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

REPLY TO THE ATTENTION OF:
W-16J

September 9, 2022

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 completed its review of the final Total Maximum Daily Loads (TMDL) for segments within the Vernon Fork Muscatatuck River Watershed (VFMRW), including supporting documentation and follow up information. The VFMRW encompasses parts of Jackson and Jennings counties in southeastern Indiana. The TMDLs address recreational use impairments due to bacteria (*E. coli*) and aquatic life use impairments attributed to excessive phosphorus and sediment.

The VFMRW TMDLs meet the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations set forth at 40 C.F.R Part 130. Therefore, EPA approves Indiana's twenty-one (21) bacteria (*E. coli*), seven (7) phosphorus and three (3) sediment (total suspended sediment) TMDLs. EPA describes Indiana's compliance with the statutory and regulatory requirements in the enclosed decision document.

EPA acknowledges Indiana's efforts in submitting these TMDLs and looks forward to future TMDL submissions by the State of Indiana. If you have any questions, please contact Mr. Paul Proto, at 312-353-8657 or proto.paul@epa.gov.

Sincerely,

Digitally signed by Fong, Tera
Date: 2022.09.09 14:36:45 -05'00'

Tera L. Fong
Division Director, Water Division

TMDL: Vernon Fork Muscatatuck River Watershed in Jackson and Jennings Counties, Indiana
Date: September 9, 2022

DECISION DOCUMENT
FOR THE VERNON FORK MUSCATATUCK RIVER 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 Vernon Fork Muscatatuck River Watershed (VRMRW) (HUC-10, 05120207-07) is located in southeastern Indiana (Figure 1 of the final TMDL document) and encompasses approximately 212 square miles (mi^2) (approximately 136,000 acres) in parts of Jackson and Jennings. The watershed originates in Jennings County and flows southwest into Jackson County where the Muscatatuck River joins the East Fork of the White River south of Crothersville, Indiana.

Table 1 of this Decision Document identifies the Hydrologic Unit Code (HUC) twelve scale (HUC-12) subwatersheds in the VFMRW where Indiana has found impaired waters which are addressed by this TMDL. The Indiana Department of Environmental Management (IDEM) monitored the health of the stream environments in the VFMRW by collecting field data on the chemical, physical and habitat characteristics (e.g., sediment data) of individual stream reaches as well as aquatic biological community data in 2020-2021. IDEM reviewed water quality data for individual waters and made assessment determinations of which individual waterbodies were impaired according to water quality standard (WQS) and water quality target (WQT) values (Table 1 of this Decision Document).

Summing the individual impairments across the six HUC-12s yields, twenty-one (21) bacteria *(E. coli)* TMDLs, seven (7) total phosphorus (TP) TMDLs and three (3) total suspended solids (TSS) TMDLs. TMDL tables for all of these segments are found in the Attachments to this Decision Document. IDEM explained that those segments which exhibited impaired biology (i.e., impaired biotic communities (IBC)) were addressed via surrogate TP and/or TSS TMDLs. IDEM linked IBC impairments, observed in the VFMRW, to sediment inputs and explained that implementation efforts designed to mitigate sediment inputs to surface waters would likely result in improved habitat for fish and macroinvertebrate communities. Additionally, segments which exhibited dissolved oxygen (DO) impairments were addressed via surrogate TP and/or TSS TMDLs.

Table 1: Summary of Impairments in the Vernon Fork Muscatatuck River Watershed and TMDL Count

HUC-12	2022 AUID	Impaired Beneficial Use	TMDL
Indian Creek subwatershed (05120207-07-01)			
07-01	INW0771_02	Recreational Use	*E. coli*
	INW0771_03	Recreational Use	*E. coli*
	INW0771_04	Recreational Use	*E. coli*
	INW0771_T1006	Recreational Use	*E. coli*
Sixmile Creek subwatershed (05120207-07-02)			
07-02	INW0772_01A	Recreational Use	*E. coli*
	INW0772_01A	Aquatic Life Use - Impaired Biotic Communities & Dissolved Oxygen	*TP*
	INW0772_03	Recreational Use	*E. coli*
	INW0772_03	Aquatic Life Use - Impaired Biotic Communities	*TP*
	INW0772_04	Recreational Use	*E. coli*
	INW0772_05	Recreational Use	*E. coli*
	INW0772_06	Recreational Use	*E. coli*
Storm Creek subwatershed (05120207-07-03)			

07-03	INW0773_01	Recreational Use	*E. coli*
	INW0773_T1002	Recreational Use	*E. coli*
	INW0773_T1002	Aquatic Life Use - Impaired Biotic Communities & Dissolved Oxygen	*TP & TSS*
Mutton Creek subwatershed (05120207-07-04)			
07-04	INW0774_01	Recreational Use	*E. coli*
	INW0774_02	Recreational Use	*E. coli*
	INW0774_03	Recreational Use	*E. coli*
	INW0774_03	Aquatic Life Use - Dissolved Oxygen	*TP & TSS*
	INW0774_T1002	Recreational Use	*E. coli*
	INW0774_T1003	Recreational Use	*E. coli*
	INW0774_T1005	Recreational Use	*E. coli*
	INW0774_T1005	Aquatic Life Use - Impaired Biotic Communities	*TP & TSS*
Polly Branch subwatershed (05120207-07-05)			
07-05	INW0775_01	Recreational Use	*E. coli*
	INW0775_T1003	Recreational Use	*E. coli*
	INW0775_T1003	Aquatic Life Use - Impaired Biotic Communities	*TP*
Grassy Creek subwatershed (05120207-07-06)			
07-06	INW0776_T1009	Recreational Use	*E. coli*
	INW0776_T1019	Recreational Use	*E. coli*
	INW0776_T1019	Aquatic Life Use - Impaired Biotic Communities	*TP*

Land Use:

The VFMRW watershed encompasses approximately 136,000 acres (approximately 212 mi^2) in southeastern Indiana. Land use in the VFMRW is comprised of forested lands, agricultural lands, hay/pasture lands, developed lands, wetlands, open water and shrub and scrub lands. Land use coverages from National Agricultural Statistics Service (NASS) cropland data layer (2019) were used to characterize land use in the VFMRW (Table 2 of this Decision Document).

Table 2: Land use in the Vernon Fork Muscatatuck River Watershed

Land Use Category Description	Acreage	Square Miles	Distribution (% of the total area in the Vernon Fork Muscatatuck River Watershed)
Forested Land	54,127	84.57	39.82%
Agricultural Land	32,818	51.28	24.14%
Hay/Pasture	32,619	50.97	23.99%
Developed Land	11,917	18.62	8.77%
Wetlands	3,152	4.93	2.32%
Open Water	1,287	2.01	0.95%
Shrub/Scrub	24	0.04	0.02%
TOTAL	**135,944.00**	**212.41**	**100%**

Problem Identification:

Bacteria (E. coli) TMDLs: Bacteria exceedances can negatively impact recreational uses (i.e., 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. During the analyses of water quality data, the presence of *E. coli* confirms the presence of bacteria in that water quality sample.

