Appendix N

Northeast Lakeshore TMDL

Total Maximum Daily Loads for Total Phosphorus and Total Suspended Solids

Response to Comments on Draft TMDL Report and

Edits to Draft TMDL Report and Allocations

Appendix N:

This appendix provides a summary of the comments received by the Wisconsin Department of Natural Resources (department) during the comment period for the draft of the Northeast Lakeshore Total Maximum Daily Loads (TMDL) which ran from January 31, 2023, through March 3, 2023, and a summary of edits made to the TMDL report and associated allocations.

Summary of Edits to TMDL Report and Allocations:

1. Unit Conversion for Bemis Plant D and Cedar Valley Cheese. The allocations were labeled as pounds/year; however, the actual allocation numbers reflected kg/year. This was corrected.
2. U.S. EPA's submitted grammatical edits and suggested text edits – see comment 32.
3. Addition of report section discussing climate change considerations.
4. Additional text added to reasonable assurance section including text covering implementation planning and water quality monitoring.
5. Additional section added to Appendix M (Edge-of-Field Targets and SnapPlus Analysis), Section 2.2: Special Consideration for Dissolved Reactive Phosphorus in Subsurface Flow.
6. Additional text added to Sections 4.1.1 and 5.5 to improve the clarity of the description of the implicit margin of safety.
7. Update of edge-of-field targets in Appendix M to reflect SnapPlus version 20.

Summary of Comments and Responses:

Comments are followed by a response and have been grouped by category. All but one of the comments received were submitted by and jointly signed by the Environmental Law and Policy Center (ELPC), Alliance for the Great Lakes (AGL), and Midwest Environmental Advocates (MEA). The last comment, number 32, includes editorial comments form U.S. EPA.

The submitted comments included a list of citations. The citations are listed at the back of this document.

The Draft TMDL fails to allocate dissolved reactive phosphorus (DRP) loads, which undermines the likely success and legal sufficiency of this TMDL.

1) It is well-established that dissolved reactive phosphorus (DRP) drives harmful algal blooms,[1] but the TMDL does not provide an allocation for DRP, and instead relies solely on the existing numeric total phosphorus (TP) limits for its allocations. *See* Draft TMDL at 21, 23. This calls the TMDL's effectiveness and legal sufficiency, especially with respect to implementation, into question.

Response: Wisconsin does not have promulgated numeric criteria for DRP. Section NR 102.06, Wis. Adm. Code, identifies the water quality criteria for total phosphorus (TP) that shall be met in surface waters. Per s. NR 212.73(3), Wis. Adm. Code, TMDLs shall be established to ensure attainment of *applicable numeric and narrative criteria for the pollutant of concern. The pollutant of concern identified for impaired waters in the NE Lakeshore study is TP. The department lacks the authority to set TMDL allocations for DRP without first adopting numeric water quality criteria for DRP.*

The effectiveness of the TMDL is not diminished (see response to item 2 below) and legally the department lacks the authority to set allocations based on DRP.

2) Setting TP load allocations alone will not achieve the necessary DRP load reductions needed to curb the harmful algal growth that this TMDL is supposed to reduce. It is well understood that TP is a poor proxy for DRP, which is 100% bioavailable for uptake, while particulate phosphorus (the other component of TP) is 25-50% bioavailable.[2]

Response: The department disagrees that TP is a poor proxy for DRP. There is a strong correlation between average TP and DRP for wadable streams in Wisconsin as shown by a Pearson's correlation coefficient (R) of 0.90 across sites.[1] For non-wadable rivers, the correlation between TP and DRP produced an R of 0.89.[2] Both of these R values show that a significant and positive correlation exists between TP and DRP.

Specifically, within the NE Lakeshore TMDL study area, three monitoring sites with long-term records show strong correlations between TP and DRP when calculated across individual sampling events. The table below shows the correlation coefficient (R) for each of these three sites along with the number of sampling events (n).

Station Location	***n***	***R***
Kewaunee River near Kewaunee, WI	*249*	*0.929*
Manitowoc River at Manitowoc, WI	*600*	*0.756*
Sheboygan River at Sheboygan, WI	*542*	*0.78*

Wisconsin's EPA-approved statewide water quality phosphorus criteria are for TP, as established and defined in s. NR 102.06, Wis. Adm. Code. U.S. EPA released guidance for states and tribes both in 2000 and in 2021 that recommended use of TP for development of water quality criteria. TP is the most used measure of phosphorus in state water quality criteria. Phosphorus criteria are expressed in terms of TP for two main reasons. First, the dissolved form of phosphorus changes in the environment, depending on several factors. For example, iron-bound phosphorus may be released as bioavailable phosphorus in the absence of oxygen. And second, the statistical relationship between TP and chlorophyll-α (a proxy for algal biomass) is stronger than the relationship between dissolved orthophosphate (PO_4, typically a large fraction of bioavailable P) and chlorophyll-α. This is often because PO_4 is rapidly used by growing algae and is therefore not present in high concentrations in filtered water samples. Additionally, bioassay procedures to directly quantify bioavailable phosphorus can be prohibitively expensive and time consuming, and the benefit of this sample *analysis to the department does not outweigh the cost. Since the TP/chlorophyll-α relationship is the strongest of assessed alternatives, TP is the best surrogate among practical options.*

1. *Dale M. Robertson, David J. Graczyk, Paul J. Garrison, Lizhu Wang, Gina LaLiberte, and Roger Bannerman, 2006, Nutrient Concentrations and Their Relations to the Biotic Integrity of Wadeable Streams in Wisconsin, U.S. Geological Survey Professional Paper 1722.* https://pubs.usgs.gov/pp/pp1722/pdf/PP_1722.pdf

2. Dale M. Robertson, Brian M. Weigel, and David J. Graczyk, 2008, Nutrient Concentrations and Their Relations to the Biotic Integrity of Nonwadeable Rivers in Wisconsin, U.S. Geological Survey Professional Paper 1754. https://pubs.usgs.gov/pp/1754/

3) In Lake Erie, for example, it has been demonstrated that decreases in TP do not necessarily equate to similar decreases (or any decreases at all) in DRP.[3] In fact, practices that reduce losses of attached phosphorus (and thus TP)—particularly, no-till—do not reduce DRP losses and can actually make them worse.[4]

Response: The soils and agricultural systems that dominate the Lake Erie basin differ from those in the NE Lakeshore. The department has concluded that the literature supplied by ELPC et al. are specific to the Lake Erie basin, and therefore not necessarily applicable to the NE Lakeshore. Many studies also examine the impact of management practices, such as no-till, alone and without the necessary supporting management practices which can skew the results.

The relationship between tillage, soil characteristics, and phosphorus dynamics is complex, and certainly deserves attention when formulating a nutrient management plan. It is unlikely that no-till alone is responsible for the observed increases in DRP in the Lake Erie basin. Typically, a suite of management practices needs to be deployed to properly address agricultural runoff instead of adoption of just one management practice such as no-till. For example, without a supporting nutrient management plan, no-till can result in an increase in DRP concentrations through a build-up of phosphorus at the soil surface. Countering this, under a system that employees no-till and cover crops, DRP concentrations may increase; however, the total runoff volume is typically reduced resulting in a net lower overall DRP load. The department agrees that efforts should be taken to reduce TP with considerations given to the resulting DRP losses, and additional text has been added to Appendix M Section 2.2 to address this concern.

Wisconsin's nutrient management software, SnapPlus (https://snapplus.wisc.edu/), accounts for both TP and DRP losses from a field under various management scenarios. This allows producers to evaluate the combined impacts of nutrient management, the timing and application methods of manure, and tillage systems (including no-till) on phosphorus losses allowing for an optimized approach that reduces both TP and DRP.

SnapPlus provides producers and local conservation staff the flexibility to optimize management scenarios within the context of the landscape that is being cultivated. Prescribing specific *agricultural practices in the TMDL limits the capacity for watershed managers to evolve with improving practices in the future, inhibits local buy-in of the TMDL, and potentially results in unintended consequences when watershed-scale analysis of BMPs do not account for local landscape knowledge.*

4) In other words, it is entirely possible that TP targets could be met without any corresponding improvement in water quality because DRP loads remain too high. Because the Draft TMDL is intended to decrease the eutrophication and nuisance algae growth that are driven by DRP, the Draft TMDL must account for DRP, not TP alone.[5] Otherwise U.S. EPA will not be able to determine whether the TMDL "has been established at a level necessary to implement water quality standards" (33 U.S.C. § 1313(d)(1)(C)). WDNR should focus on DRP as the TMDL implementation plan is developed and executed in order to provide greater overall water quality protection and improvement.

   Response: DRP reductions are particularly important where reductions are needed to improve water quality in lakes and larger rivers where biological activity complicates nutrient chemistry more than in smaller, higher-gradient streams. The department agrees that DRP plays a potentially more important role than TP in reducing algae blooms in Lake Erie but disagrees that those observations are transferrable to the NE Lakeshore study area (see item 2 above). The NE Lakeshore TMDL is written to meet water quality criteria in tributaries *to Lake Michigan and not Lake Michigan itself.*

   An additional section has been included in Appendix M (Edge-of-Field Targets and SnapPlus Analysis, Section 2.2, Special Consideration for Dissolved Reactive Phosphorus in Subsurface Flow) that encourages special consideration of DRP when assessing edge-of-field P loss.

5) We encourage WDNR to incorporate DRP, not just TP, into the TMDL's allocations and implementation planning, and prioritize control of sources with a high soluble phosphorus fraction. For example, winter waste spreading should be prohibited entirely in the TMDL region given the link between DRP and this practice. Similarly, tillage and other nutrient management practices—particularly on tile drained fields, per Comment 2 below—should be carefully studied, and the implementation plan should reflect the most up-to-date scientific findings on the relationship between in-field practices and DRP loss.

   Response: See comment 1 above regarding the department's authority to incorporate DRP into the TMDL.

   The implementation plan can be adjusted to reflect updated scientific findings regarding the interactions between various agricultural management practices and DRP; however, TMDLs lack the authority to create new regulations or requirements such as prohibitions on winter spreading of manure. Modifications to existing state statutes and administrative code requires legislative action and concurrence.

Wisconsin's nutrient management software, SnapPlus (https://snapplus.wisc.edu/) estimates both TP and DRP losses from an agricultural field under various management scenarios. This allows producers to evaluate the combined impacts of nutrient management, the timing and application methods of manure, and tillage systems (including no-till) on phosphorus losses. This will give producers and local conservation staff the flexibility to optimize their approach in a way that fits the local landscape context, and simultaneously reduces both TP and DRP.

Neither the Draft TMDL nor Appendix F adequately account for pollution from tile drainage.

Response: Comments 6 through 9 pertain to tile drainage and reference the Maumee Basin. Studies and references pertaining to the Maumee Basin tile drainage systems are not necessarily transferrable to the NE Lakeshore. The density of tile drainage in the Maumee Basin is much greater than that of the NE Lakeshore (see Figure 1 below). The soils and agricultural systems of the Maumee Basin are also very different than those in the NE Lakeshore study area.

