TMDL: Lake Manitou Phosphorus TMDL in portions of Fulton and Miami Counties in northern Indiana
Date: July 2, 2025

DECISION DOCUMENT FOR THE LAKE MANITOU TMDL IN NORTHERN 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 Total Maximum Daily Loads (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. The guidelines provided under each heading in this decision document are an attempt to summarize and provide information regarding currently effective statutory and regulatory requirements relating to TMDLs, but are not a substitute for statutory requirements or EPA's regulations.

1. Identification of Water body, Pollutant of Concern, Pollutant Sources, and Priority Ranking

The TMDL submittal should identify the water body as it appears on the State's/Tribe's 303(d) list. The water body 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 water body 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 water body. 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 water body 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.

EPA Review of the Lake Manitou TMDL:

Location Description/Spatial Extent:

Lake Manitou (INB06P1016_00) is located in northern Indiana in portions of Fulton and Miami counties (Figure 1 of the final TMDL document). Lake Manitou is in the Lake Manitou-Mill Creek (LMMC) Hydrologic Unit Code (HUC) twelve scale (HUC-12) subwatershed (05120106-05-00). The Indiana Department of Environmental Management (IDEM) identified the boundaries of the watershed that contributes flow to Lake Manitou in Figure 3 of the final TMDL document. The contributing watershed to Lake Manitou is approx. 44.31 square miles (approx. 28,362 acres) and includes two fourteen-digit HUC subwatersheds, Rain Creek (05120106-05-00-20) and Robbin Taylor Ditch (05120106-05-00-10) (Figure 3 of the final TMDL document). Surface water in the contributing watershed generally flows from the southeast to the northwest. The Lake Manitou outlet is in the northwestern corner of the lake where Lake Manitou empties into Mill Creek (Figure 3 of the final TMDL document). Mill Creek flows into the Tippecanoe River northwest of Rochester, Indiana. The Tippecanoe River flows westward where it eventually joins the Wabash River.

Indiana identified Lake Manitou as being impaired due to excessive phosphorus on its 2024 Clean Water Act Section 303(d) Impaired Waters List. Lake Manitou's impaired water quality condition negatively impacted its designated use for full body contact recreational use-aesthetics. Indiana's Lake Manitou (INB06P1016_00) phosphorus TMDL will address this impaired condition.

Land Use:

The Lake Manitou Watershed (LMW) encompasses approximately 28,362 acres (approximately 44.31 mi^2) in northern Indiana. Land use in the LMW is comprised of agricultural lands, forested lands, hay/pasture lands, developed lands, wetlands, open water, and shrub and scrub lands. IDEM employed land use coverages from the National Agricultural Statistics Service (NASS) cropland data layer (2024) to characterize land use in the LMW (Table 1 of this Decision Document).

Table 1: Land use in the Lake Manitou Watershed

Land Use Category Description	Acreage	Square Miles	Distribution (% of the total area in the Lake Manitou Watershed)
Agricultural Land	17,093	27	60%
Forested Land	3,916	6	14%
Hay/Pasture	3,221	5	11%
Developed Land	2,119	3	7%
Wetlands	1,098	2	4%
Open Water	908	1	3%
Shrub/Scrub	8	0	< 1%
TOTAL	**28,363**	**44**	**100%**

Problem Identification:

Phosphorus TMDL: While total phosphorus (TP) 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.

Priority Ranking:
The Lake Manitou TMDL was prioritized to be completed based on local interest in addressing water quality deficiencies within the lake, IDEM's interest in conducting baseline water quality monitoring for local planning, and the willingness of local partners (e.g., the Fulton 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 Lake Manitou.

Pollutants of Concern:
Recreational Use: The pollutant of concern for total body contact recreational use impairment is total phosphorus.

Source Identification (point and nonpoint sources):
Point Source Identification: The potential point sources to Lake Manitou are:

National Pollutant Discharge Elimination System (NPDES) permit holders: IDEM acknowledges that there are no NPDES permitted facilities currently discharging to Lake Manitou or present in the subwatersheds that contribute to Lake Manitou (pp. viii and 15 of the final TMDL document).