Phosphorus TMDLs: While total phosphorus is an essential nutrient for aquatic life, elevated concentrations of TP can lead to nuisance algal blooms that negatively impact aquatic life and recreation (e.g., swimming, boating, fishing, etc.). Algal decomposition depletes dissolved oxygen levels within the water column which can stress benthic macroinvertebrates and fish. Excess algae can shade the water column which limits the distribution of aquatic vegetation. Aquatic vegetation stabilizes bottom sediments, and also is an important habitat for macroinvertebrates and fish. Further, depletion of dissolved oxygen can cause phosphorus release from bottom sediments (i.e., internal loading).

Degradations in aquatic habitats or water quality (e.g., low dissolved oxygen levels in the water column) can negatively impact aquatic life use. Increased turbidity, brought on by elevated levels of nutrients within the water column, can reduce dissolved oxygen in the water column, and cause large shifts in dissolved oxygen and pH throughout the day. Shifting chemical conditions within the water column may stress fish and macroinvertebrate species. In some instances, degradations in aquatic habitats or water quality have reduced fish populations or altered fish communities from those communities supporting sport fish species to communities which support more tolerant rough fish species.

TSS TMDLs: Excess siltation and flow alteration in streams may impact aquatic life by altering habitats. Excess sediment can fill pools, embed substrates, and reduce connectivity between different stream habitats. The result is a decline in habitat types that in healthy streams support diverse macroinvertebrate communities. Excess sediment can also reduce spawning and rearing habitats for certain fish species. In addition, excess suspended sediment can clog the gills of fish and thus reduce fish health. Flow alterations within the VFMRW due to drainage improvements on or near agricultural lands, have in some instances resulted in increased peak flows. Higher peak flows in stream environments, which typically occur during storm events, can carry increased sediment loads to streams and erode streambanks. Deposited fine sediments may embed substrates leading to habitat loss.

Priority Ranking:
The VFMRW 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 (e.g., the Jennings County Soil and Water Conservation District (SWCD)) to develop a Section 319 application and watershed management plan (WMP). The development and adoption of a localized WMP will lead to the implementation of best management practices (BMPs) and other mitigation strategies to improve water quality within the VFMRW.

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.

Aquatic Community Support: 327 IAC 2-1-3(a)(2)(A) states that all surface waters should be capable of supporting a well-balanced, warm water aquatic community. The pollutants of concern for aquatic life use impairment are excess TP (nutrients) and TSS (sediment).

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

National Pollutant Discharge Elimination System (NPDES) permit holders: NPDES permitted facilities may contribute pollutant loads (e.g., bacteria, nutrients and/or sediment) to surface waters through facility discharges of treated wastewater. Permitted facilities discharge wastewater according to their NPDES permit. IDEM identified several NPDES permit holders in the VFMRW (Table 3 of this Decision Document) which were assigned a portion of the wasteload allocation (WLA) for the bacteria, phosphorus or TSS TMDLs.

Table 3: Permitted NPDES dischargers in the Vernon Fork Muscatatuck River Watershed which received a portion of a WLA

Facility Name	Permit Number	Subwatershed / AUID	Receiving Stream	Estimated Design Flow (MGD)	Bacteria WLA	TP WLA	TSS WLA
					(cfu/day)	(lbs / day)	(lbs / day)
Crothersville WWTP	IN0022683	Grassy Creek (07-06)	Nehrt Ditch	0.47 (high flows) / 0.31 (low flows)	4.18E+09	3.92 (high flows) / 2.07 (low flows)	NA
HWRT Terminal Seymour LLC	ING340019	Mutton Creek (07-04)	Mutton Creek	0.07	NA	NA	27.03
Jennings Northwest Regional Utility WWTP	IN0056049	Sixmile Creek (07-02)	Sixmile Creek	0.35	3.13E+09	2.94	NA

Municipal Separate Storm Sewer Systems (MS4): Stormwater from MS4s can transport pollutants (e.g., bacteria, nutrients and/or sediment) to surface waterbodies during or shortly after storm events. IDEM identified one MS4 permittee in the VFMRW, the City of Seymour (INR040082) which was assigned a portion of the bacteria WLA (Table 5 of this Decision Document), a portion of the phosphorus WLA (Table 7 of this Decision Document) and a portion of the TSS WLA (Table 8 of this Decision Document).

Stormwater runoff from permitted construction and industrial areas: Construction sites and NPDES permitted industrial sites may contribute sediment to surface waters during stormwater runoff events. For certain subwatersheds, the VFMRW TSS TMDLs assumed that there would be sediment stormwater inputs from construction and industrial sites. Therefore, in select subwatersheds, IDEM calculated a WLA to be assigned to construction stormwater and/or industrial stormwater (Table 8 of this Decision Document). Construction areas in the VFMRW must comply with the requirements of IDEM's Stormwater Program. Industrial facilities which discharge wastewater to surface waters in the VFMRW must obtain an industrial wastewater permit which include effluent limitations.

Combined Sewer Overflows (CSOs) and Sanitary Sewer Overflows (SSOs): There is one CSO which IDEM recognized in the phosphorus TMDL for the Grassy Creek subwatershed (05120207-07-06). IDEM explained that the outfall for the CSO was assigned a WLA=0 because the CSO was covered by a Long Term Control Plan (LTCP) and the facility's NPDES permit (Town of Crothersville WWTP – IN0022683).

Concentrated Animal Feeding Operations (CAFOs): IDEM did not identify any CAFO facilities in the VFMRW.

Nonpoint Source Identification: The potential nonpoint sources to the VFMRW are:

Non-regulated urban runoff: Runoff from urban areas (urban, residential, commercial or industrial land uses) can contribute various pollutants (e.g., bacteria, TP and sediments) to local waterbodies. 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 are agricultural operations where animals are kept and raised in confined spaces. CFOs generate manure which may be spread onto fields. 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 CFOs within the VFMRW (Table 13 of the final TMDL document).

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of pollutants (e.g., bacteria, nutrients and/or sediments) which may lead to impairments in surface waters of the VFMRW. Manure and fertilizer spread onto fields is often a source of pollutants, and their export can be exacerbated by tile drainage lines, which channelize the stormwater flows and reduce the time available for bacteria to die-off. Sediment can be mobilized in a similar fashion to bacteria. Tile lined fields and channelized ditches enable particles to move more efficiently into surface waters.