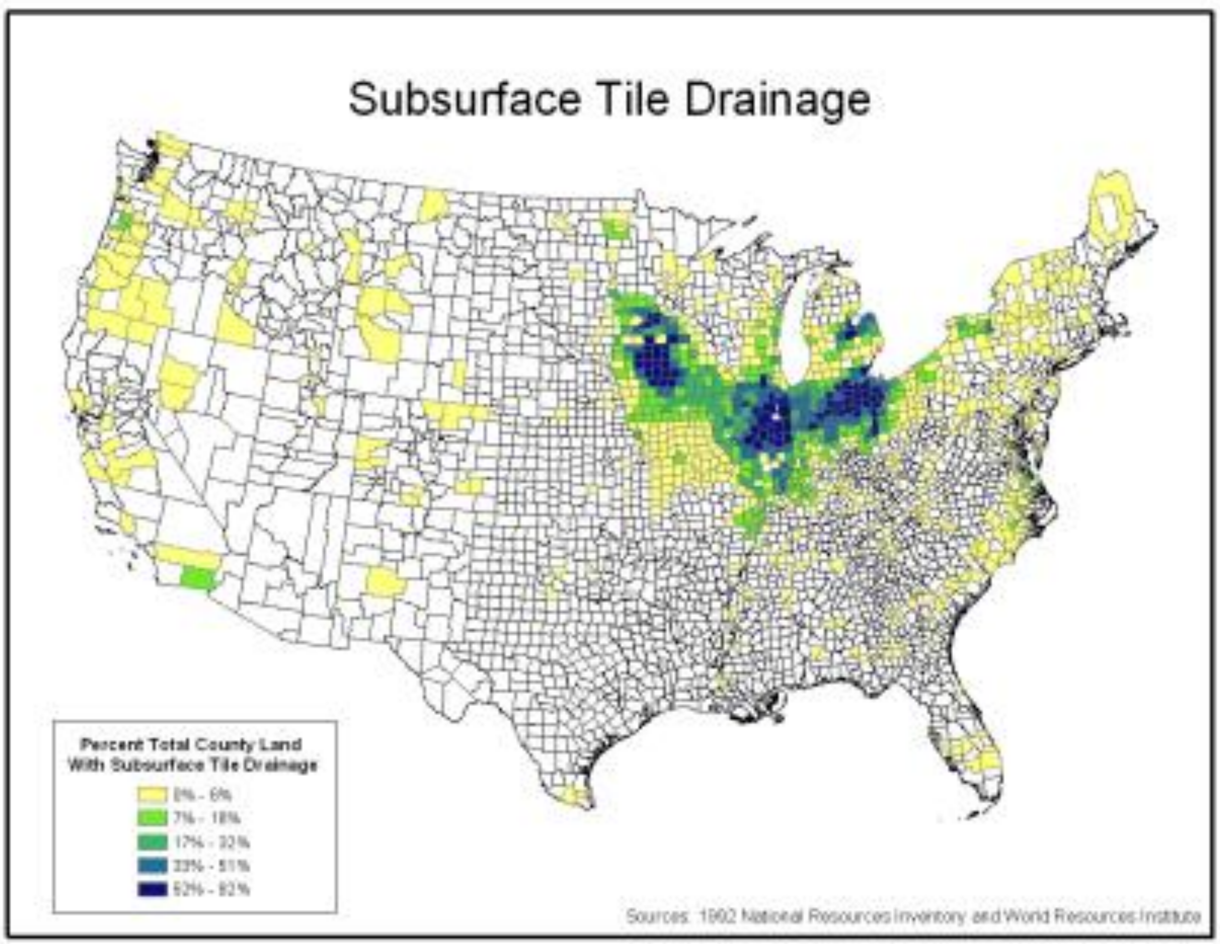


Figure 1 Density of subsurface tile drainage in the conterminous U.S.[1]

The figure is pulled from a study[1] that also notes that both Michigan and Wisconsin have a lower percentage of cropland with subsurface drainage than Iowa, Illinois, Ohio, and Indiana. Due to this and the additional reasons described in responses to comments 6 through 9 below, instead of focusing on subsurface drainage the department concentrated its efforts on accurately characterizing crop rotations, tillage systems, soil phosphorus concentrations and synthetic fertilizer and manure applications.

1. *Suggs, Zachary. 2007. Assessing U.S. Farm Drainage: Can GIS Lead to Better Estimates of Subsurface Drainage Extent?; World Resource Institute. http://pdf.wri.org/assessing_farm_drainage.pdf*

6) We are pleased that the Draft TMDL recognizes that "transport of dissolved phosphorus in subsurface agricultural runoff can be accelerated on fields with tile drainage systems, which act as a conduit between subsurface water and adjacent drainage channels." (Draft TMDL at 48). Appendix F further acknowledges that tile drainage is "practiced in six of the eight counties in the NEL basin." (Appendix F at 19). Wisconsin's current Nutrient Management Standard (WI Code 590) also recognizes the risks posed by tile drainage, providing heightened requirements for manure application on land where subsurface drainage is present. See, e.g., WI Code 590 at Sections IV(A)(1)(n), IV(A)(3)(b), V(O). Notwithstanding all this, however, WDNR decided to exclude tile drainage from the SWAT model. (See Appendix F at 19). The exclusion of this potentially significant transport system for P and TSS from the TMDL's modeling will make it impossible for U.S. EPA to determine whether the TMDL "has been established at a level necessary to implement water quality standards" 33 U.S.C. 1313(d)(1)(C).

   Response: The SWAT model lacks the capacity to adequately simulate TP and DRP transport through tile drains. This is well described in the draft SWAT model report for the Maumee River TMDL (Appendix 2, Section 2.0[1]):

   > *A significant weakness of the SWAT 2012 code is that it does not accurately represent transport of DRP from the soil surface and soil matrix into tile drains. Transport from the soil surface can occur both via leaching through the soil matrix and by drainage of ponded water on the surface especially via soil macropores that connect to tile drains. Williams et al. (2016) showed that no-till agriculture tended to increase DRP loss through tile drains, while incorporating surface-applied phosphorus fertilizers reduces loss, suggesting that communication via macropores may be the dominant process. Radcliffe et al. (2015) provided a review of models to predict phosphorus losses in drained fields, including SWAT and the related APEX model, and found the performance of all models to be lacking, because they did not fully account for the transport of dissolved phosphorus in pooled water on the land surface to tile drains via macropores. Lu et al. (2015) presents an extension to SWAT 2012 called DrainP, developed in Denmark. This version was modified to predict DRP in multiple soil layers with improved, but still not impressive representation of*

DRP in tile flow. They also note that lack of a proper macropore routine appears to be a significant problem.

Due to the insufficiency of accurate routines in the SWAT model to simulate tile drains, and the lack of information on the precise location, depth, and size of tiles (all of which can lead to confounding behavior in terms of phosphorus loss[2]), the department chose not to simulate tile drainage in the SWAT model.

The department disagrees that it will be impossible for U.S. EPA to "determine whether the TMDL has been established at a level necessary to implement water quality standards'". The TMDL is calculated correctly when background/natural loading, reserve capacity, the margin of safety, and the allocation, all sum to the assimilative loading capacity that is set to meet water quality criteria. In other words, the assimilative loading capacity is not a function of the baseline load (where tile drains would be simulated). For calculating TMDL allocations, the primary purpose of the SWAT model is to accurately estimate streamflow and background/natural loading. Simulation of tile drains would only be useful for calibrating the SWAT model in the case where tile drains are the primary determinant of phosphorus transport, but tile drains likely play a much smaller role in determining phosphorus transport than, for example, the quantification of the total amount of manure applied on agricultural fields or the fraction of the water budget associated with surface runoff. The success of the calibration of the SWAT model for this TMDL is testament to the appropriate parameterization of determinants of phosphorus transport.

1. *Maumee Watershed Nutrient TMDL—Draft TMDL Report, Appendix 2: Soil and Water Assessment Tool Models and Publications. https://epa.ohio.gov/static/Portals/35/tmdl/MaumeeNutrient/Appendix2-Model-Review.pdf*
2. *King, K. W., Williams, M. R., Macrae, M. L., Fausey, N. R., Frankenberger, J., Smith, D. R., Kleinman, P. J., & Brown, L. C., 2015. Phosphorus transport in agricultural subsurface drainage: a review. Journal of environmental quality, 44(2), 467–485. https://doi.org/10.2134/jeq2014.04.0163*

7) Drainage tile systems "can quickly transfer excess nutrients directly from farm fields to nearby streams." [6] Liquid waste from concentrated animal feeding operations (CAFOs) and smaller AFOs, which contains very little solids content, behaves like water in its flow patterns and will travel quickly to the tiles, eventually draining into surface waters.[7] This means that when liquid manure is applied to a tiled field, some of that manure inevitably will be discharged into surface waters, even in the absence of precipitation. No-till can make phosphorus loss through tile drainage worse.[8] In fact, the USDA Agricultural Research Service has recognized that liquid manure application on tile drainage is a plausible reason for the increase in DRP and resulting harmful algal blooms in Lake Erie.[9] Tile drainage is an entirely separate pathway from overland flow through which P and TSS can travel to surface waters. Excluding tile drainage from the SWAT model is scientifically unjustified, and will significantly reduce the effectiveness of the TMDL.

Response: See the responses to similar comments above as well as the response to comment 8 which addresses the lack of sufficient information to accurately characterize tile drainage within the SWAT model. The density of tile drainage in the Lake Erie basin, as well as other landscape and soil characteristics, differs enough from those in the NE Lakeshore TMDL study area, meaning results *from studies in the Lake Erie drainage basin may not necessarily translate to the NE Lakeshore TMDL study area.*

Both ch. NR 243, Wis. Adm. Code and the Wisconsin Pollution Discharge Elimination System (WPDES) Concentrated Animal Feeding Operation (CAFO) permit contain provisions pertaining to the application of manure and process wastewater. Section 3.7.1 of the WPDES CAFO permit includes a provision that "Manure or process wastewater may not run off the application site nor discharge to waters of the state through subsurface drains due to precipitation or snowmelt except if the permittee has complied with all land application restrictions in NR 243 and this permit, and the runoff or discharge occurs as a result of a rain event that is equal to or greater than a 25-year, 24-hour rain event." S. NR 243.14(2)(b)2., Wis. Adm. Code, states "During dry weather conditions, manure or process wastewater may not run off the application site, nor discharge to waters of the state through subsurface drains." S. NR 243.14(2)(b)4., Wis. Adm. Code also states that "Manure or process wastewater may not run off the application site nor discharge to waters of the state through subsurface drains due to precipitation or snowmelt except if the permittee has complied with all land application restrictions in this subchapter and the WPDES permit, and the runoff or discharge occurs as a result of a rain event that is equal to or greater than a 25-year, 24-hour rain event."

A TMDL is unable to assign allocations to prohibited discharges or unauthorized discharges.