Concentrated Animal Feeding Operations (CAFOs): IDEM explained that there are no CAFO facilities currently discharging to Lake Manitou our present in the subwatersheds that contribute to Lake Manitou (p. 23 of the final TMDL document).

Nonpoint Source Identification: The potential nonpoint sources to Lake Manitou are:

Non-regulated urban runoff: Runoff from urban areas (urban, residential, commercial, or industrial land uses) can contribute various pollutants (e.g., nutrients and/or sediments) to local waterbodies. Stormwater from urban areas, which drain impervious surfaces, may introduce pollutants to surface waters. Potential urban sources of nutrients 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 seven permitted CFOs within the Lake Manitou watershed (Table 11 of the final TMDL document).

Stormwater runoff from agricultural land use practices: Runoff from agricultural lands may contain significant amounts of pollutants (e.g., nutrients and/or sediments) which may lead to impairments in Lake Manitou and to the surface waters (i.e., the tributaries) that contribute to Lake Manitou. 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. 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 nutrients 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 nutrients 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 nutrient counts and may contribute to downstream impairments. Smaller animal facilities may add 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 nutrients to Lake Manitou and to the subwatersheds that contribute to Lake Manitou. 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 nutrients to Lake Manitou and to the subwatersheds that contribute to Lake Manitou.

Future Growth:
IDEM examined population growth in the LMW over the past two decades and found, in general, that the population in the LMW has remained relatively unchanged (Section 2.7 of the final TMDL document). To account for any future changes in population in the LMW, IDEM included an allocation for future growth (AFG) as part of its TMDL calculations (Table 2 of this Decision Document). IDEM believes that the AFG will provide additional protection for in-lake water quality. The wasteload allocation (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 this first element.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the water body, 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 (DO) criteria). In such cases, the TMDL submittal should explain the linkage between the pollutant of concern and the chosen numeric water quality target.

EPA Review of the Lake Manitou TMDL:
Designated Uses:
The designated use recognized for the Lake Manitou phosphorus TMDL is total body contact recreation use and aesthetics.

Recreational use: IDEM explained that it strives to achieve waters free from substances that, "contribute to the growth of nuisance plants or algae" within the water column.

Indiana Administrative Code 327 IAC 2-1-6(a) has the following narrative criteria that apply to all waters of the state:

"*All surface waters at all times and at all places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:*

(a)re in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to create a nuisance, be unsightly, or otherwise impair the designated uses. [327 IAC 2-1-6. Sec. 6. (a) (1)(D)]"

The protection of recreational uses in lakes from adverse effects of high nutrients and eutrophic conditions is accomplished by translating an Indiana's narrative to total phosphorus and chlorophyll-a (chl-*a*) numeric targets (Sections 1.1.1 and 1.2 of the final TMDL document).

Phosphorus TMDL target: Indiana's narrative standard was translated to a TP target for the Lake Manitou phosphorus TMDL:

- Total phosphorus at or below 51 µg/L (based on chl-*a* and TP concentrations observed in reservoirs); and
- Chlorophyll-a at or below 25 µg/L (i.e., 2 to 25 µg/L).

The preservation of recreational uses is especially important during the summer months when people are most likely to be engaged in activities such as swimming, wading, or boating (typically June 1 to August 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. The total phosphorus and chl-*a* targets must each be met during the recreational season to meet IDEM's water quality benchmarks for lakes and reservoirs and are applied year-round for the purposes of the Lake Manitou phosphorus TMDL (Section 1.2.1 of the final TMDL document).

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

3. Loading Capacity - Linking Water Quality and Pollutant Sources

A TMDL must identify the loading capacity of a water body 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)). 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.

EPA Review of the Lake Manitou TMDL:
IDEM used the U.S. Army Corps of Engineers (USACE) BATHTUB model to calculate the loading capacity for the Lake Manitou phosphorus TMDL. IDEM stated that it believes that BATHTUB is a suitable model to predict the cause-and effect relationship between nutrient loading and lake water quality response (Section 3.2 of the final TMDL document). Therefore, the BATHTUB model was utilized to link observed

phosphorus water quality conditions and estimated phosphorus loads to in-lake water quality estimates. BATHTUB is a steady-state annual or seasonal model that predicts a lake's recreational season (June 1 to August 31) average surface water quality. BATHTUB utilizes annual or seasonal time-scales which are appropriate because watershed TP loads are normally impacted by seasonal conditions.