Stream channelization and stream erosion: Eroding streambanks and channelization efforts may add TP and sediment to local surface waters. Eroding riparian areas may be linked to soil inputs within the water column and potentially to changes in flow patterns. Changes in flow patterns may also encourage down-cutting of the streambed and streambanks. Stream channelization efforts can increase the velocity of flow (via the removal of the sinuosity of a natural channel) and disturb the natural sedimentation processes of the streambed.

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

Septic systems: Failing septic systems are a potential source of bacteria and nutrients within the VFMRW. Septic systems generally do not discharge directly into a waterbody, 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.

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

Future Growth:
IDEM examined population growth in the VFMRW over the past two decades and found, in general, that the population in the VFMRW was slightly increasing (Section 2.6 of the final TMDL document). To account for this population growth, IDEM included an allocation for future growth (AFG) as part of its TMDL calculations (Tables 5, 7 and 8 of this Decision Document). The AFG was set at 5% of the loading capacity for each flow regime for the bacteria, TP and TSS TMDLs. As the population continues to grow in southeastern Indiana, IDEM believes that the AFG will provide additional protection for instream water quality. 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 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.

Comment:

Designated Uses:
The designated uses for waterbodies identified in the VFMRW TMDL are for total body contact recreation use and aquatic life use.

Recreational use: 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 and is 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.

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).]

Waterbodies are held to recreational use criteria during the time of the year when people are most likely to be engaged in activities such as swimming, wading or boating (April 1 through October 31). The recreational 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.

Bacteria *(E. coli)* TMDL target:
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. An EPA report, "*An Approach for Using Load Duration Curves in the Development of TMDLs*" (EPA 841-B-07-006, August 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 outlined in the 2007 EPA report 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 for the TMDL, both the monthly geometric mean and single sample maximum will be used to assess the extent of implementation by point and nonpoint sources.

Aquatic Life Use: 327 IAC 2-1-3(a)(2)(A) states that all surface waters, except as described in subdivision (5), will be capable of supporting a well-balanced, warm water aquatic community. Furthermore, at all times, all surface waters outside of mixing zones shall be free of substances in concentrations that on the basis of available scientific data are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants (327 IAC 2-1-6(a)(2)).

Phosphorus and TSS TMDL targets:
Currently IDEM has not developed numeric criteria for TP and TSS. For the VFMRW TP and TSS TMDLs, IDEM employed water quality targets for TP (**0.30 mg/L**) and TSS (**30.0 mg/L**) as endpoints for TMDL calculations (Table 4 of this Decision Document). Water quality target values were applied to improve water quality within waterbodies related to nutrient and sediment inputs, to improve DO

concentrations in the water column and to improve conditions to support well balanced aquatic communities. In several tributaries to VFMRW, DO and biological communities demonstrated conditions indicating that their respective water quality targets were not being met. Low DO is often the result of elevated nutrient levels (TP), while biological community deficiencies can be generally associated with higher sediment or nutrient concentrations. The basis for the TP and TSS targets is discussed in Section 2 of the final TMDL document.

The State of Indiana strives to achieve waters free from substances that, "contribute to the growth of nuisance plants or algae" within the water column. IDEM believes that exceedances of TP and/or TSS targets impact the overall health of biological communities and levels of DO within the water column. IDEM identified segments with low DO and areas with impaired biological communities during its water quality assessment activities in 2020-2021. IDEM indicated that the DO and IBC impaired areas were thought to be influenced by increased concentrations of TP and/or TSS.

Table 4: Water quality standards and targets* utilized within the VFMRW TMDLs

Parameter	Units	TMDL Targets
Numeric Water Quality Standards for addressing the Bacteria (*E. coli*) impaired segments within the VFMRW		
E. Coli [1]	# cfu / 100 mL	**235 single sample maximum**
		Geometric mean < 125 [2]
Numeric Water Quality Target [3] for addressing the Nutrient impaired segments within the VFMRW		
Total Phosphorus (TP)	mg/L	No value should be greater than **0.30 mg/L**
Numeric Water Quality Target [4] for addressing the Sediment impaired segments within the VFMRW		
Total Suspended Solids (TSS)	mg/L	No value should be greater than **30.0 mg/L**
Numeric Water Quality criteria and targets for addressing the Dissolved Oxygen and Biotic Community impaired segments within the VFMRW		
Dissolved Oxygen (DO)	mg/L	No value should be less than 4.0 mg/L [5]
Fish community Index of Biotic Integrity (IBI)	Score	Fully supporting IBI ≥ 36
Benthic aquatic macroinvertebrate community index (mIBI)	Score	Fully supporting mIBI ≥ 36

* = Section 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.
3 = IDEM anticipates that by meeting the TP target the water quality in the waterbody will be able to support a well-balanced aquatic community.
4 = IDEM anticipates that by meeting the TSS target the water quality in the waterbody will be able to support a well-balanced aquatic community.
5 = Indiana Administrative Code Title 327 Water Pollution Control Board. Article 2. Section 1-6(a)

The 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 VFMRW 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 and TSS. The LDC approach assigns loadings based on flow.

Bacteria (E. coli) TMDLs: For all *E. coli* TMDLs addressed by the VFMRW 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 and that by setting the bacteria TMDLs to meet the single sample maximum 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 VFMRW TMDLs are calculated to meet the WQS of 235 cfu/100 mL on any given day, across all flow conditions within the VFMRW.

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 C.F.R. §130.2). To establish the loading capacities for the VFMRW 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 C.F.R. §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 waterbody. If all sources meet the WQS at discharge, then the waterbody should meet the WQS and its designated use.

IDEM approached the VFMRW TMDLs by calculating loading capacity values for individual HUC-12 subwatersheds. The USGS operates a stream gaging station (USGS Gage #03369500, Vernon Fork, Muscatatuck River at Vernon, Indiana) in northeastern portion of the VFMRW (Figure 28 of the final TMDL document). IDEM used flow data from this location to calculate flow duration curves (FDC) for each of the subwatersheds within the VFMRW. The FDC were developed from flow frequency tables based on recorded and scaled flow volumes measured at the USGS gage #03369500. 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 #03369500 were employed to characterize the flows within the HUC-12 subwatersheds in the VFMRW. Daily stream flows were necessary to implement the load duration curve approach. These were estimated using the observed flows available at the USGS gage #03369500 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 (#03369500)
$A_{ungaged}$ = Drainage area of the ungaged location
A_{gaged} = Drainage area of the USGS gage location (#03369500)

In this procedure, the drainage area of each monitoring station (or impaired segment) was divided by the drainage area of USGS gage #03369500. The flows for each of the stations were then calculated by multiplying the USGS gage #03369500 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 VFMRW 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 VFMRW 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 VFMRW basin in 2020-2021 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. The individual sampling loads were plotted on the same figure with the LDC.