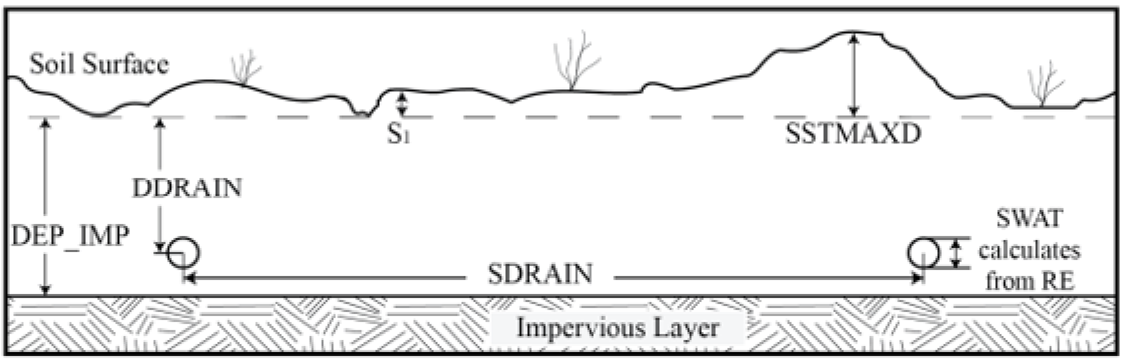
8) WDNR also fails to explain why it "lack[s]" sufficient information about tile drainage to meaningfully incorporate it into the TMDL. (See Appendix F at 19). All CAFOs with WPDES permits are required to have "a field-specific, phosphorus-based nutrient management plan (NMP),"[10] and Wisconsin Code 590 requires all nutrient management plans to include the "location, to the maximum extent practical, of inlets, outlets, tile lines and tile depth of subsurface drainage systems in fields where nutrients are applied." WI Code 590 at Section VI(a)(12). Accordingly, it is not clear exactly what information WDNR lacks about tile systems, and why WDNR would not be able to get additional information from permitted CAFOs in the TMDL zone if it were to ask for it.

Response: Wisconsin Practice Standard Code 590, Nutrient Management, is an NRCS technical standard. Requirements contained in a technical standard that supersede authorities granted through administrative code or state statute are not necessarily enforceable.

S. NR 243.14(2)(e), Wis. Adm. Code, states "A permittee shall identify as part of its nutrient management plan, to the maximum extent practicable, the presence of subsurface drainage systems in fields where its manure or process wastewater is applied." This requirement is mirrored in the CAFO General Permit (WPDES Permit No. WI-0063274-01) in Section 3.7.3 which includes the provision "The permittee shall identify, to the maximum extent practicable, the presence of subsurface drainage systems in fields where its manure or process wastewater is applied as part of the nutrient management plan."

Chapter NR 243, Wis. Adm. Code, the CAFO General Permit, and NRCS 590 all contain similar language referencing "to the maximum extent practicable". This means that depending on the *installation date of the tile systems, many of which were installed prior to the drafting of relevant administrative code and NRCS 590, information regarding depth of tile, tile spacing, and tile diameter may not be available. While fields with subsurface drainage are identified, a survey of nutrient management plans reveals that about approximately 60% of nutrient management plans contain detailed mapping of the tile drainage system. Most nutrient management plans clearly identify subsurface inlets and outlets, as required; however, very few can provide information regarding spacing, depth, or pipe radius. Even if the department had clear authority beyond s. NR 243.14(2)(e), Wis. Adm. Code, to request information on tile depth, spacing, and radius, many producers simply do not have that information available or even knowledge of whether the tile identified in the field is properly functioning.*

To simulate tile drainage, SWAT utilizes a routine called "DRAINMOD" which utilizes the Houghoudt and Kirkham drainage equations and a drainage coefficient.



SWAT's "DRAINMOD" routine requires field specific information including the depth of the tile system relative to any confining layer, depth of the groundwater table, the distance between tile lines, the diameter of the tile lines, a drainage coefficient, and pump capacity if applicable. In areas where drain tile installation and the hydrogeology is fairly uniform, this information, if available, can be aggregated up for use in SWAT model HRU files or subbasins. In the NE Lakeshore TMDL study area, neither the necessary model inputs are available from nutrient management plans nor are tile systems or hydrogeologic conditions uniform enough to parameterize into representative SWAT input files. The SWAT model for the NE Lakeshore TMDL already had over 4,800 HRUs accounting for the detailed data collected documenting agricultural management practices; the addition of tile drainage into the SWAT model would have required sacrificing this accuracy to try and simulate something that could not be accurately represented.

Simulating pollutant delivery through tile drainage becomes even more complex with the necessary information needed to estimate nutrient delivery often lacking. The parameters of SWAT's "DRAINMOD" routine, characterizing the tile system, can have significant impacts on the transport of phosphorus, and can be confounding when paired within the variability of the landscape and soil characteristics such as preferential flow, phosphorus sorption capacity, redox conditions, soil-test phosphorus levels, tillage, cropping system, and the source, rate, placement, and timing of nutrient application coupled with variation in hydrologic and groundwater conditions (King et al, 2014)[1].

1. K.W. King, N.R. Fausey, M.R. Williams. "Effect of subsurface drainage on streamflow in an agricultural headwater watershed"; J. Hydrol., 519 (2014), pp. 438-445, 10.1016/j.jhydrol.2014.07.035

9) As it stands, the Draft TMDL ignores an entire, potentially significant pathway through which phosphorus and TSS are flowing into surface waters. This calls into question the accuracy of the loading capacity modeling as well as the load and wasteload allocations, particularly for nonpoint sources. We encourage WDNR to take a closer look at the information available about tile drainage and incorporate it into the TMDL.

Response: The assimilative loading capacity of a waterbody is defined as the amount of a pollutant that the waterbody can assimilate and still meet water quality criteria and standards.

> *S. NR 212.72(5), Wis. Adm. Code: "Loading capacity" means the greatest amount of loading that a water can receive without violating water quality standards.*

Sections 4.1.1 documents how loading capacity is calculated for stream and river reaches. Section 4.1.2 documents how loading capacities are calculated for lake sand reservoirs. The loading capacity is independent of the actual pollutant load. The loading capacity is divided into allowable loads with the load allocation covering nonpoint sources and the wasteload allocation covering permitted sources.

> *S. NR 212.72(4), Wis. Adm. Code: "Load allocation" means the nonpoint source allocation as defined in s. NR 212.03 (14).*

> *S. NR 212.03(14), Wis. Adm. Code: "Nonpoint source allocation" means that portion of the total maximum load distributed or apportioned to nonpoint sources and unavailable for allocation to point sources.*

While not required nor approved by U.S. EPA, a percent reduction can be provided in a TMDL based on the difference between the baseline pollutant load and allocation. The load allocation can either include the nonpoint sources lumped together or can be broken out into individual load allocations for various sources.

> *S. NR 212.73(3)(d)6., Wis. Adm. Code: Nonpoint sources may be accounted for in a TMDL through an allocation to a single category or through individual load allocations to various nonpoint sources.*

Tile drainage is implicitly accounted for in the load allocation. Due to the inability of the SWAT model to specifically breakout and simulate the pollutant load from tile drainage, an explicit allocation for tile drainage is not provided. The SWAT model is calibrated and validated to water quality monitoring data which represents the summation of all possible sources including tile drainage.

As such, the TMDL does not ignore a potential source of pollutants nor is the accuracy of the assimilative loading capacity impacted by the approaches utilized in the NE Lakeshore TMDL.

CAFOs should be given wasteload allocations that accurately reflect the pollutants they discharge.

10) CAFOs should be given wasteload allocations that accurately reflect the pollution their operations discharge in the TMDL region. Without accurate allocations for these point sources, U.S. EPA will be unable to determine whether the TMDL "has been established at a level necessary to implement water quality standards." 33 U.S.C. § 1313(d)(1)(C). Indeed, the U.S. EPA recently instructed the Ohio EPA, in its TMDL for the Maumee River, to "characterize existing phosphorus loads" from all CAFOs in the Maumee watershed (regardless of whether they have NPDES permits or not), and "establish allowable loads for all 76 identified CAFOs."[11] Without an accurate accounting of CAFOs' point source discharges, U.S. EPA may reject the Draft TMDL.

Response: The department assumes the specific comment that is being referenced is:

> *"17. p. 34, 5th paragraph: The first sentence reads, "There are no NPDES permitted CAFO facilities within the Maumee Watershed." Concentrated animal feeding operations are point sources under the CWA. EPA's NPDES program has identified 76 CAFOs in the Ohio portion of the Maumee watershed, 6 CAFOs with a NPDES permit and 70 CAFOs without a NPDES permit. EPA requests that OEPA characterize existing phosphorus loads from this point source sector, and establish allowable loads for all 76 identified CAFOs, including related production and land application areas, in the wasteload allocation portion of the forthcoming TMDL.*
>
> *Such loads should account for (1) all releases from production areas and (2) all releases from land application areas that do not qualify for the agricultural storm water exclusion under the Act. See 40 C.F.R. § 122.23(e). Releases that qualify for the agricultural storm water exclusion may be placed in the load allocation portion of the TMDL. Releases that should be placed in the WLA include, but are not limited to, releases to a jurisdictional water (1) through artificial subsurface drainage (i.e., tile drainage), as well as (2) through ground water "if the addition of pollutants … is the functional equivalent of a direct discharge from the point source to navigable waters." See 140 S. Ct. 1462 (2020).*
>
> *EPA offers the above as a point of emphasis in light of the statements on p. 34 and in Table 3 (p. 32) that no CAFOs in the watershed possess NPDES permits and the lack of CAFO discussions in the existing point source loading or waste load allocation sections of the draft PRM, as well as the following quote from p. 52, "… 85 percent of Ohio's contribution of total phosphorus load was sourced from agricultural lands.", as CAFOs operate within the broader agricultural sector."*

The department did not receive a similar comment from U.S. EPA for the NE Lakeshore TMDL.

11) Currently, the Draft TMDL allocates a wasteload allocation of "zero" to CAFOs, but the reality is that CAFOs are responsible for significant, if unmeasured, amounts of pollution from their production areas—not just from land spreading—and WDNR is well aware of this fact. According to the Draft TMDL, "CAFO wasteload allocations are set to zero because CAFOs must comply with all authorized discharge and overflow requirements described in the WPDES CAFO General Permit (Permit number)." But the WDNR's own publicly available records demonstrate that dozens of permitted CAFOs have violated their permits. Since 2012, WDNR has documented over 600 WPDES permit violations by CAFOs, including over 140 categorized as "Production Area Runoff." Additionally, WDNR's spills database includes 857 documented manure spills during that same time period.[12] The Draft TMDL's wasteload allocation of "zero" relies on a presumption of total permit compliance and operational perfection; WDNR's own data demonstrates that this reliance is misguided.

Response: Wasteload allocations cannot exceed established regulations and are not assigned to sources to cover violations of permit conditions. Wasteload allocations for CAFO production areas are set to zero because CAFOs must comply with all authorized discharge and overflow requirements described in the WPDES CAFO General Permit or Individual Permit, whichever is applicable to a particular facility. In accordance with the CAFO Permits, overflow events from CAFOs are allowable due to precipitation related overflows from CAFO storage structures which are properly designed, constructed, operated, and maintained in accordance with CAFO permits; however, discharges from such overflows are allowable only if they do not cause or contribute to a violation of water quality criteria and standards. In addition, a CAFO may not discharge any pollutants from the production area to a 303(d)-listed surface water if the pollutants discharged are related to the cause of the impairment. For this TMDL study, these pollutants include TP and TSS; however, surface waters may be listed as impaired for additional pollutants such as bacteria. This effectively results in WLA of zero.

Conditions of noncompliance are not covered by wasteload allocations but are addressed through the permit and enforcement process.