BATHTUB has built-in statistical calculations which account for data variability and provide a means for estimating confidence in model predictions. BATHTUB employs a mass-balance TP model that accounts for water and TP inputs from tributaries, direct watershed runoff, the atmosphere, and sources internal to the lake, and outputs through the lake outlet, water loss via evaporation, and TP sedimentation and retention in the lake sediments. BATHTUB provides flexibility to tailor model inputs to specific lake morphometry, watershed characteristics and watershed inputs. The BATHTUB model also allows IDEM to assess different impacts of changes in nutrient loading. BATHTUB allows the user the choice of several different mass-balance TP models for estimating loading capacity.

IDEM acknowledged that there are no USGS flow gauging stations or suitable surrogate USGS flow gages in nearby watersheds to the LMW. IDEM used information from the Spreadsheet Tool for Estimating Pollutant Loads (STEPL) to estimate flow and pollutant loadings to Lake Manitou (Section 3.1 and Appendix B of the final TMDL document). STEPL nonpoint source estimates were derived from STEPL default databases that incorporate precipitation data, default runoff nutrient concentrations for various land use types, default groundwater nutrient concentrations and default soil erosion parameters for both the Rain Creek and Robbin Taylor Ditch HUC-14 subwatersheds. IDEM also provided estimates of loading from different land uses in the LMW in Table 24 of the final TMDL document.

The BATHTUB model calculated the loading capacity for Lake Manitou. The loading capacity is the maximum phosphorus load which Lake Manitou can receive over an annual period and still meet the water quality target values of TP less than 51 µg/L and chl-*a* equal to or less than 25 µg/L. Loading capacities on the annual scale (pounds per year (lbs/year)) were calculated to meet the water quality targets during the recreational season (June 1 through August 31). The time period of June to August was chosen by IDEM as the recreational season because it corresponds to the months that the general public would typically use Lake Manitou for aquatic recreation and is the time of the year when water quality is likely to be impaired by excessive nutrient loading. Loading capacities were divided by 365 to calculate the daily loading capacities.

IDEM described its consideration of nonpoint phosphorus contributions of atmospheric deposition and internal loading in its BATHTUB model development and concluded that both of these sources should be set to 0 lbs/day of phosphorus (Section 3.2.3 of the final TMDL document). IDEM subdivided the loading capacity among the WLA, LA, margin of safety (MOS) and an allocation for future growth (AFG) (Table 2 of this Decision Document). These calculations were based on the critical condition, the summer recreational season, which is typically when the water quality in Lake Manitou is typically degraded and phosphorus loading inputs are the greatest. TMDL allocations assigned during this critical period (i.e., climatic and nutrient loading conditions that can cause the rapid growth of nuisance algae) are calculated to be protective of the remainder of the calendar year (September through May).

Table 2: Total Phosphorus (TP) TMDL for Lake Manitou (INB06P1016_00)

Total Phosphorus TMDL	Annual	Daily
	(lbs / yr)	*(lbs / day)*
Wasteload Allocation (WLA): Total	0.00	0.00
Load Allocation (LA)	11520.0	31.6
Margin Of Safety (MOS) (10%)	1355.3	3.7
Future Growth (5%)	677.6	1.9
Loading Capacity	13552.90	37.10
Current Conditions (TP Loading)	22588.2	61.9
Percent Reduction	40%	

Table 2 of this Decision Document communicate IDEM's estimates of the reduction required for Lake Manitou to meet its water quality targets. This loading reduction (i.e., the percentage reduction column) was estimated from existing and TMDL load calculations. IDEM expects that this reduction of current TP loading conditions will result in the attainment of the water quality target and the Lake Manitou's water quality will return to a level where the designated use is no longer considered impaired.

The EPA concurs with the data analysis and BATHTUB modeling approach utilized by IDEM in its calculation of wasteload allocations (WLA), load allocations (LA), the margin of safety (MOS) and the allocation for future growth (AFG) calculations for the Lake Manitou TMDL.

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

4. Load Allocations (LA)

The 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.