The LDC plots were subdivided into five flow regimes; *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 flow 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 plots with the individual sampling points with the calculated LDC to better 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 VFMRW contain multiple impaired segments which are upstream of the HUC-12 subwatershed outlet point. Instead of calculating individual loads for each upstream impaired reaches, 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 VFMRW with bacteria impairments. WLA were assigned to individual NPDES permitted facilities and MS4 communities 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 (e.g., 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 5 of this Decision Document (attached) reports five points (the midpoints of the designated flow regime) on the loading capacity curve. However, it should be understood that 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 waterbody. 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 5 of this Decision Document identifies the loading capacity for the waterbody at each flow regime. Although there are numeric loads for each flow regime, the LDC is what is being approved for this TMDL.

Table 5: Bacteria (*E. coli*) TMDLs for the Vernon Fork Muscatatuck River Watershed is attached

IDEM explained that, for most of the subwatersheds, measured bacteria concentrations exceed the bacteria WQS within the high, moist flow, mid-range flow and dry flow regimes (Table 46 of the final TMDL document). IDEM concluded that bacteria inputs to waters of the VFMRW 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 VFMRW.

Table 6 of the Decision Document discusses IDEM's estimates of loading reductions for each subwatershed in the VFMRW. These loading reductions were calculated from field sampling data collected in the VFMRW by IDEM in 2020-2021 (Section 5.2 of the final TMDL document). IDEM has communicated that the loading reductions in Table 6 of this Decision Document are a conservative estimate of load reductions needed to attain TMDL targets. IDEM further explained that it 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 VFMRW when the TMDLs are achieved.

Table 6: Estimated concentration reductions for the TMDLs in the Vernon Fork Muscatatuck River Watershed

HUC-12 Subwatershed	High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
	0 - 10 %	10 - 40 %	40 - 60 %	60 - 90 %	90 - 100 %
Bacteria TMDLs in the Vernon Fork Muscatatuck River Watershed					
Indian Creek (05120207-07-01)	94%	95%	21%	0%	0%
Sixmile Creek (05120207-07-02)	93%	83%	90%	92%	77%
Storm Creek (05120207-07-03)	95%	69%	76%	84%	94%
Mutton Creek (05120207-07-04)	95%	90%	93%	92%	92%
Polly Branch (05120207-07-05)	95%	95%	85%	82%	86%
Grassy Creek (05120207-07-06)	95%	73%	72%	68%	75%
Total Phosphorus TMDLs in the Vernon Fork Muscatatuck River Watershed					
Sixmile Creek (05120207-07-02)	--	0%	25%	11%	14%
Storm Creek (05120207-07-03)	57%	0%	0%	0%	0%
Mutton Creek (05120207-07-04)	60%	0%	0%	0%	0%
Polly Branch (05120207-07-05)	0%	57%	0%	0%	0%
Grassy Creek (05120207-07-06)	48%	67%	0%	86%	86%
Total Suspended Solids TMDLs in the Vernon Fork Muscatatuck River Watershed					

Storm Creek (05120207-07-03)	87%	0%	0%	0%	0%
Mutton Creek (05120207-07-04)	88%	0%	0%	0%	0%

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 VFMRW TMDLs. The methods used for determining the TMDL are consistent with EPA technical memos.[1]

Phosphorus and TSS TMDLs: TMDLs for TP and TSS were developed in a similar fashion to the bacteria TMDLs. IDEM used TP and TSS TMDLs as surrogate TMDLs for DO and IBC impaired segments in the VFMRW. The WQT of 0.3 mg/L was used to set the loading capacity of the TP TMDLs and the WQT of 30 mg/L was used to set the loading capacity of the TSS TMDLs. IDEM incorporated the LDC approach to calculate pollutant loadings for each of these parameters at the outlet points of subwatersheds (HUC-12 scale) within the VFMRW. Impaired reaches were assigned to their respective subwatershed based on the location of the reach within the VFMRW.

Subwatersheds in the VFMRW contain multiple impaired segments which are upstream of the HUC-12 subwatershed outlet point. Instead of calculating individual loads for each upstream impaired reaches, 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 TP or TSS impaired segments, IDEM employed a LDC based TMDL which determined TP or TSS loads for each of the five flow regimes of the LDC.

IDEM explained that consistency in both land use and nonpoint source contributions of TP or TSS 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 TP or TSS impaired HUC-12 subwatersheds.

The LDC plots were subdivided into five flow regimes; high flows, moist conditions, mid-range flows, dry conditions, and low flows. 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 WQT 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 WQT.

TMDLs were calculated for each subwatershed in the VFMRW. WLA were assigned to NPDES permitted facilities, MS4 communities and construction/industrial stormwater 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 (e.g., stormwater

[1] 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.

runoff from agricultural land use practices, failing septic systems, urban stormwater runoff etc.). Instead, load allocations were represented as one value for each TMDL. EPA is approving the load(s) expressed in the current TMDLs.

Table 7: Total Phosphorus (TP) TMDLs for the Vernon Fork Muscatatuck River Watershed is attached
&
Table 8: Total Suspended Solid (TSS) TMDLs for the Vernon Fork Muscatatuck River Watershed is attached

IDEM explained that, for most of the subwatersheds, measured TP and TSS concentration measurements exceed the water quality targets within the higher flow regimes. IDEM concluded that TP and/or TSS inputs to waters of the VFMRW likely occur across high flow conditions and implementation efforts should target those flow conditions to reduce nutrient and sediment contributions into the VFMRW.

Table 6 of the Decision Document discusses IDEM's estimates of TP and TSS loading reductions for subwatersheds in the VFMRW. These loading reductions were calculated from field sampling data collected in the VFMRW by IDEM in 2020-2021. IDEM has communicated that the loading reductions in Table 6 of this Decision Document are a conservative estimate of load reductions needed to attain TMDL targets. IDEM further explained that it 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 VFMRW when the TMDLs are achieved.

EPA concurs with the data analysis and LDC approach utilized by IDEM in its calculation of wasteload allocations, load allocations, the margin of safety and the future growth calculation for the VFMRW TMDLs. The methods used for determining the TMDL are consistent with EPA technical memos.[2]

The 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.

<u>Comment:</u>
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

[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.

(235 cfu/100 mL) and the WQT for TP (0.3 mg/L) and TSS (30 mg/L). The WQS and WQT were applicable across all flow conditions in the subwatershed (Tables 5, 7 and 8 of this Decision Document).

IDEM identified several nonpoint sources in this TMDL report. Loadings for the two pollutants were recognized as originating from many diverse nonpoint sources 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 (e.g., 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 VFMRW TMDL and WMPs developed for the VFMRW (see Section 6 of the final TMDL document) 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 2020-2021. 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, TP and TSS. EPA finds the IDEM's approach for calculating the LA to be reasonable.