12) Additionally, as explained above in Comment 2, applying liquid manure onto tile drained fields inevitably leads to discharge, and the delivery of this manure through the tile lines could—and should—be measured as a point source. Under Section 502(14) of the Clean Water Act, a "point source" of pollution "means any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, [or] concentrated animal feeding operation [] from which pollutants are or may be discharged," so long as it does not meet the agricultural stormwater exemption. See 33 U.S.C. § 1362(14). The Draft TMDL itself acknowledges that tile lines act as "conduit[s]" from which pollutants can be discharged. (See Draft TMDL at 48) ("The transport of dissolved phosphorus in subsurface agricultural runoff can be accelerated on fields with tile drainage systems, **which act as a conduit** between subsurface water and adjacent drainage channels.") (Emphasis added). And liquid manure can and will run through and out of tile lines without any rain acting as a carrier. Accordingly, manure discharged through a tile line is a "point source" that does not meet the agricultural stormwater exemption; it should not be lumped with

nonpoint sources in the load allocation. At the very least, manure discharged through tiles lines must be considered in the TMDL's modeling and allocations, as discussed in Comment 2.

Response: CAFO manure or process wastewater is prohibited from running off the application site or discharging to waters of the state through subsurface drains during dry weather conditions, see s. NR 243.14(2)(b)2., Wis. Adm. Code. Waste load allocations cannot be assigned to activities that assume noncompliance with the operation's permit or nutrient management plan.

Agricultural storm water is a concept contained within the Clean Water Act. Section 40 CFR 122.23(e) states "For purposes of this paragraph, where the manure, litter or process wastewater has been applied in accordance with site specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients in the manure, litter or process wastewater, as specified in § 122.42(e)(1)(vi)- (ix), a precipitation-related discharge of manure, litter or process wastewater from land areas under the control of a CAFO is an agricultural stormwater discharge."

For permitted farms, agricultural storm water is a precipitation related discharge of manure or process wastewater pollutants to surface waters from a land application area that may occur after the owner or operator of the CAFO has land applied the manure or process wastewater in compliance with the nutrient management requirements of NR 243.14 and the terms and conditions of its WPDES permit (s. NR 243.03(2), Wis. Adm. Code). This concept applies to both fields with and without subsurface drain tile.

In 2017, Food & Water Watch submitted a petition (https://www.foodandwaterwatch.org/wp-content/uploads/2021/06/citizens_cafo_cwa_petition.pdf) to U.S. EPA to reevaluate several CAFO rules. One of which is the concept of agricultural storm water. U.S. EPA has agreed to respond to the petition by August 15, 2023. Until a change regarding the definition of agricultural runoff is made by U.S. EPA, tile drainage from agricultural fields does fall under the definition of a point sources as cited in the comment.

As previously discussed, the TMDL load allocations implicitly include nonpoint loadings for both surface runoff and runoff from tile drains. The SWAT model lacks the necessary routines to accurately simulate the pollutant loadings from tile drainage and the information necessary to simulate tile drainage is not available.

13) Finally, the TMDL region is highly karstic, meaning that pollutants from land applied manure can quickly find routes into groundwater and then back into surface water. Adding pollutants through groundwater can be the "functional equivalent" of a direct discharge from a point source into surface waters. See Cnty. of Maui, Hawaii v. Hawaii Wildlife Fund, 206 L. Ed. 2d 640, 140 S. Ct. 1462, 1476 (2020). Given the highly karstic features of this region combined with the heavy volume of CAFOs there, contamination of the impaired waters via groundwater is a serious risk that is also completely ignored in the current wasteload allocation given to CAFOs.

Response: Wisconsin's rules require that manure be applied at a rate that prevents "delivery of manure and process wastewater to waters of the state" (including groundwater) and that minimizes "the loss of nutrients and other contaminants to waters of the state to prevent exceedances of groundwater" quality standards. In addition, both ch. NR 243, Wis. Adm. Code, and the WPDES CAFO permit contain requirements protecting surface and groundwater.

- *S. NR 243.14(2)(b)5., Wis. Adm. Code, requires that "Manure or process wastewater may not be applied to saturated soils."*
- *S. NR 243.14(2)(b)6., Wis. Adm. Code, requires that "Land application practices shall maximize the use of available nutrients for crop production, prevent delivery of manure and process wastewater to waters of the state, and minimize the loss of nutrients and other contaminants to waters of the state to prevent exceedances of groundwater and surface water quality standards and to prevent impairment of wetland functional values. Practices shall retain land applied manure and process wastewater on the soil where they are applied with minimal movement."*
- *S. NR 243.14(2)(b)7., Wis. Adm. Code requires that "Manure or process wastewater may not be applied on areas of a field with a depth to groundwater or bedrock of less than 24 inches."*
- S. *NR 243.14(2)(b)8., Wis. Adm. Code, requires that "Manure or process wastewater may not be applied within 100 feet of a direct conduit to groundwater."*

Discharges resulting from the land application of manure and process wastewater that occurs despite compliance with permit and nutrient management requirements is considered agricultural stormwater runoff and as such is covered under the load allocation.

14) At bottom, assigning a wasteload allocation of "zero" to CAFOs is not realistic, and the Draft TMDL should be adjusted to accurately reflect the point source pollution amounts that CAFOs are actually discharging.

Response: TMDLs are planning tools that identify the sources of pollutants and quantify the amount of a pollutant that can enter a waterbody such that the waterbody will attain and maintain the appropriate water quality standards.[1] TMDLs cannot change existing regulations, nor are they self-implementing. TMDLs utilize existing definitions and approaches currently available in the Clean Water Act, state law, and associated regulations.[2]

Under the regulations governing CAFOs in Wisconsin, a discharge is allowed under s. NR 243.13(2)(a), Wis. Adm. Code; however, under s. NR 243.13(5)(a), Wis. Adm. Code, any such discharge must meet surface water quality and groundwater standards. This requirement is what supports the assignment of a WLA of zero since any discharge from the CAFO is not allowed to cause or contribute to an exceedance of water quality standards. Any discharge that does not comply with s. NR 243.13(5)(a), Wis. Adm. Code is considered a permit violation and WLAs are not assigned for permit violations.

1. See, American Farm Bureau Federation v. U.S. EPA, 792 F.3d 281, 291 (3d Cir. 2015).
2. U.S. EPA, Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992, May 20, 2002, https://www.epa.gov/sites/default/files/2015-10/documents/2002_06_04_tmdl_guidance_final52002.pdf.

The Draft TMDL's "implicit margin of safety" is inadequate, and underestimates pollution coming from CAFOs.

Response: Many of the comments submitted conflate assimilative loading capacity and the associated allocations with the baseline pollutant load estimates used to proportionately divide the allocations among the different anthropogenic source areas. Since the TMDL's assimilative loading capacity is based on the water quality criteria and characteristics of the receiving water, the specific load from CAFOs does not impact the TMDL assimilative loading capacity. The efforts in this TMDL to characterize baseline pollutant loads was to provide information for the SWAT model development and calibration, to inform the proportional allocation method, and aid in implementation planning.

15) The Clean Water Act requires that a TMDL incorporate a "margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." 33 U.S.C. § 1313(d)(1)(C). The Draft TMDL states that it will use an implicit—rather than an explicit–—margin of safety, asserting that the FWM/GSM ratios were set "to conservative values." (Draft TMDL at 87). The TMDL, however, does not explain in what respect those levels are "conservative" as compared to other ratio levels. Instead, the TMDL simply states that its GSM concentrations were estimated using the PhosMER model which supposedly has a "greater certainty in model results," without explaining why they are more certain, let alone explaining how the FWM/GSM ratios were adjusted in a "conservative" manner based on this justification. See Draft TMDL at 71, 89.

Response: The TMDL report describes what "conservative values" means in the text that follows in that same paragraph:

> *The primary means of applying an implicit MOS was by setting FWM/GSM ratios used for loading capacity analysis (Section 4.1.1) to conservative values. GSM concentrations were estimated using the PhosMER model that predicts daily phosphorus concentrations. Confidence in PhosMER model estimates can be calculated through statistical cross-validation. An estimate of growing season median at the upper 90% confidence limit of bootstrapped predictions was chosen.*

However, the department recognizes that there is some lack of clarity in this paragraph and appreciate the opportunity to improve upon how this is communicated. The text has been changed to the following (changes underlined):

> *The primary means of applying an implicit MOS was by setting FWM/GSM ratios used for loading capacity analysis (Section 4.1 of the TMDL report) to conservative values <u>as described below.</u> GSM concentrations were estimated using the PhosMER model that*

predicts daily phosphorus concentrations. Confidence in PhosMER model estimates can be calculated through statistical cross-validation. An estimate of growing season median at the upper 90% confidence limit of bootstrapped predictions was chosen (i.e., the implicit margin of safety is set to a value that gives us 90% certainty that FWM load estimates from SWAT will result in meeting water quality criteria).

Regarding the text describing the "greater certainty in model results" using the PhosMER model, the original text was written as follows:

To determine appropriate FWM/GSM ratios for TMDL development, FWM and GSM concentrations were estimated for 32 stream monitoring sites. For each station, the annual FWM was extracted from the SWAT model. GSMs were estimated from monitoring data adjusted to control for the influence of antecedent precipitation on TP concentration (PhosMER model). PhosMER was chosen to estimate GSMs because the Department intends to use it to assess future TP monitoring data where flow may not be monitored.

Because of its greater certainty in model results, the PhosMER model was chosen as a means of applying an implicit margin of safety. To estimate the uncertainty of the GSM estimate, a statistical method called "bootstrapping" (a statistical procedure that resamples a single dataset to create many simulated samples for the purpose of estimating uncertainty) was used. The PhosMER model was bootstrapped by refitting it 200 times—with each new iteration the model table was shuffled (resampling with replacement) to simulate slightly different conditions. Each iteration generated a new set of daily TP concentrations, and each time a new GSM was calculated across those daily predictions. This process resulted in a distribution of GSM values at each site. The higher bound of the 90% confidence interval (the 95th percentile rank value) was chosen as the representation of GSM.