EPA Review of the Lake Manitou TMDL:
A load allocation value for nonpoint source contributions to the LMW was determined via the TMDL development/modeling process, along with the calculations for the load assigned to the WLA, the MOS and AFG. IDEM determined the load allocation calculations for Lake Manitou phosphorus TMDL based on the water quality target values of TP less than 51 µg/L and chl-*a* equal to or less than 25 µg/L (Table 2 of this Decision Document).

IDEM identified several nonpoint sources in this TMDL report (Section 1 of this Decision Document). IDEM recognized that nonpoint source contributions of phosphorus originated from diverse nonpoint sources including; non-regulated urban stormwater runoff, contributions from land applied manure from CFOs, stormwater runoff from agricultural land use practices, livestock with access to stream

areas, stream channelization and stream erosion, failing septic systems, 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. IDEM combined the nonpoint source estimates from the Rain Creek and Robbin Taylor Ditch HUC-14 subwatersheds into a singular nonpoint source estimate (Section 3.1.2 of the final TMDL document).

The implementation strategies outlined by IDEM in the Lake Manitou phosphorus TMDL and subsequent nonpoint source management efforts (e.g., watershed implementation plans developed for LMW or Fulton and/or Miami counties) 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 2011, 2013, 2014, 2015 and 2020. 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 nutrients to the LMW. The 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 this fourth element.

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.

EPA Review of the Lake Manitou TMDL:
IDEM did not identify any point sources discharging phosphorus into the LMW. IDEM explained that there are no NPDES permit holders in the LMW (pp. viii and 15 of the final TMDL document) and no CAFO facilities in the LMW (p. 23 of the final TMDL document).

The 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 this fifth element.

6. Margin of Safety (MOS)

The Clean Water Act, § 303(d)(1)(c), and 40 C.F.R. 130.7 (c)(1) require that a TMDL include a margin of safety (MOS) "which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." 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. The MOS may include both explicit and implicit components.

EPA Review of the Lake Manitou TMDL:
IDEM explained that the Lake Manitou nutrient (TP) TMDL incorporated both implicit and explicit Margin of Safety considerations in its development of the Lake Manitou phosphorus TMDL (Section 3.3 of the final TMDL document). Implicit MOS considerations included deploying conservative assumptions such as: utilizing a three-month summer averaging period to calculate annual phosphorus loading. IDEM set the explicit MOS at 10% of the loading capacity (Table 2 of this Decision Document) based on:

- Uncertainties in the calibration of the modeling inputs to BATHTUB;
- Uncertainties in the default values of STEPL that were used to estimate flow and extrapolated flow estimates from ungaged tributaries in the LMW;
- Assumptions made in estimating internal loading and atmospheric depositional nonpoint source contributions to Lake Manitou;
- Limitations within the BATHTUB model for capturing sediment removal processes in certain tributaries (e.g., Graham Ditch Dam); and
- The limited amount of water quality data collected in the LMW and within the contributing tributaries to Lake Manitou over the modeling time period (i.e., basing modeling assumptions on water quality monitoring with low sample sizes).

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

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)).

EPA Review of the Lake Manitou TMDL:
Seasonal variation was considered in the development of the Lake Manitou phosphorus TMDL via the use of water quality target values of TP less than 51 µg/L and chl-*a* equal to or less than 25 µg/L. Loading capacities on the annual scale (lbs/year) were calculated to meet the water quality targets during the recreational season (June 1 through August 31). The time period of June to August was chosen by IDEM as the recreational season because it corresponds to the months that the general public would typically use Lake Manitou for aquatic recreation. Also, these summer months are the time of the calendar year when waters in Lake Manitou are exposed to excessive nutrient loading, from spring and summer precipitation events, warmer in-lake temperatures and longer days with increased sun exposure. These conditions can lead to algal growth in water column and impair recreation in Lake Manitou. IDEM acknowledged that cyanobacteria blooms are seasonal, typically occurring in the summer months (Section 1.2.1 of the final TMDL document).

Phosphorus loading to surface waters in the LMW varies depending on surface water flow, land cover and climate/season. Typically, in the LMW, phosphorus 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 recreational season as well as periodic storm events and receding streamflows. The fall brings increasing precipitation and rapidly changing agricultural landscapes.