The 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 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 NPDES permit holders in Table 3 of this Decision Document and Table 43 of the final TMDL document recognizes individual WLAs for NPDES wastewater facilities in the VFMRW. IDEM explained that WLAs were calculated based on the design flow or the estimated flow of the facility and the TMDL target (e.g., for bacteria: 235 cfu/100 mL, for TP – 0.3 mg/L and for TSS: 30 mg/L) or applicable permit load (Section 5.1 of the final TMDL document and Tables 5, 7 and 8 of this Decision Document).

IDEM expects each NPDES permitted facility to meet the targets assigned by the WLA across all flow conditions. EPA expects that IDEM permit writers will consult with R5 NPDES staff as needed to revise individual NPDES permits, based on the TP and/or TSS 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 C.F.R. § 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 by 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]

IDEM identified one MS4 community (i.e., the City of Seymour (INR040082)) in the VFMRW which received a portion of the WLA for the bacteria, phosphorus and TSS TMDLs for the Mutton Creek subwatershed (05120207-07-04). IDEM's WLA for the City of Seymour was based on an areal ratio calculation, the area of the MS4 community divided by the overall area of the Mutton Creek subwatershed. This value was then multiplied by the loading capacity, minus the summation of non-stormwater WLAs, MOS and AFG. MS4 were assigned a portion of the WLA in the very high and higher flow regimes. MS4 WLA were not assigned to the normal, lower flow or low regimes.

EPA's approval of the VFMRW TMDLs is confined to the WLAs in Tables 5, 7 and 8 of this Decision Document. EPA is not taking a position on IDEM's methodology for implementing these WLAs. EPA believes that WLAs, from approved TMDLs, will be applied to NPDES permits via the permitting process and that any revisions to permits addressed in the VFMRW TMDLs will need to be consistent with the approved WLAs. EPA notes that the NPDES permitting process will ultimately set the final conditions.

Construction stormwater contributions of the TSS TMDLs:
IDEM calculated construction stormwater contributions based on areal estimates of annual construction acreage in each of the VFMRW's subwatersheds (Table 32 of the final TMDL document). On a subwatershed basis, IDEM summed the areas covered under construction stormwater permits and developed a ratio of those areas to the overall subwatershed area. This ratio was then multiplied by the loading capacity, minus the summation of non-stormwater WLAs, MOS and AFG. This calculation approximated the WLA assigned to construction stormwater.

[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) (emphasis added).

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

The 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 VFMRW bacteria (*E. coli*), nutrient (TP) and sediment (TSS) TMDLs incorporated an explicit Margin of Safety (MOS) of 10% (Section 3.3 of the final TMDL document). The use of the LDC approach minimized variability associated with the development of the VFMRW 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 imperfect WQT. A 10% MOS was considered appropriate, because the target values used in this TMDL had a firm technical basis and the extrapolated daily flow estimates are believed to accurately represent actual flow conditions in the VFMRW.

The MOS for the VFMRW 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 VFMRW 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, January 2001), 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 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 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 VFMRW bacteria (*E. coli*), nutrient (TP) and sediment (TSS) 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 nearby 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 VFMRW and thereby accounted for seasonal variability over the recreation season. TMDL loads were based on sampling that occurred during the recreational season in 2020-2021. 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).

Phosphorus and TSS TMDLs: Nutrient and sediment inputs to waters in the VFMRW typically occur during wet weather events. Critical conditions that impact the response of surface waters in the VFMRW to nutrient and sediment inputs occur during periods of low flow. Nutrient and sediment inputs to surface waters typically occur primarily through wet weather events. Two significant land uses in the VFMRW are agricultural and pasture lands (Table 2 of this Decision Document). Nutrient and sediment loadings from agricultural and pasture lands will vary depending on the agricultural activities on site and the presence or absence of BMPs to minimize stormwater runoff from these areas.

Sediment loading to surface waters in the VFMRW varies depending on surface water flow, land cover and climate/season. Typically, in the VFMRW, sediment is being moved from terrestrial source locations into surface waters during or shortly after wet weather events. Spring is typically associated with large flows from snowmelt, the summer is associated with the growing season as well as periodic storm events and receding streamflows, and the fall brings increasing precipitation and rapidly changing agricultural landscapes.

Critical conditions that impact loading, or the rate that sediment is delivered to the waterbody, were identified as those periods where large precipitation events coincide with periods of minimal vegetative cover on fields. Large precipitation events and minimally covered land surfaces can lead to large runoff volumes, especially to those areas which drain agricultural fields. The conditions generally occur in the spring and early summer seasons.

Additionally, low flow periods can impact the water quality in waterbodies of the VFMRW. During low flow periods, TP and sediment can accumulate, there is less assimilative capacity within the waterbody, and generally TP and sediment are not transported through the waterbody at the same rate they are under normal flow conditions.

Increased algal growth during low flow periods can deplete dissolved oxygen within the water column. Critical conditions that impact loading, or the rate that nutrients are delivered to the waterbody, were identified as those periods where large precipitation events coincide with periods of minimal vegetative cover on fields. Large precipitation events and minimally covered land surfaces can lead to large runoff volumes, especially to those areas which drain agricultural fields. The conditions generally occur in the spring and early summer seasons.

The TP and TSS TMDLs account for varying loads and critical conditions by employing the LDC framework and the extrapolated daily flow estimates. The USGS flow gage measurements represented a range of flow conditions in the VFMRW and thereby accounted for seasonal variability over the entire calendar year.

The 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:

A discussion of reasonable assurance is provided in Section 6 of the final TMDL document. Many of the activities and actions identified in the TMDL and watershed management planning documents will be applied in TMDL subwatersheds in the VFMRW. The recommendations made by IDEM in the VFMRW TMDL and by outside groups (e.g., the Jennings and/or Jackson County SWCDs) in various watershed management planning documents will lead to improved 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 VFMRW. Some of these partners include: the Jennings County SWCD, the Jackson County SWCD, the US Department of Agriculture Natural Resources Conservation Service (USDA-NRCS), Indiana State Department of Agriculture, the Indiana Department of Natural Resources and local health departments.

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 C.F.R. §122.44(d)(1)(vii)(B), NPDES permit effluent limits must be consistent with assumptions and requirements of all WLAs in an approved TMDL. IDEM's stormwater program and NPDES permit program are the main implementing programs for ensuring WLA are consistent with the TMDL. Stormwater runoff associated with MS4 conveyances are regulated by 327 IAC 15-13-1 (Rule 13). Local stormwater efforts can also provide reasonable assurance that stormwater inputs are being targeted by local MS4 partners. Local cities and towns will need to work with IDEM's stormwater program to advance the goals outlined in post-TMDL implementation documents.