The text has been updated to more clearly communicate the steps (changes underlined):

To determine appropriate FWM/GSM ratios for TMDL development, FWM and GSM concentrations were estimated for 32 stream monitoring sites. For each station, the annual FWM was extracted from the SWAT model. GSMs were estimated from monitoring data adjusted to control for the influence of antecedent precipitation on TP concentration (PhosMER model). PhosMER was chosen to estimate GSMs for 3 reasons:

1. *NR 102.07(1)(c) notes that PhosMER can be used for refining TP assessments.*
2. *It has the capacity to estimate long-term GSMs for sites where long-term sampling records are not available.*
3. *It can be used to estimate the uncertainty of a long-term GSM estimate.*

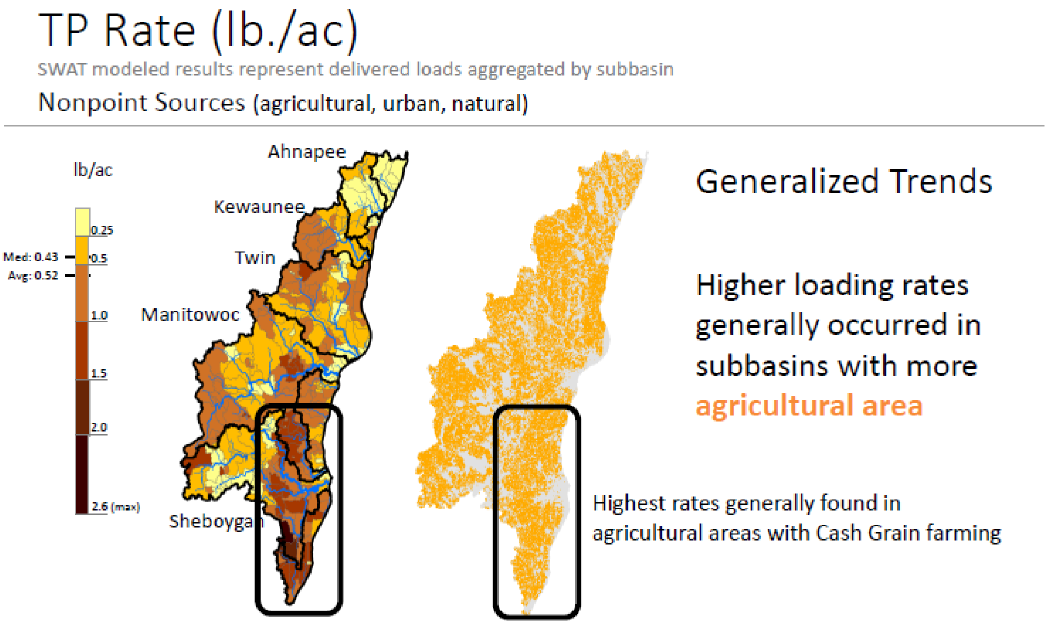
Because of its capacity for estimating uncertainty in long-term GSMs, the PhosMER model was chosen as a means of applying an implicit margin of safety. To estimate the uncertainty of the GSM estimate, a statistical method called "bootstrapping" (a statistical procedure that resamples a single dataset to create many simulated samples for the purpose of estimating uncertainty) was used. The PhosMER model was *bootstrapped by refitting it 200 times—with each new iteration the model table was shuffled (resampling with replacement) to simulate slightly different conditions. Each iteration generated a new set of daily TP concentrations, and each time a new GSM was calculated across those daily predictions. This process resulted in a distribution of GSM values at each site. The higher bound of the 90% confidence interval (the 95th percentile rank value) was chosen as the representation of GSM.*

16) Below are just a handful of examples where WDNR could have—but did not—adjust for a "lack of knowledge" by making more "conservative" (or more accurate) estimates. To start, Appendix G acknowledges that WDNR's manure analysis does not account for any manure that was "sold to non-dairy farmers or applied to cash grain crops." (Appendix G at 5). Instead, the analysis incorporated only dairy fields, arguing that "dairy fields are the predominant agricultural land use consistently receiving manure in the NE Lakeshore basin." [Id]. But even accepting that dairy fields are "predominant," that does not mean that non-dairy fields can simply be ignored, particularly when DNR acknowledges that they do, in fact, receive manure. Indeed, according to Appendix E, cash grain rotations account for significant percentage of rotations in many of the TMDL counties; for example, in Brown County, cash grain rotations are 18% of agricultural area. (Appendix E at 5). Instead of adjusting the model in a conservative manner to account for this missing information, Appendix G simply lays out the gap in knowledge and justifies its decision to disregard it.

Response: The examples included in this comment have no impact on the calculation of the assimilative loading capacity of the receiving waters and thus do not impact the margin of safety.

The department had limited access to data regarding manure sold to other producers; however, the model calibration and validation shows that the agricultural management practices have been sufficiently characterized. If model calibration and validation did not indicate a good fit for streamflow, sediment, and phosphorus, additional model adjustments would have been made. As discussed in comment 8, the SWAT model for the NE Lakeshore TMDL has balanced the number of HRUs accounting for the detailed data collected documenting agricultural management practices with model efficiency.

In addition, model results summarized in the graphic below (from NE Lakeshore TMDL Webinar #6) show that cash grain rotations were accurately simulated and are responsible for a higher delivery of TP to receiving waters than fields under other agricultural management. This is likely due to the historic applications of manure that resulted in elevated soil test values for phosphorus on these fields. Without the alfalfa typical in a dairy crop rotation which provides a period of sustained vegetated cover, the lower crop residue levels typical in corn-soybean rotations result in higher erosion rates and a higher delivery of TP. The overall loading rates from these fields when compared to the baseline loads and edge of field targets contained in Appendix M illustrates the importance of targeting the cash grain fields with appropriate management practices.



17) Appendix G also acknowledges that WDNR considered manure from "cattle sources only"– not any non-animal sources of P such as runoff from feed leachate. See Appendix G at 5. WDNR justifies this exclusion by arguing that "these situations are difficult to quantify and are likely to be outweighed by cattle source contributions." [Id]. Again, even if cattle manure is a greater contributor of P than leachate is, that is not a justification for ignoring leachate altogether. Instead, WDNR should have accounted for the knowledge gap by making more conservative estimates about the volume of manure, and/or attempting to estimate leachate runoff volumes separately for inclusion in the model, based on annual reports from CAFOs, some of which manage their leachate in ponds/catch basins in a manner that is totally separate from manure lagoons.[13]

Response: In most cases, feed storage leachate is routed to manure storage lagoons. Under a nutrient management plan, a lagoon is agitated and mixed and then sampled to determine the nutrient content and determine appropriate application rates consistent with the nutrient management plan. Compared to manure, feed leachate is low in phosphorus. Given the small overall contribution of phosphorus from feed leachate and given that it is often mixed with manure, the assumptions made by the department on how to treat feed leachate does not impact the allocation process and the proportioning of allocations to different source areas.

The department has adequately characterized the different source areas for both the development and calibration of the SWAT model and the of partitioning of allocations by source area. The SWAT model cannot account for every watershed characteristic or variation in management practices but rather focuses on the predominate conditions and management practices that impact runoff and pollutant loadings along with those that may disproportionately impact runoff volumes and pollutant loadings. Also, if conservative assumptions are made for every model input, the SWAT model will not properly calibrate or validate.

18) Appendix G also relies on six-year-old data about cattle numbers (the 2017 census), but the number of animals in the watershed has likely grown. CAFO expansion has a significant and well-documented impact on water quality that cannot simply be ignored. For example, adding a single CAFO to a HUC-8 region "leads to a 1.7% increase in total phosphorus levels,"[14] and the conversion of just three dairies into CAFOs in one watershed has been documented to result in a 91% increase in downstream total P loads.[15] But the margin of safety apparently does not take into account any potential expansion of animal numbers over the past six years. At minimum, the TMDL should be updated when 2022 Census data are available, and those quantities of manure and associated P content should be incorporated into what we hope will be a forthcoming, comprehensive implementation strategy and plan.

Response: The time-period used for estimating cattle numbers aligns closest to the instream monitoring and SWAT model run periods. This was a deliberate decision to parameterize the SWAT model so that the model results would align as closely as possible to water quality sampling.

Since the TMDL's assimilative loading capacity is based on the water quality criteria and characteristics of the receiving water, the specific baseline loads do not impact the TMDL assimilative loading capacity. The TMDL assimilative loading capacity does not change when changes occur on the landscape. In other words, if real-life loading to a watershed increased due to an increase in cattle numbers, the TMDL assimilative capacity and associated allocations remain the same; however, the overall needed reduction would increase since the real-life loadings exceed the baseline loading condition.

The comment also assumes an expansion in the number of animal units. In actuality, the number of animal units has remained relatively stable in the watershed over the past 10-years. Instead of seeing increasing numbers of animal units, the trend has been a continued consolidation of dairy operations into CAFOs. This has resulted in more operations becoming permitted and falling under WPDES permit conditions and mandated nutrient management planning requirements for the fields.

19) Additionally, as described in Comments 2 and 3 above, CAFOs discharge pollutants via spills and unintended discharges from their production areas, as well as through tile lines and groundwater. The Draft TMDL, however, does not account for any of these factors in their modeling or wasteload allocation calculations. In addition to the changes, we recommend in Comments 2 and 3, these facts are further reason why the margin of safety needs to be more conservative.

Response: These pollutant sources are accounted for implicitly in the load allocations. The impact of spills, unintended discharges from production areas, and pollutant loads from tile drainage are also collectively captured in the water quality monitoring data that is used in the SWAT watershed model calibration and validation process.

As discussed above, the assimilative loading capacity of the receiving water is not set by the pollutant load baselines thus conservative assumptions regarding this pollutant loads do not provide a margin of safety for the TMDL assimilative loading capacity. The margin of safety is really limited to conservative assumptions regarding the calculation of the assimilative loading capacity, such as those used in this TMDL, or an explicit margin of safety that is directly applied to the assimilative loading capacity.

20) The TMDL's implicit margin of safety with respect to streambank erosion is also troubling. The Draft TMDL acknowledges that "TP and TSS loading from streambank erosion is not explicitly modeled." (Draft TMDL at 87). The Draft TMDL asserts that this approach supports an implicit margin of safety for nonpoint source allocations "because WDNR plans to encourage practices specifically aimed at reducing streambank erosion while also attaining allocations for land-based sources." (Id.) But the TMDL does not explain what "practices" it "plans" to encourage, nor does it give any explanation for how those practices, if adopted, would be likely to result in a reduction of TP and/or TSS, let alone how likely they are to be adopted. Making things worse, certain practices (like no-till) may reduce TP and TSS but can actually exacerbate DRP loss. Accordingly, the vague promise of voluntary adoption of unnamed practices that are not guaranteed to be effective—and might actually be harmful—can hardly be considered "conservative."

Response: The reasoning behind the implicit margin of safety is that the needed reductions from the agricultural source areas were applied to the edge-of-field estimates contained in Appendix M. Attainment of the edge-of-field targets allows attainment of the load allocation with any additional reductions such as those from streambank stabilization projects, barnyard projects, or other nonpoint projects potentially providing a margin of safety with regards to attaining the load allocation since the load allocation could be attained by just meeting the edge-of-field targets. Conceptually the utilization of additional management practices, such as streambank stabilization, could be considered to provide a margin of safety; however, additional examination determined such practices to be a better fit with reasonable assurance. This is because these practices provide additional management practices demonstrating that the load allocation can be attained through supporting management practices complementing the field scale management practices used to attain the edge-of-field targets contained in Appendix M. In addition, the calculation of the assimilative loading capacity is not impacted and thus does not impact the margin of safety.

Once the TMDL allocations are approved, the department conducts a sensitivity analysis looking at a suite of management practices to determine what level of implementation is required to meet the edge-of-field targets. The analysis is conducted once allocations are approved because of the workload associated with the 80 to 100 thousand model runs needed to conduct the analysis. Once completed, the analysis is included in the department's guidance "Guidance for Implementing Water Quality Trading in WPDES Permits [PDF]" and updated as TMDLs are approved or changes to SnapPlus necessitate adjustments. The department determined that the best location for this analysis was the water quality trading guidance because of the use of this analysis in credit threshold *calculations for water quality trades between point sources and nonpoint sources. The analysis looks at three management scenarios:*

- *Baseline TMDL Scenario: This corresponds to the baseline agricultural assumptions used to develop the TMDL. Specific details about individual baselines can be found in the respective TMDLs.*
- *Conservation Scenario 1: This scenario implements the management measures listed in Table 1 including changes in tillage, cover crops, and nutrient management.*
- *Conservation Scenario 2: This scenario implements the management practices of Scenario 1 with the additional establishment and maintenance of a grass filter strip / buffer strip.*

Other combinations of management practices may be sufficient to meet the credit threshold or interim floor use for water quality trading. The analysis performed by the department and the practices listed in Table 1 are not meant to be an all-inclusive examination of potential management practices but rather examines the level of implementation and feasibility of attaining the targets using conventional field management practices. Table 1, included below, provides a summary of the baseline and conservation scenarios.