Critical conditions that impact loading, or the rate that phosphorus 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.

The TP and chl-*a* water quality target values are set at concentrations where meeting these water quality target values will ensure that recreational uses are met during all seasons/conditions, even those seasons/conditions outside of the recreation season (i.e., September through May).

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

8. Reasonable Assurance

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 Review of the Lake Manitou TMDL:
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 the Rain Creek and Robbin Taylor Ditch HUC-14 subwatersheds in the LMW. The recommendations made by IDEM in the LMW TMDL and by outside groups (e.g., the Fulton County SWCD) 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 LMW. Some of these partners include: the Fulton County SWCD, the Miami County SWCD, the U.S. Department of Agriculture Natural Resources Conservation Service (USDA-NRCS), Indiana State Department of Agriculture (ISDA), the Indiana Department of Natural Resources (IDNR) and local health departments.

Examples of activities which provide reasonable assurance that nonpoint source reductions will be achieved for phosphorus are described in Section 6 of the TMDL. The LMW 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 Fulton County SWCD was likely to pursue Indiana Section 319 grant monies to develop and install 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 (Section 6.3.3 of the final TMDL document).

Federal programming that could be deployed to the LMW to mitigate nonpoint source contributions of phosphorus include:

- *Clean Water Act (CWA) Section 319 Grants:* States receive grant money that supports state and local nonpoint source mitigation efforts. Activities supported via Section 319 include: technical and financial assistance, education, training, technology transfer, demonstration projects and monitoring to assess the status of nonpoint source implementation efforts.
- *USDA Farm Service Administration (FSA) Conservation Reserve Program (CRP):* CRP is a program which provides funding to producers that remove environmentally sensitive land from agricultural production areas and install conservation practices (e.g., riparian buffers, wetlands, etc.). The goals of the CRP are to improve water quality, prevent soil erosion and reduce loss of wildlife habitat.
- *USDA-FSA Conservation Reserve Enhancement Program (CREP):* The USDA-FSA's CREP is a component of the USDA-FSA's CRP and designed to address conservation activities on agricultural lands in specific geographic ares, such as the LMW. These incentives encourage landowners to enroll new acres or maintain existing acres in conservation practices (e.g., filter strips, saturated buffers, wetlands and wooded riparian buffers).
- *USDA-NRCS Environmental Quality Incentive Program (EQIP):* EQIP provides technical and financial assistance to producers for practices aimed at improving agricultural operations and natural resource conservation. Conservation practices under EQIP target reducing phosphorus inputs (e.g., via the use of variable rate fertilization and/or subsurface placement of fertilizers), reducing erosion (e.g., via the use of cover crops) and water quantity management efforts (e.g., via drainage water management).

Additional federal programming (e.g., USDA-NRCS Conservation Stewardship Program (CSP), etc.) is summarized in Section 6.3.1 of the final TMDL document.

State programming that could be deployed to the LMW to mitigate nonpoint source contributions of phosphorus include:

- *ISDA Clean Water Indiana (CWI) Program:* Indiana's CWI Program provides financial and technical assistance, education, training and cost-share to farmers/landowners, as well as local conservation partners, for implementation projects that target nonpoint source contributions.

- *ISDA's Infield Advantage Program:* A resource for Indiana farmers/landowners for conducting on-farm research, deploy innovative management approaches and ultimately encourage participants to make more informed decisions and improve efficiency. Farmers can use a variety of available tools, e.g., precision agricultural tools (aerial imagery), soil tests and analytical methods to enhance their productivity and target water quality improvement opportunities.
- *IDNR's Lake and River Enhancement (LARE) Program:* The LARE program provides technical and financial resources to local farmers/landowners and local partners for nutrient and sediment implementation efforts.
- *IDEM's Hoosier Riverwatch Programming:* Hoosier Riverwatch works with volunteers and partnering organizations to educate local community members on the connectivity between land use and water quality. Hoosier Riverwatch hosts: outreach and educational events, training events and water quality monitoring events.

Additional state programming opportunities (e.g., Indiana State Revolving Fund Loan Programs, etc.) are summarized in Section 6.3.2 of the final TMDL document.

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.

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

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.