Examples of activities which provide reasonable assurance that nonpoint source reductions will be achieved for bacteria (*E. coli*), total phosphorus and sediment are described in Section 6 of the TMDL. The VFMRW 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 Jackson and/or Jennings County SWCDs were likely to pursue Indiana Section 319 grant monies to develop a comprehensive WMP for the VFMRW 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 Stormwater Program, the IDEM Nonpoint Source program and various other land and water resource protection efforts sponsored by state agencies.

The 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.

<u>Comment:</u>
IDEM completed a comprehensive biological, physical and chemical survey of streams within the VFMRW in 2020-2021 as part of its basin monitoring schedule. Water quality data were collected at various locations within the VFMRW, and those assessments were utilized to develop the TMDLs in this report. Water quality monitoring in the VFMRW is anticipated to continue by voluntary monitoring efforts organized at the local level. Future monitoring in the VFMRW 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*), nutrient and sediment concentrations. Monitoring will be adjusted as needed to assist in continued source identification and elimination and will also gage the efficiency of pollution reduction strategies.

During the monitoring period, watershed managers will determine the appropriate monitoring cycle for the VFMRW. The monitoring schedule will be adjusted, as needed, to improve source identification and source elimination efforts. IDEM will monitor whether bacteria (*E. coli*) criteria and nutrient and sediment targets are being achieved and adjust the VFMRW BMP strategy as needed to meet these WQS and targets. When results indicate that the waterbody is meeting the appropriate WQS and targets, the waterbody will be recategorized on Indiana's Integrated Report.

The 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 and sediment inputs to the surface waters in the VFMRW. Local partners, such as the Jackson and Jennings County SWCDs and other local partners will bear the responsibility for assisting in the management of lands and waters within the VFMRW. These partners will also be tasked with finding creative adaptive management strategies to meet changing water quality conditions within the watershed. The focus of all of the implementation strategies will be to reduce bacterial and sediment inputs to the surface waters in the VFMRW. The main bacterial and sediment 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 VFMRW.

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 waterbodies 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 VFMRW.

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.

Phosphorus 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 nutrient inputs to the VFMRW.

Urban/Residential Nutrient Reduction Strategies: These strategies involve reducing stormwater runoff from urban areas and single family residences within the VFMRW. These practices could include; rain gardens, lawn fertilizer reduction, planting buffer strips near waterbodies, vegetation management and replacement of failing septic systems. Water quality educational programs could also be utilized to inform the general public on nutrient reduction efforts and their impact on water quality.

Agricultural Reduction Strategies: These strategies involve reducing nutrient transport from fields and minimizing soil loss. Specific practices would include; planting buffer strips near streams and lakes, streambank stabilization practices (gully stabilization and installation of fencing near streams), wetland restoration, and nutrient management planning.

Improved Agricultural Drainage Practices: A review of local agricultural drainage networks should be completed to examine how improving drainage ditches and drainage channels could be reorganized to reduce the influx of nutrients to the surface waters in the VFMRW. The reorganization of the drainage network could include the installation of drainage ditches or sediment traps to encourage particle settling during high flow events. Additionally, cover cropping and residue management is recommended to reduce erosion and thus siltation and runoff into streams.

Public Education Efforts: Public programs will be developed to provide guidance to the general public on nutrient 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 VFMRW. Local watershed partners (ex. the Allen County SWCD, along with others) could assume additional responsibilities in communicating nutrient reduction strategies to stakeholders, via mailing annual newsletters or updating their website with nutrient reduction strategies.

<u>TSS TMDLs:</u>

Reducing stormwater peak flows within surface waterbodies in the VFMRW is the primary recommendation for reducing sediment loads in the watershed. Streamside buffering, particularly via wetland restoration or construction, is a recommended practice that would reduce both sediment and other related pollutant loads, and in some cases may help mitigate flow alteration by maximizing infiltration rates.

Urban-suburban Stormwater Mitigation Efforts: Reducing peak flow stormwater inputs within the VFMRW would aid in reducing erosion and streambank losses within the watershed. This practice may be accomplished via reducing impervious cover or employing other low impact development/green technologies which allow stormwater to infiltrate, evaporate or evapotranspire before reaching the stormwater conveyance system.

Identification of Stream and River Erosional Areas: An assessment of stream and river channel erosional areas should be completed to evaluate areas where erosion control strategies could be implemented in the VFMRW. Implementation actions (e.g., planting deep-rooted vegetation near waterbodies to stabilize streambanks) could be prioritized to target areas which are actively eroding. This strategy could prevent additional sediment inputs into surface waters of the VFMRW and minimize or eliminate degradation of habitat.

Improved Agricultural Drainage Practices: A review of local agricultural drainage networks should be completed to examine how improving drainage ditches and drainage channels could be reorganized to reduce the influx of sediments to the surface waters in the VFMRW. The reorganization of the drainage network could include the installation of drainage ditches or sediment traps to encourage particle settling during high flow events. Additionally, cover cropping and residue management is recommended to reduce erosion and thus siltation and runoff into streams.

Reducing Livestock Access to Stream Environments: Livestock managers should be encouraged to implement measures to protect riparian areas. Managers should install exclusion fencing near stream environments to prevent direct access to these areas by livestock. Additionally, installing alternative watering locations and stream crossings between pastures may aid in reducing sediments to surface waters.

The EPA finds that this criterion has been adequately addressed. The 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 7 of the final TMDL document. Throughout the development of the VFMRW TMDLs the public was given various opportunities to participate. A TMDL kickoff meeting was held virtually in October 2020 to introduce the project and to solicit public input. The public was invited to submit any additional water quality data and information toward the development of the VFMRW TMDL during the kickoff meeting in October 2020. IDEM and the Jennings County SWCD hosted a TMDL public outreach event in June 2021 in North Vernon, Indiana where IDEM explained what a TMDL is and how they collect water chemistry, fish and macroinvertebrate samples.

A public meeting was held in North Vernon, Indiana on July 14, 2022 where IDEM described the results of the draft TMDL (Section 7 of the final TMDL document). 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/resources/total-maximum-daily-load-reports/vernon-fork-muscatatuck-river/) for a public comment period. The 30-day public period was started on July 15, 2022 and ended on August 15, 2022.

IDEM did not receive any public comments on the draft VFMRW TMDL during the public comment period. IDEM submitted the final TMDL and submittal letter to the EPA on August 30, 2022.

The 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 waterbody, and the pollutant(s) of concern.

Comment:

The EPA received the final VFMRW TMDL document, submittal letter and accompanying documentation from IDEM on August 30, 2022. 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 C.F.R. Part130.

The EPA finds that the TMDL transmittal letter submitted for the Vernon Fork Muscatatuck River Watershed by IDEM satisfies the requirements of this twelfth element.

