efforts. IDEM will monitor whether bacteria (*E. coli*) targets are being achieved and adjust the LSCW BMP strategy accordingly to meet these water quality targets. When results indicate that the water body is meeting the appropriate WQS and targets, the water body will be removed from Indiana's List of Impaired Waters.

The U.S. EPA finds that this criterion has been adequately addressed.

## 10. Implementation

EPA policy encourages Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired by nonpoint sources. Regions may assist States/Tribes in developing implementation plans that include reasonable assurances that nonpoint source LAs established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. In addition, EPA policy recognizes that other relevant watershed management processes may be used in the TMDL process. EPA is not required to and does not approve TMDL implementation plans.

**Comment:**

The focus of implementation strategies will be the reduction of bacterial inputs to the surface waters in the LSCW. Local partners, such as the Jackson County SWCD and other county SWCD partners (i.e., Lawrence and Monroe) will bear the responsibility for assisting in the management of lands and waters within the LSCW. These partners will also be tasked with finding creative adaptive management strategies to meet changing water quality conditions within the watershed. Implementation strategies discussed in this TMDL focused on reducing bacterial inputs to surface waters in the LSCW. The main bacterial reduction strategies include:

***Bacteria (E. coli TMDLs):***

*Septic System Improvements:* Local septic management programs and educational opportunities can aid in the reduction of septic pollution. Educating the public on proper septic maintenance, finding and eliminating illicit discharges and repairing failing systems could lessen the impacts of septic derived bacterial inputs to the LSCW.

*Reducing Livestock Access to Stream Environments:* The installation of exclusion fencing near stream and river environments to prevent direct access for livestock, installing alternative water supplies, and installing stream crossings between pastures, would reduce the influxes of bacteria and improve water quality within the watershed.

*Manure Collection and Storage Practices:* Manure has been identified as a source of bacteria. Bacteria can be transported to surface water bodies via stormwater runoff. Bacteria laden water can also leach into groundwater resources. Improved strategies for the collection, storage and management of manure can minimize impacts of bacteria entering the surface and groundwater system. Repairing manure storage facilities or building roofs over manure storage areas may decrease the amount of bacteria in stormwater runoff.

*Riparian Area Management Practices:* Protection of streambanks within the watershed through planting of vegetated/buffer areas with grasses, legumes, shrubs or trees will mitigate bacteria inputs into surface waters. These areas will filter stormwater runoff before the runoff enters the main stem or tributaries of the LSCW.

*Agricultural Land Management Practices:* Runoff from cropland and pastures combined with the application of manure to fields in the late summer are a likely source of bacteria found in stormwater runoff from agricultural areas. Planting vegetation along riparian areas (riparian buffers) will aid to slow down water and allow it to filter through the vegetation before entering surface water environments.

*Public Education Efforts:* Public programs will be developed to provide guidance to the general public on bacteria reduction efforts and their impact on water quality. These educational efforts could also be used to inform the general public on what they can do to protect the overall health of the LSCW. Local watershed partners (e.g., the Jackson County SWCD, along with others) could assume additional responsibilities in communicating bacteria reduction strategies to stakeholders, via mailing annual newsletters or updating their website with bacteria reduction strategies.

The U.S. EPA finds that this criterion has been adequately addressed. The U.S. EPA reviews but does not approve implementation plans.

## 11. Public Participation

EPA policy is that there should be full and meaningful public participation in the TMDL development process. The TMDL regulations require that each State/Tribe must subject calculations to establish TMDLs to public review consistent with its own continuing planning process (40 C.F.R. §130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval should describe the State's/Tribe's public participation process, including a summary of significant comments and the State's/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. §130.7(d)(2)).

Provision of inadequate public participation may be a basis for disapproving a TMDL. If EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

**Comment:**
The public participation section of the TMDL submittal is found in Section 8 of the final TMDL document. Throughout the development of the LSCW TMDLs the public was given various opportunities to participate. TMDL kickoff meetings were held in November 2015 in Monroe County USDA Service Center in Bloomington, Indiana. The public was invited to submit any additional water quality data and information toward the development of the LSCW TMDL during the kickoff meetings in 2015. A draft TMDL meeting was held in Bedford, Indiana at the Purdue Extension Office on July 9, 2018. IDEM described the results of the draft TMDL. The public was invited to submit formal comments on the draft document and informed of the findings of the document.

IDEM posted the draft TMDL report online at (https://www.in.gov/idem/nps/3955.htm) for a public comment period. The 30-day public period was started on July 2, 2018 and ended on August 2, 2018. IDEM did not receive any public comments on the draft LSCW TMDL during the public comment period. IDEM submitted the final TMDL and submittal letter to the U.S. EPA on August 20, 2018.

The U.S. EPA finds that the TMDL document submitted by IDEM satisfies the requirements of this eleventh element.

## 12. Submittal Letter

A submittal letter should be included with the TMDL submittal, and should specify whether the TMDL is being submitted for a *technical review* or *final review and approval*. Each final TMDL submitted to EPA should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final review and approval, should contain such identifying information as the name and location of the water body, and the pollutant(s) of concern.

**Comment:**
The U.S. EPA received the final LSCW TMDL document, submittal letter and accompanying documentation from IDEM on August 20, 2018. The transmittal letter explicitly stated that the final TMDLs referenced in Table 1 of this Decision Document were being submitted to EPA pursuant to Section 303(d) of the Clean Water Act for EPA review and approval.

The letter clearly stated that this was a final TMDL submittal under Section 303(d) of CWA. The letter also contained the name of the watershed as it appears on Indiana's 303(d) list, and the causes/pollutants of concern. This TMDL was submitted per the requirements under Section 303(d) of the Clean Water Act and 40 CFR 130.

The U.S. EPA finds that the TMDL transmittal letter submitted for Lower Salt Creek Watershed by IDEM satisfies the requirements of this twelfth element.

## 13. Conclusion

After a full and complete review, the U.S. EPA finds that the TMDLs submitted for the Lower Salt Creek Watershed satisfy all the elements of approvable TMDLs. This approval is for **forty-three (43) bacteria TMDLs**. These **43 TMDLs** address impaired water bodies in five HUC-12 subwatersheds for recreational use impairments. Refer to Table 1 of this Decision Document for subwatershed and AUID details.

The U.S. EPA's approval of these TMDLs extend to the waterbodies which are identified within the LSCW, with the exception of any portions of the waterbodies that are within Indian Country, as defined in 18 U.S.C. Section 1151. The U.S. EPA is taking no action to approve or disapprove TMDLs for those waters at this time. The U.S. EPA, or eligible Indian Tribes, as appropriate, will retain responsibilities under the CWA Section 303(d) for those waters.