Table 1. Summary of Baseline and Conservation Scenarios

Category	Baseline TMDL practice	Conservation Scenario 1	Conservation Scenario 2
Tillage	Moldboard, chisel + disc, disc, strip or no-till	Dairy and Cash Grain: No till used on all years of crop rotation. Potato and Vegetable include spring cultivation.	Same as #1
Cover Crops	None	Dairy rotation: Winter Rye after corn silage - 2 out of 3 yrs. Cash Grain: small grain cover crop after harvest - 3 out of 6 yrs. Potato/Vegetable: small grain after potato harvest - 1 out of 2 yrs.	Same as #1 Same as #1 Same as #1
Contour Farming	None	Field farmed on contour	Same as #1
Fertilizer Application	Spring or In-Season application	Same as baseline	Same as baseline
Solid Manure Application: method, rate, and timing	Spring or Fall+ Winter application; surface applied or incorporated	No winter application; same baseline timing and rate. No manure incorporation, only surface applied	Same as #1
Liquid Manure Application: method, rate, and timing	Spring or Fall + Winter application; surface applied or incorporated	No winter application; same baseline timing and rate; all liquid manure injected, no surface or incorporation	Same as #1
Dairy Rotation - Forage	Alfalfa: Spring seeding + 3 more alfalfa yrs.	Alfalfa-Grass - Fall or Spring seeding + 3 more alfalfa-grass yrs.	Same as #1
Edge of Field Filter Strip	None	None	Edge of Field Filter Strip established and maintained over crop rotation

The comment also falsely assumes certain practices such as no-till to be harmful and places a disproportionate emphasis on the importance of DRP. These claims are addressed in the responses to comments 1 through 4.

21) Bottom line, there is substantial uncertainty about the effluent limitations needed to protect water quality from nonpoint sources. Aside from the uncertainties discussed above, this also includes: uncertainty about the effectiveness of manure management practices and other pollution reduction measures in this particular region; uncertainty about and unpredictability of weather patterns, especially heavy rains that drive much DRP loading (apart from the fact that, due to climate change, heavy rains will continue to worsen); and uncertainty regarding the future growth of CAFOs and other AFOs in the region.

Given these uncertainties and given that WDNR has failed to demonstrate how its assumptions were, in fact, "conservative," WDNR's decision to use an implicit margin of safety is not justified. WDNR's assertion that it has incorporated an "implicit" margin of safety is unsupported, speculative, and inadequate to “account [for] any lack of knowledge concerning the relationship between effluent limitations and water quality.” 33 U.S.C § 1313(d)(1)(C).

Response: Effluent limitations are implemented through WPDES permits which are applicable to point sources, not nonpoint sources. This comment lists multiple sources of uncertainty, some of which impact the TMDL assimilative loading capacity and other that do not but rather influence the baseline loading conditions used in setting the proportional allocations. The two sources of uncertainty that are listed in this comment that impact the assimilative loading capacity are weather patterns and climate change.

Weather patterns are inherently unpredictable and are a mix of the events that happen each day. Weather reflects the conditions of the atmosphere over a short period of time while climate refers to the average atmospheric conditions that prevail in each region over a longer period of time. Climate is the average of weather events. Climate represents what is expected and weather is what occurs.

> *Weather Patterns: To account for the variability in weather, a long-term weather record was utilized that included wet, average, and dry years as well as large rainfall events to account for variability and provide representation of a wide range of hydrologic conditions. The weather data consisting of daily precipitation, minimum and maximum temperature, solar radiation, and relative humidity, was obtained from the Daily Surface Weather and Climatological Summaries (Daymet) (https://daymet.ornl.gov/overview). Daymet is a gridded, continuous dataset with one square kilometer resolution for the entire contiguous United States. The project is led by the National Aeronautics and Space Administration (NASA). The Daymet website includes a Single Pixel Extraction Tool that was used to download daily weather data for the years 1998 through 2019. The center point of each SWAT subbasin was input to the Single Pixel Extraction Tool to acquire weather data for each subbasin. This allowed the SWAT model to account for both spatial and temporal variations in weather events.*
>
> *Climate Change: A climate change section will be added to the TMDL report. Projections of precipitation patterns and temperatures are highly variable by location, and individual climate models. The ensemble of climate model projections for Wisconsin generally shows more annual precipitation with precipitation patterns shifting toward drier summers and wetter springs and falls accompanied overall with more intense storms. The updated GLISA/NOAA predictions shows by mid-century, assuming the RCP8.5 high emissions scenario, a decrease in summer precipitation amounts for this portion of Wisconsin ranging between 0 and 1.0 inches per season and an increase in the numbers of days with over 1-inch of precipitation from 0 days to 1.5 days. These changes are impossible to translate into actual daily weather events needed to drive the SWAT watershed model. NOAA is currently engaged in a multi-year process to update Atlas 14 with nonstationary approaches and statistics to project changes in rainfall design storms such as the 1-year design storm, 25-year design storm, etc. NOAA is also evaluating downscaled global models’ ability to mimic extreme precipitation events at both the temporal and spatial scales.*

This information is not yet available and only provides design storms and not the continuous records needed to run the SWAT watershed model.

After consultation with climate change researchers at UW-Madison, the approach that has been recommended for TMDL development is to use a weather dataset from the most current climate normal period. NOAA calculates Climate Normals every 10 years covering a 30-year period. The 1991-2020 U.S. Climate Normals are the latest series of decadal Normals going back to 1950. Consistent with this approach, the department utilized the most current dataset, 1998-2019, within the most recent Climate Normals for input into the SWAT model.

Regarding the uncertainty around the future growth of CAFOs and AFOs in the NE Lakeshore TMDL Basin, the trend has not been toward more cows in the study area but rather a consolidation of dairy farms into CAFOs. In addition, as has been previously discussed, the TMDL's assimilative loading capacity is independent of the number of cows and pollutant loading rates. A needed percent reduction from current conditions to the TMDL's assimilative loading capacity may change but not the assimilative loading capacity itself. While U.S. EPA does not approve percent reductions, the department has included percent reductions to aid in implementation; however, these percent reductions are measured from a defined edge of field loading rate (lbs./acre/year). If agricultural management changes such as more cows in the watershed resulting in edge of field load for fields increasing beyond the baseline, a higher percent reduction will be required from this new condition down to the TMDL load capacity edge-of-field target.

The department does not agree with the comment's assertion that the implicit margin of safety is unsupported, speculative, and inadequate. The methods employed in this TMDL satisfy both the requirements contained in s. NR 212.73(3)(e), Wis. Adm. Code. and 33 U.S.C § 1313(d)(1)(C). The comment has failed to identify actual sources of uncertainty that impact the TMDL's assimilative loading capacity that have not been accounted for in the TMDL analysis. The adjustment of the growing season median through bootstrapping and resampling the data 200 times, using data from the most recent Climate Normal, along with using the higher bound of the 95th percentile rank value provides an implicit margin of safety for the assimilative loading capacity for each reach that is based on both actual data and the uncertainty around that data. Use of an explicit margin of safety may result in a margin of safety that is either inadequate or overly restrictive.

The Draft TMDL fails to include reasonable assurances that nonpoint source reductions will be achieved.

22) TMDLs must provide "reasonable assurances that nonpoint source reduction will in fact be achieved." [16] Otherwise, "the entire load reduction must be assigned to point sources."[17] U.S. EPA requires reasonable assurances to ensure that the waste load and load allocations established in the TMDL are not based on overly generous assumptions regarding the amount of non-point source pollution reduction that will occur.[18] As it stands, the Draft TMDL is severely lacking in reasonable

assurances because it relies solely on existing (potentially under-funded) voluntary programs to reduce pollution, as well as voluntary compliance with edge-of-field pollution reduction targets.

Response: The NE Lakeshore TMDL meets the requirements of Reasonable Assurance outlined under s. NR 212.73(5), Wis. Adm. Code, which includes considerations including, but not limited to receiving water characteristics including persistence, behavior, and ubiquity of pollutants of concern; the types of remedial activities necessary; and available regulatory and non-regulatory controls. TMDLs cannot change existing regulations, nor are they self-implementing. TMDLs utilize existing definitions and approaches currently available in the Clean Water Act.[1] As a delegated state, Wisconsin's state statutes, administrative code, and policies are consistent with the CWA and layout the regulations and performance standards available for implementing the TMDL. Elimination of cost share requirements or making voluntary nonpoint programs mandatory requires changes in state statute or administrative code.

The Comment references two U.S. EPA documents and within those documents are statements that appear at the core of the issue being raised in the Comment.

> *"Under the CWA, the only federally enforceable controls are those for point sources through the NPDES permitting program. In order to allocate loads among both point and nonpoint sources, there must be reasonable assurances that nonpoint source loads will in fact be achieved. Where there are not reasonable assurances, under the CWA, the entire load reduction must be assigned to point sources." (Comment Reference 16 and 17)*

> *"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." (Comment Reference 16 and 17)*

The TMDL demonstrates that the aggregate sum of the load allocations and wasteload allocations will not exceed the assimilative loading capacity of the waterbody. The TMDL analysis also clearly shows that even if the entire needed load reduction was assigned to point sources that water quality criteria would not be attained. In addition, per s. NR 217.16(2), Wis. Adm. Code, the department lacks the authority to assign the entire load reduction to the point sources but rather if after two permit terms, the department determines the nonpoint source load allocation has not been substantially reduced, the department may impose the more stringent water quality based effluent limitation calculated under s. NR 217.13, Wis. Adm. Code, or may include the TMDL based limitation for an additional permit term if the department determines there will be significant nonpoint source load reductions within the upcoming permit term.

While the reliance on the use of voluntary programs is expanded on in Comments 23 through 26, It is important to note that the authorities under the CWA differ between point and nonpoint sources. U.S. EPA provides a concise summary of these differences on their website[2]:

> *"TMDL wasteload allocations (those pollutant allocations assigned to point sources) are generally implemented through EPA's National Pollutant Discharge Elimination System (NPDES) permits under CWA section 402. This section of the Act requires that point source discharges be controlled by including water quality-based effluent limits in permits issued to point source entities. Under EPA's permitting regulations, water quality-based discharge limits in NPDES permits must be "consistent with the assumptions and requirements" of wasteload allocations in EPA-approved TMDLs."*
>
> *"Non-point source load reduction actions are implemented through a wide variety of programs at the state, local and federal level. These programs may be regulatory, non-regulatory or incentive-based e.g., a cost-share program. In addition, waterbody restoration can be assisted by voluntary actions on the part of citizen and/or environmental groups. The EPA section 319 program provides grant money to the states to fund specific projects aimed at reducing the nonpoint source pollution."*
>
> *"Although states are not explicitly required under section 303(d) to develop TMDL implementation plans, many states include some type of implementation plan with the TMDL. When developed, TMDL implementation plans may provide additional information on what point and nonpoint sources contribute to the impairment and how those sources are being controlled or should be controlled in the future."*

1. *U.S. EPA, Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992, May 20, 2002, https://www.epa.gov/sites/default/files/2015-10/documents/2002_06_04_tmdl_guidance_final52002.pdf.*

2. *https://www.epa.gov/tmdl/overview-total-maximum-daily-loads-tmdls#7*

The TMDL's reliance on existing, potentially under-funded, programs is inadequate to provide "reasonable assurances."