EPA Review of the Lake Manitou TMDL:
Sampling in Lake Manitou was completed through collaboration with Indiana's Clean Lakes Program in 2011, 2013, 2014, 2015 and 2020. Water quality data were collected at various locations within the LMW, and that data informed the BATHTUB modeling efforts of this report. Water quality monitoring in the LMW is anticipated to continue by voluntary monitoring efforts organized at the local level (e.g., Hoosier Riverwatch). Future monitoring in the LMW 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 phosphorus concentrations. Monitoring will be adjusted as needed to assist in continued source identification and elimination and will also measure the efficiency of pollution reduction strategies.

During the monitoring period, watershed managers will determine the appropriate monitoring cycle for the Lake Manitou watershed. The monitoring schedule will be adjusted, as needed, to improve source identification and source elimination efforts. IDEM will monitor whether nutrient targets are being achieved and adjust the Lake Manitou implementation strategy as needed to meet this WQS and/or target. When results indicate that the waterbody is meeting its water quality targets, the waterbody will be recategorized on Indiana's Integrated Report.

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

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.

EPA Review of the Lake Manitou TMDL:
The focus of implementation strategies will be the reduction of phosphorus inputs to the surface waters in the adjacent and upstream subwatersheds of Lake Manitou. Local partners, such as the Fulton and Miami County SWCDs and other local partners will bear the responsibility for assisting in the management of lands and waters within the Lake Manitou watershed. These partners will also be tasked with finding creative adaptive management strategies to meet changing water quality conditions within the watershed. The main nutrient reduction strategies include:

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 Lake Manitou and its contributing watershed.

Urban/Residential Nutrient Reduction Strategies: These strategies involve reducing stormwater runoff from urban areas and single-family residences within the Lake Manitou and its contributing watershed. 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.

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 nutrients and improve water quality within the watershed.

Manure Collection and Storage Practices: Manure has been identified as a source of nutrients. Nutrients can be transported to surface waterbodies via stormwater runoff. Nutrient laden water can also leach into groundwater resources. Improved strategies for the collection, storage and management of manure can minimize impacts of nutrients entering the surface and groundwater system. Repairing manure storage facilities or building roofs over manure storage areas may decrease the amount of nutrients 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 nutrient inputs into surface waters. These areas will filter stormwater runoff before the runoff enters the main stem or tributaries to Lake Manitou and its contributing watershed.

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 nutrients 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.

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 Lake Manitou watershed. 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.

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 Lake Manitou watershed. 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 nutrient inputs into surface waters of the Lake Manitou watershed.

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 Lake Manitou watershed. Local watershed partners (e.g., the Fulton 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.

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.

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.

EPA Review of the Lake Manitou TMDL:
The public participation section of the TMDL submittal is found in Section 7 of the final TMDL document. Throughout the development of the Lake Manitou TMDL IDEM held a series of outreach and public engagement activities in the watershed. A TMDL kickoff meeting was held in Rochester, Indiana on October 23, 2017, 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 Lake Manitou TMDL during the kickoff meeting as well as in subsequent meetings with local stakeholders.

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/lake-manitou/) for a public comment period. The 30-day public period was started on May 9, 2025, and ended on June 9, 2025.

IDEM did not receive any public comments on the draft Lake Manitou TMDL during the public comment period. IDEM submitted the final TMDL and submittal letter to the EPA on June 16, 2025.

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 water body, and the pollutant(s) of concern.

EPA Review of the Lake Manitou TMDL:
The EPA received the final Lake Manitou TMDL document, submittal letter and accompanying documentation from IDEM on June 16, 2025. The transmittal letter explicitly stated that the final TMDL referenced in Table 1 of this Decision Document was being submitted to the 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. Part 130.

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

13. Conclusion

After a full and complete review, the EPA finds that the one (1) total phosphorus TMDL for Lake Manitou satisfies all elements of an approvable TMDL. This TMDL approval is for **one TMDL**, addressing segments for recreational use impairments (Table 1 of this Decision Document).

The EPA's approval of this TMDL extends to the waterbody which is identified above with the exception of any portions of the waterbody that are within Indian Country, as defined in 18 U.S.C. Section 1151, and as further discussed in our Decision Document. 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.