13. Conclusion

After a full and complete review, the EPA finds that the TMDLs submitted for the Vernon Fork Muscatatuck River Watershed satisfy all of the elements of approvable TMDLs. This approval is for **twenty-one (21) bacteria TMDLs, seven (7) TP TMDLs and three (3) TSS TMDLs**. These **thirty-one (31) TMDLs** address impaired waterbodies in six HUC-12 subwatersheds for recreational use and aquatic life use impairments. Refer to Table 1 of this Decision Document for subwatershed and AUID details.

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

ATTACHMENTS

Attachment #1: Table 5: Bacteria (*E. coli*) TMDLs for the Vernon Fork Muscatatuck River Watershed TMDL Report

Attachment #2: Table 7: Total phosphorus (TP) TMDLs for the Vernon Fork Muscatatuck River Watershed TMDL Report

Attachment #3: Table 8: Total suspended solids (TSS) TMDLs for the Vernon Fork Muscatatuck River Watershed TMDL Report

++

ATTACHMENT #1:

Table 5: Bacteria (*E. coli*) TMDLs for the Vernon Fork Muscatatuck River Watershed (IN)

Flow Regime TMDL analysis *E. coli* (cfu bacteria/day)	High Flows	Moist Flow Conditions	Mid-range Flows	Dry Flow Conditions	Low Flows
Duration Interval	0 - 10 %	10 - 40 %	40 - 60 %	60 - 90 %	90 - 100 %
Indian Creek subwatershed (05120207-07-01)					
4 segments: INW0771_02, INW0771_03, INW0771_04 & INW0771_T1006					
Bacteria TMDL (cfu bacteria/day)	**8.27E+12**	**1.62E+12**	**5.34E+11**	**1.38E+11**	**2.47E+10**
Wasteload Allocation (WLA): Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Load Allocation (LA)	9.12E+11	1.78E+11	5.89E+10	1.52E+10	2.72E+09
Upstream Drainage Input from Muscatatuck River	7.20E+12	1.41E+12	4.65E+11	1.20E+11	2.15E+10
Margin Of Safety (MOS) (10%)	1.07E+11	2.10E+10	6.92E+09	1.78E+09	3.20E+08
Future Growth (5%)	5.36E+10	1.05E+10	3.46E+09	8.92E+08	1.60E+08
Sixmile Creek subwatershed (05120207-07-02)					
5 segments: INW0772_01A, INW0772_03, INW0772_04, INW0772_05 & INW0772_06					
Bacteria TMDL (cfu bacteria/day)	**1.17E+12**	**2.53E+11**	**1.05E+11**	**5.02E+10**	**3.47E+10**
WLA - Jennings Northwest Regional Utility (IN0056049)	3.13E+09	3.13E+09	3.13E+09	3.13E+09	3.13E+09
Wasteload Allocation (WLA): Total	3.13E+09	3.13E+09	3.13E+09	3.13E+09	3.13E+09
Load Allocation (LA)	9.90E+11	2.12E+11	8.59E+10	3.95E+10	2.64E+10
Margin Of Safety (MOS) (10%)	1.17E+11	2.53E+10	1.05E+10	5.02E+09	3.47E+09
Future Growth (5%)	5.84E+10	1.27E+10	5.24E+09	2.51E+09	1.73E+09
Storm Creek subwatershed (05120207-07-03)					
2 segments: INW0773_01 & INW0773_T1002					
Bacteria TMDL (cfu bacteria/day)	**8.54E+11**	**1.67E+11**	**5.51E+10**	**1.42E+10**	**2.55E+09**
Wasteload Allocation (WLA): Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Load Allocation (LA)	7.26E+11	1.42E+11	4.69E+10	1.21E+10	2.16E+09

Margin Of Safety (MOS) (10%)	8.54E+10	1.67E+10	5.51E+09	1.42E+09	2.55E+08
Future Growth (5%)	4.27E+10	8.34E+09	2.76E+09	7.10E+08	1.27E+08
Mutton Creek subwatershed (05120207-07-04)					
6 segments: INW0774_01, INW0774_02, INW0774_03, INW0774_1002, INW0774_1003 & INW0774_T1005					
Bacteria TMDL (cfu bacteria/day)	**2.57E+12**	**5.03E+11**	**1.67E+11**	**4.34E+10**	**8.30E+09**
WLA - MS4: City of Seymour (INR040082)	9.16E+10	1.79E+10	0.00E+00	0.00E+00	0.00E+00
Wasteload Allocation (WLA): Total	9.16E+10	1.79E+10	0.00E+00	0.00E+00	0.00E+00
Load Allocation (LA)	1.37E+12	2.68E+11	9.47E+10	2.48E+10	4.89E+09
Upstream Drainage Input from Storm Creek (07-03) subwatershed	8.54E+11	1.67E+11	5.51E+10	1.42E+10	2.55E+09
Margin Of Safety (MOS) (10%)	1.72E+11	3.36E+10	1.11E+10	2.92E+09	5.76E+08
Future Growth (5%)	8.58E+10	1.68E+10	5.57E+09	1.46E+09	2.88E+08
Polly Branch subwatershed (05120207-07-05)					
2 segments: INW0775_01 & INW0775_T1003					
Bacteria TMDL (cfu bacteria/day)	**1.08E+13**	**2.13E+12**	**7.24E+11**	**2.10E+11**	**6.33E+10**
Wasteload Allocation (WLA): Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Load Allocation (LA)	1.13E+12	2.20E+11	7.28E+10	1.87E+10	3.36E+09
Upstream Drainage Input from Indian Creek (07-01) & Sixmile Creek (07-02) subwatersheds	9.44E+12	1.87E+12	6.39E+11	1.88E+11	5.94E+10
Margin Of Safety (MOS) (10%)	1.33E+11	2.59E+10	8.56E+09	2.21E+09	3.95E+08
Future Growth (5%)	6.63E+10	1.30E+10	4.28E+09	1.10E+09	1.98E+08
Grassy Creek subwatershed (05120207-07-06)					
2 segments: INW0776_T1009 & INW0776_T1019					
Bacteria TMDL (cfu bacteria/day)	**1.52E+13**	**2.99E+12**	**1.01E+12**	**2.88E+11**	**8.12E+10**
WLA - Town of Crothersville WWTP (IN0022683)	4.18E+09	4.18E+09	4.18E+09	4.18E+09	4.18E+09
Wasteload Allocation (WLA): Total	4.18E+09	4.18E+09	4.18E+09	4.18E+09	4.18E+09
Load Allocation (LA)	1.54E+12	3.01E+11	9.91E+10	2.51E+10	3.89E+09
Upstream Drainage Input from Mutton Creek (07-04) & Polly Branch (07-05) subwatersheds	1.33E+13	2.63E+12	8.91E+11	2.53E+11	7.16E+10
Margin Of Safety (MOS) (10%)	1.82E+11	3.59E+10	1.21E+10	3.44E+09	9.60E+08
Future Growth (5%)	9.11E+10	1.80E+10	6.07E+09	1.72E+09	4.80E+08