23) The Draft TMDL does not point to a single new program, project, regulation, or permit that will ensure that nonpoint source reduction "will in fact be achieved." Instead, the Draft TMDL points to a laundry list of existing programs but does not describe how these programs have been successfully utilized in past, let alone how these programs will achieve target reductions in the future. See Draft TDL at 95-107. A plan that simply relies on the same existing programs—without any description of how these programs will be enhanced, better funded, better targeted, or changed in any way—falls far short of what is required. The business-as-usual approach to pollution reduction in this region is not working. That is why a TMDL is necessary.

Response: This comment assumes that business as usual is not working and that is why the TMDL is needed. As a counter, the Ahnapee River, which is located in the NE Lakeshore TMDL study area has a 9-Key Element Plan that was developed and implemented, similar to how the overall NE Lakeshore TMDL will be implemented. The Ahnapee watershed, like much of the NE Lakeshore TMDL study area, is dominated by agricultural land use with most of the total phosphorus pollutant loads stemming from activities related to agricultural production. The Ahnapee River is divided into two segments, (1) stream miles 0.00 – 7.86 and (2) stream miles 7.86 to 14.71.

> *Segment (1) was listed as impaired in the 1998 listing cycle for PCBs. It was also listed as impaired for total phosphorus in 2014 because total phosphorus concentrations exceeded WisCALM listing criteria for the Fish and Aquatic Life use. This segment of the Ahnapee River was evaluated during every two-year cycle from 2014 to 2022. During the 2022 cycle; data for total phosphorus showed that concentrations were clearly below 2022 WisCALM listing criteria for Aquatic Life use and Segment (1) was officially delisted for total phosphorus on 4/27/2022.*
>
> *Segment (2) was listed as impaired in the 1998 listing cycle for PCBs. Evaluations of phosphorus, temperature, chloride, fish sample data, and bug sample data occurred on a two-year cycle from 2018 and 2022 and confirmed that Segment (2) was in good condition and meeting the Aquatic Life use.*

The successful delisting of the Ahnapee River demonstrates the effectiveness of the 9-Key Element planning and associated implementation approach. The TMDL implementation plan, which while not included in the draft TMDL, will be detailed in subsequent planning documents, and will identify areas for development and implementation of 9-Key Element Plans. Additional text has been added to the report.

As previously discussed, the TMDL lacks the ability to create new regulations and requirements. TMDLs are informational tools that identify the sources of pollutants and quantify the amount of a pollutant that can enter a waterbody so that the waterbody will attain and maintain the appropriate water quality standards.[1] TMDLs cannot change existing definitions and regulations, nor are they self-implementing. TMDLs utilize existing definitions and approaches currently available in the Clean Water Act and associated regulations.[2]

Additional text will be added to the reasonable assurance section outlining the implementation strategy that is being developed. The TMDL has identified HUC 12 watersheds that have high nonpoint baseline loads. These HUC 12 watersheds will have EVAAL (https://dnr.wisconsin.gov/topic/Nonpoint/EVAAL.html) analysis performed to identify fields with the highest potential for nutrient export and will have management practices targeted at these fields to reach the edge-of-field targets identified in Appendix M of the NE Lakeshore TMDL report.

1. *See, American Farm Bureau Federation v. U.S. EPA, 792 F.3d 281, 291 (3d Cir. 2015).*

2. EPA, Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992, May 20, 2002, https://www.epa.gov/sites/default/files/2015-10/documents/2002_06_04_tmdl_guidance_final52002.pdf.

24) Indeed, the Draft TMDL acknowledges that many of its programs "will require having adequate amounts of [] funding," as well as "adequate staffing and financial support to fund staff." (Draft TMDL at 96). But the TMDL is silent as to where such additional funding and staffing might come from. Moreover, many of the programs rely on voluntary participation which cannot be guaranteed. Indeed, U.S. EPA disapproved the Lake Champlain TMDL for this very reason, finding that the TMDL's "weakness (in the reasonable assurance context) is that nearly all of the recommendations are just that – recommendations. Nearly all elements of the plan depend on both additional funding and entities' willingness to participate or cooperate voluntarily with the intent of the program."[19]

Response: The department's review of U.S. EPA's decision document to reverse their previous approval of the Lake Champlain found that the core issue regarding reasonable assurance was not that nonpoint controls were voluntary but rather what EPA cited for the disapproval, in addition to an inadequate margin of safety, was 40 C.F.R. §130.2(i), "[i]f best management practices or other nonpoint source pollution controls make more stringent load allocations practicable, then wasteload allocations can be made less stringent."

U.S. EPA Guidance[1] allows for voluntary and incentive-based approaches

> *"For 303(d)-listed waters impaired solely or primarily by nonpoint sources, TMDL implementation may involve individual landowners and public or private enterprises engaged in agriculture, forestry, or urban development. The primary implementation mechanism will generally be the State section 319 nonpoint source management program coupled with State, local, and Federal land management programs, and authorities."*
>
> *"For example, voluntary, incentive-based approaches at the State and local level can be used to implement management practices for controlling nonpoint source pollution. In addition, local regulations or ordinances related to zoning, land use, and storm water runoff are often used to abate polluted runoff."*

Under s. NR 212.73(5), Wis. Adm. Code, the reasonable assurance section can factor in considerations including, but not limited to receiving water characteristics including persistence, behavior, and ubiquity of pollutants of concern; the types of remedial activities necessary; and available regulatory and non-regulatory controls. It is important to note that these considerations revolve around the length of time it may take to meet water quality standards and not the core TMDL tenant that the aggregate sum of load allocations and wasteload allocations meets the assimilative loading capacity.

1. "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)", U.S. EPA, August 8, 1997. https://www.epa.gov/sites/default/files/2015-10/documents/2003_10_21_tmdl_ratepace1997guid_0.pdf

WPDES CAFO permittees should be required to demonstrate compliance with edge-of-field targets or face penalties.

25) The TMDL acknowledges that agriculture is the single largest contributor to nonpoint source pollution for both TP (86%) and TSS (91.5%) (see Draft TMDL at 68), but there does not appear to be any mechanism for ensuring that reduction goals will be met by agricultural producers. We are pleased that Appendix M contains edge-of-field targets for pollution reduction, calculated on a subbasin level. But without any enforcement mechanisms to ensure that reduction targets are being met, the TMDL lacks "reasonable assurances" that needed nonpoint source reductions—the vast majority of which are agricultural - will be met.

We recognize that Appendix M contains a "carrot" in the form of water quality trading credits for point sources in a trading relationship with a producer who can demonstrate compliance with reduction goals. However, Appendix M lacks any meaningful "sticks," and neither it nor the Draft TMDL explain how WDNR intends to track whether these targets are being met by agricultural producers. At the very least, CAFOs should be required to demonstrate compliance with the subbasin reduction goals for fields in their NMPs as a condition of their WPDES permits. As it stands, the current CAFO General permit[20] does not contain any requirements regarding TMDL compliance with respect to land application; it merely requires zero discharge "from the production area" if CAFOs are in a TMDL zone. As explained in Comment 3, that wasteload allocation of zero is unrealistic; the permit's silence on TMDL compliance when it comes to land application is also unjustified.

Response: Appendix M does not contain "sticks" because TMDLs cannot change existing regulations or create new regulations or permit requirements. TMDLs utilize existing definitions and approaches currently available in the Clean Water Act and associated regulations[1] including state applicable state statutes and administrative code.

To make the edge-of-field targets contained in Appendix M a requirement, the edge-of-field targets would need to be adopted as targeted performance standards per the requirements of s. NR 151.005, Wis. Adm. Code, using the procedure laid out in s. NR 151.004, Wis. Adm. Code. The TMDL modeling and associated allocations demonstrates that it is likely, that even after substantial implementation of the phosphorus index performance standard contained in s. NR 151.04 Wis. Adm. Code, that the associated phosphorus reductions may not be sufficient to meet the load allocations or phosphorus reductions stipulated in Appendix M.

There are several factors that must be considered; while both the edge-of-field targets and the phosphorus index can be calculated in SnapPlus, they do differ. The edge-of-field targets are calculated using the predominant soil and average slope on a field while the phosphorus index is *calculated with the critical slope and soil. Both the phosphorus index and the edge-of-field targets are expressed in pounds/acre/year; however, they represent different conditions.*

The implementation of the edge-of-field targets, if adopted as targeted performance standards under s. NR 151.004 Wis. Adm. Code, would be similar to current implementation and tracking for the ch. NR 151, Wis. Adm. Code, performance standards.

Targeted performance standards adopted under s. NR 151.004, Wis. Adm. Code, would be applicable to both permitted and unpermitted crop and livestock producers; however, ch. NR 243, Wis. Adm. Code, would also require updating to reflect the targeted performance standards for implementation in permitted nutrient management plans.

1. EPA, Guidelines for Reviewing TMDLs Under Existing Regulations Issued in 1992, May 20, 2002, https://www.epa.gov/sites/default/files/2015-10/documents/2002_06_04_tmdl_guidance_final52002.pdf.

26) We recognize that enforcement on a field-by-field basis would be challenging. That is why CAFOs are an appropriate subset of producers to focus on. WDNR's CAFO program already has field and compliance staff in place, and CAFOs are already required to submit regular reports to. Moreover, CAFOs are the primary source of manure in the region, so it only makes sense for them to carry some amount of responsibility for ensuring that reduction goals are met.

We urge the WDNR to require all CAFO WPDES permittees (whether subject to the general or an individual permit) to annually report compliance with the edge-of-field targets in Appendix M for all fields in their NMPs, or face penalties for failing to meet the required reductions.

Response: The department is not authorized, unless changes are made to both chs. NR 151 and NR 243, Wis. Adm. Code, to make such requirements mandatory. The TMDL itself has no regulatory authority to require such reporting under the permit. Adoption of targeted performance standards under ss. NR 151.004 and NR 151.005, Wis. Adm. Code, would apply to all agricultural fields and not just CAFOs.

27) The failure to properly reduce nonpoint source contributions has real consequences on public taxpayers. A 2022 report by the Alliance for the Great Lakes found that harmful algal bloom-related monitoring and treatment costs Toledo residents using bloom-laden Lake Erie as their water source an average of $18.76 per person every year.[21] If nonpoint source reductions do not occur, the burden of meeting the TMDL targets will fall on the wastewater treatment plants and other point sources of phosphorus, landing ultimately on downstream ratepayers.

As it stands, Appendix M amounts to little more than a set of voluntary recommendations that will not pass muster under U.S. EPA precedent.[22]

Response: This comment references U.S.EPA's disapproval of the Lake Champlain Phosphorus TMDL on January 24, 2011. The department questions the relevance of the Lake Champlain TMDL to the NE

Lakeshore TMDL. The Lake Chaplain TMDL was disapproved by U.S. EPA based on the margin of safety and reasonable assurance. The disapproval of the margin of safety was based on two identified deficiencies: (1) it was determined that the implicit margin of safety was inadequate because a segment-by-segment analysis revealed that four of the nine segments were not covered by the implicit margin of safety and (2) that model predictions showed significantly less than a 95% chance of meeting criteria in eight of the nine segments and therefore provided no margin of safety for eight of the nine segments. The analysis used by the department in the NE Lakeshore TMDL provides an implicit margin of safety for every reach.