ATTACHMENT #2:

Table 7: Total Phosphorus (TP) TMDLs for the Vernon Fork Muscatatuck River Watershed (IN)

Flow Regime TMDL analysis TP (lbs/day)	High Flows	Moist Flow Conditions	Mid-range Flows	Dry Flow Conditions	Low Flows
Duration Interval	0 - 10 %	10 - 40 %	40 - 60 %	60 - 90 %	90 - 100 %
Sixmile Creek subwatershed (05120207-07-02)					
2 segments: INW0772_01A & INW0772_03					
TP TMDL (lbs/day)	**328.89**	**71.32**	**29.47**	**14.13**	**9.76**
WLA - Jennings Northwest Regional Utility (IN0056049)	2.94	2.94	2.94	2.94	2.94
Wasteload Allocation (WLA): Total	2.94	2.94	2.94	2.94	2.94
Load Allocation (LA)	276.62	57.68	22.11	9.07	5.36
Margin Of Safety (MOS) (10%)	32.89	7.13	2.95	1.41	0.98
Future Growth (5%)	16.44	3.57	1.47	0.71	0.49
Storm Creek subwatershed (05120207-07-03)					
1 segment: INW0773_T1002					
TP TMDL (lbs/day)	**240.37**	**46.94**	**15.51**	**4.00**	**0.72**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	204.31	39.90	13.19	3.40	0.61
Margin Of Safety (MOS) (10%)	24.04	4.69	1.55	0.40	0.07
Future Growth (5%)	12.02	2.35	0.78	0.20	0.04
Mutton Creek subwatershed (05120207-07-04)					
2 segments: INW0774_03 & INW0774_T1005					
TP TMDL (lbs/day)	**723.55**	**141.45**	**46.87**	**12.20**	**2.34**
WLA - MS4: City of Seymour (INR040082)	25.78	5.04	0.00	0.00	0.00
Wasteload Allocation (WLA): Total	25.78	5.04	0.00	0.00	0.00
Load Allocation (LA)	384.93	75.29	26.65	6.98	1.38
Upstream Drainage Input from Storm Creek (07-03) subwatershed	240.37	46.94	15.51	4.00	0.72
Margin Of Safety (MOS) (10%)	48.32	9.45	3.14	0.82	0.16
Future Growth (5%)	24.16	4.73	1.57	0.41	0.08
Polly Branch subwatershed (05120207-07-05)					
1 segment: INW0775_T1003					
TP TMDL (lbs/day)	**3,030.55**	**598.93**	**203.84**	**59.03**	**17.82**
Wasteload Allocation (WLA): Total	0.00	0.00	0.00	0.00	0.00
Load Allocation (LA)	317.35	61.98	20.48	5.27	0.95
Upstream Drainage Input from Indian Creek (07-01) & Sixmile Creek (07-02) subwatersheds	2,657.19	526.02	179.75	52.83	16.71
Margin Of Safety (MOS) (10%)	37.32	7.29	2.41	0.62	0.11
Future Growth (5%)	18.67	3.65	1.20	0.31	0.06

Grassy Creek subwatershed (05120207-07-06)					
1 segment: INW0776_T1019					
TP TMDL (lbs/day)	**4,266.78**	**841.45**	**284.90**	**80.91**	**22.86**
WLA - Town of Crothersville WWTP (IN0022683)	3.92	3.92	3.92	3.92	2.07**
Outfall 002 (CSO)	0*	0*	0*	0*	0*
Wasteload Allocation (WLA): Total	3.92	3.92	3.92	3.92	2.07
Load Allocation (LA)	431.86	81.99	25.14	4.30	0.23
Upstream Drainage Input from Mutton Creek (07-04) & Polly Branch (07-05) subwatersheds	3,754.10	740.38	250.71	71.24	20.16
Margin Of Safety (MOS) (10%)	51.27	10.11	3.42	0.97	0.27
Future Growth (5%)	25.63	5.05	1.71	0.48	0.14

* = CSO discharge WLAs for the Town of Crothersville WWTP (IN0022683) were set to 0. IDEM explained that CSO WLAs will be implemented by the Long-Term Control Plan (LTCP) and the NPDES Permit. IDEM stated that the TMDL does not alter the ongoing activities and efforts of the existing LTCP.

** = Allocation is based upon an analysis of reported TP discharges from similar facilities with phosphorus treatment and using the 2021 average reported flow of 0.31 MGD for the Town of Crothersville WWTP, which IDEM determined was representative of discharge during low flow conditions.

ATTACHMENT #3:

Table 8: Total Suspended Solid (TSS) TMDLs for the Vernon Fork Muscatatuck River Watershed (IN)

Flow Regime TMDL analysis TSS (lbs/day)	High Flows	Moist Flow Conditions	Mid-range Flows	Dry Flow Conditions	Low Flows
Duration Interval	0 - 10 %	10 - 40 %	40 - 60 %	60 - 90 %	90 - 100 %
Storm Creek subwatershed (05120207-07-03)					
1 segment: INW0773_T1002					
TSS TMDL (lbs/day)	**24,036.76**	**4,694.16**	**1,551.40**	**399.50**	**71.65**
Industrial Stormwater	7.47	1.46	0.00	0.00	0.00
Wasteload Allocation (WLA): Total	7.47	1.46	0.00	0.00	0.00
Load Allocation (LA)	2,0423.78	3,988.58	1,318.69	339.58	60.91
Margin Of Safety (MOS) (10%)	2,403.68	469.42	155.14	39.95	7.17
Future Growth (5%)	1,201.84	234.71	77.57	19.98	3.58
Mutton Creek subwatershed (05120207-07-04)					
2 segments: INW0774_03 & INW0774_T1005					
TSS TMDL (lbs/day)	**72,355.47**	**14,144.86**	**4,686.89**	**1,220.31**	**233.66**
WLA - HWRT Terminal Seymour LLC (IN340019)	27.03	27.03	27.03	27.03	27.03
WLA - MS4: City of Seymour (INR040082)	2,576.15	502.51	0.00	0.00	0.00
Construction Stormwater	331.95	64.75	0.00	0.00	0.00
Industrial Stormwater	181.06	35.32	0.00	0.00	0.00
Wasteload Allocation (WLA): Total	3116.19	629.61	27.03	27.03	27.03
Load Allocation (LA)	37,954.70	7,403.49	2,638.13	670.65	110.67
Upstream Drainage Input from Storm Creek (07-03) subwatershed	24,036.76	4,694.16	1,551.40	399.50	71.65
Margin Of Safety (MOS) (10%)	4,831.87	945.07	313.55	82.08	16.20
Future Growth (5%)	2,415.94	472.54	156.77	41.04	8.10