The other reason U.S. EPA cited for the disapproval was based reasonable assurance and 40 C.F.R. §130.2(i), "[i]f best management practices or other nonpoint source pollution controls make more stringent load allocations practicable, then wasteload allocations can be made less stringent." U.S. EPA further wrote, "Most of the WLAs for treatment plants in the final TMDL were based on the plants' design flows with effluent concentrations of 0.6 mg/l or 0.8 mg/l of phosphorus (depending on the type of facility), well above levels that would otherwise be required in the absence of nonpoint source load reductions, and well above what was technologically feasible at the time. Nineteen of the smallest facilities were given WLAs based on a much less stringent effluent concentration of 5.0 mg/l."

It is important to note that the NE Lakeshore TMDL is not holding any of the point sources at their current effluent limits, making wasteload allocation less stringent, or setting wasteload allocations that result in phosphorus concentrations anywhere near 5.0 mg/L. Rather the wasteload allocations in the NE Lakeshore TMDL result in equivalent 6-month concentrations, based on design flows, of between 0.05 and 0.36 mg/L with most municipal treatment plants around 0.20 mg/L. These equivalent effluent concentrations are orders of magnitude lower than those contained in the Lake Champlain TMDL. This difference becomes even more significant when considering that the wasteload allocations for the Lake Champlain TMDL were to meet criterion ranging between 0.01 and 0.054 mg/L while most of the wasteload allocations in the NE Lakeshore TMDL are set to meet either 0.75 or 0.10 mg/L total phosphorus.

The allocation process employed in the Lake Champlain TMDL provided point sources with higher effluent limitations based on presumed nonpoint reductions while the NE Lakeshore TMDL assigns significant reductions to both point and nonpoint sources. In addition, NR 217.16 outlines effluent limit requirements for point sources should progress not be made in reducing nonpoint loads.

As the comment notes, additional reductions for point sources will come at a significant expense and the TMDL clearly shows that further reductions, through assigning wasteload allocations equivalent to zero for municipal and industrial wastewater treatment facilities, will not attain water quality standards.

In addition, U.S. EPA Guidance[1] allows for voluntary and incentive-based approaches to be used in the reasonable assurance section.

1. "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)", U.S. EPA, August 8, 1997. https://www.epa.gov/sites/default/files/2015-10/documents/2003_10_21_tmdl_ratepace1997guid_0.pdf

The Draft TMDL does not establish specific monitoring activities as part of its implementation plan.

28) According to the U.S. EPA, a TMDL implementation plan 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 standard."[23]

The TMDL lacks meaningful information on the implementation planning process, including what criteria will be monitored and evaluated, and how that evaluation will result in an implementation plan that does more than the status quo of existing efforts. For example, there is no timeline for implementation or accountability, or any interim reduction targets; nor have any metrics been identified to show whether actual progress is being made. An adequate implementation plan should also include flexibility to account for changes in scientific understanding or factual, on-the-ground realities that could impact the effectiveness of the TMDL in the future. We appreciate the openness and transparency that has been provided to the public throughout the TMDL development process, and hope that as WDNR further develops the implementation plan, the public will have ample opportunity to review and respond to the implementation as it goes through development and ultimately execution.

Response: The TMDL does not contain an implementation plan because U.S. EPA does not require an implementation plan to be submitted as part of the TMDL submittal package nor does it approve the implementation plan; however, an implementation plan is under development and completed portions can be added to the reasonable assurance section of the final TMDL report.

Regarding the specific point of a monitoring plan, a plan has been under development; however, it was not included in the TMDL report. The department has been collecting long term trend (LTT) river monitoring at the following locations:

- *Kewaunee River at County Road F*
- *Manitowoc River at south of Waldo Blvd*
- *Sheboygan River at Indiana Ave & 36th St. - Esslingen Park*

Water quality samples are collected at these sites year-round (except during winter/ice conditions) on a monthly basis and include the following parameters: pH, alkalinity, conductivity, turbidity, chloride, chlorophyll a, total suspended solids, orthophosphate, total phosphorus, ammonia, nitrate + nitrite, total Kjeldahl nitrogen, and E. coli. The department will continue to monitor the three LTT river sites following the same protocol outlined above into the foreseeable future.

In addition to LTT river sites, the department has been and will continue to monitor two long term trend wadable stream sites.

- *Branch River at North Union Road*
- *Pine Creek at County Road T*

The LTT wadable stream sites are sampled once a year (summer field season). The water quality parameters include chloride, total phosphorus, nitrate + nitrite, ammonia, total nitrogen, and total suspended solids.

In addition to these sites, 12 additional locations will be monitored. In 2023, the department initiated a long-term volunteer surface water monitoring program in the NE Lakeshore TMDL study. Volunteers were recruited and trained to follow department sampling protocol for the collection of monthly samples from May through October [i.e. growing season] for: TP, DRP, TSS, TN, and field measurements of turbidity and flow. Following department protocols the samples will be shipped to the State Lab of Hygiene for analyses.

Department streams biologists selected 12 locations for the program's first year. The goal of the program is to collect meaningful data over the next 20 years, and to engage the public on water quality issues. The programmatic goal is to add additional monitoring locations and recruit additional volunteers as awareness of the program grows. As of 04/19/23, enough volunteers for the 2023 sampling season have been recruited. Monitoring will begin in May 2023. The 12 sites are:

Kewaunee Model Basin

- *Silver Creek at Willow Road*
- *Kewaunee River at Hillside Road*
- *East Twin River at Steiners Corners Road*
- *West Twin River at County Road V*

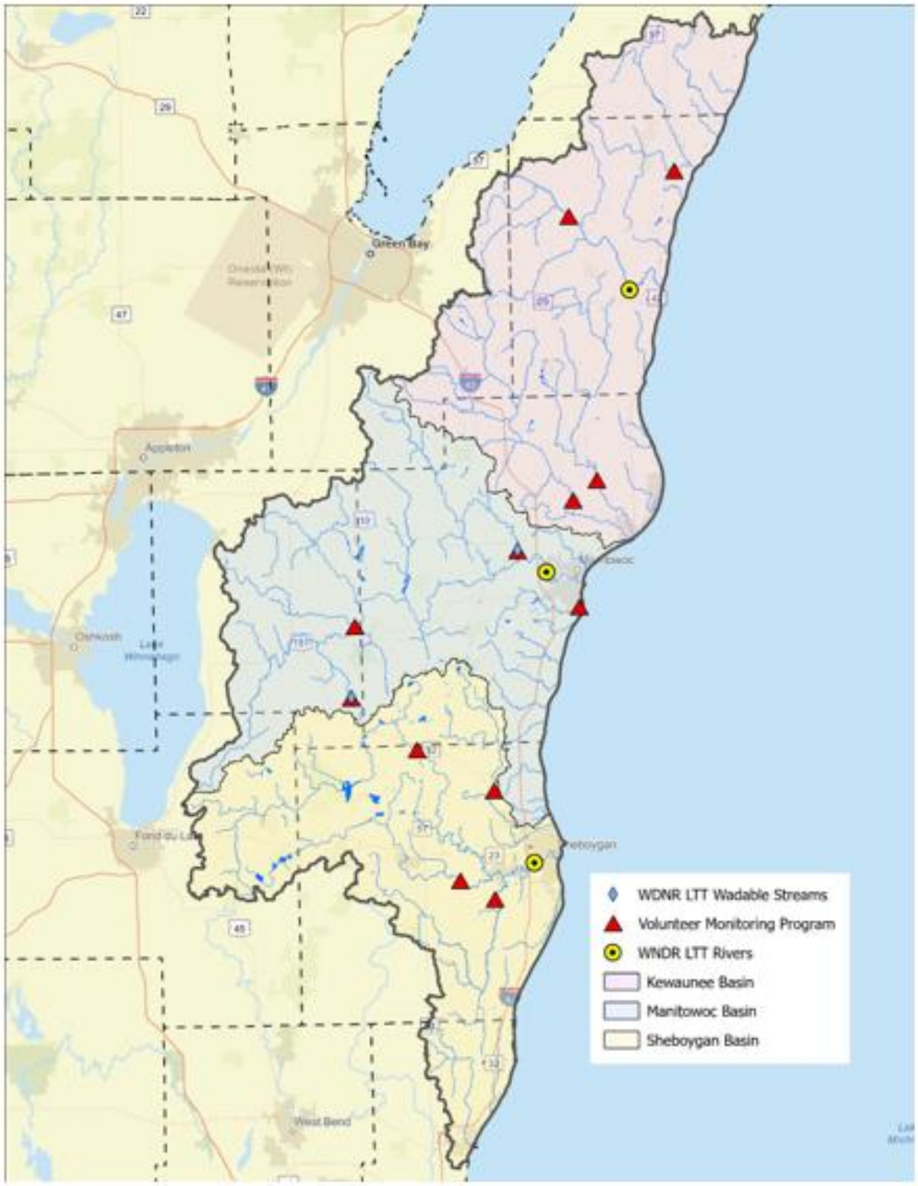
Manitowoc Model Basin

- *Branch River at North Union Road*
- *South Branch Manitowoc River at Lemke Road*
- *Silver Creek at County Road LS*
- *Pine Creek at County Road T*

Sheboygan Model Basin

- *Sheboygan River at State Highway 57*
- *Onion River at Ourtown Road*
- *Pigeon River at State Highway 42*
- *Mullet River at Sumac Road*

Below is a map of the monitoring locations for the 2023 monitoring season.



WDNR surface water monitoring locations in the Northeast Lakeshore TMDL [April 2023].

Watershed specific surface water monitoring will be conducted in the NEL TMDL study area as warranted. Based on the information/data received from participating implementation partners, the department will track the level of implementation occurring throughout the NEL TMDL study area. By tracking the amount of implementation activities occurring, the department can effectively plan the use of existing state resources and/or apply for external funds [i.e., grants] if available for monitoring activities, including staff for sample collection and/or laboratory analyses of the samples. As total phosphorus and TSS reductions goals/targets are achieved, the department will develop and implement a watershed specific monitoring plan to evaluate water quality in relation to water quality criteria.

The department will be responsible for de-listing any 303(d) waterbodies in accordance with WisCALM (https://dnr.wisconsin.gov/topic/SurfaceWater/WisCALM.html) listing and delisting requirements and may rely on biological confirmation in addition to chemical parameters. Typically, these watershed specific evaluations conducted by the department are known as Targeted Watershed Assessments (TWA).

As dictated by the WPDES permits, wastewater facilities are required to monitor and report their effluent values to the WDNR monthly. Implementation to address agricultural nonpoint sources is typically conducted at a HUC12 scale watershed or smaller; and is usually proceeded by the development of a Nine Key Element Plan (9KEP). Currently there are five approved 9KEPs, with two 9KEPs under development in the NEL TMDL area. Each of the 9KEPs have a monitoring strategy for their respective watershed.

29) As it stands, the TMDL contains little specificity and no accountability framework, particularly with respect to monitoring nonpoint sources. The Draft TMDL asserts that “[t]racking the implementation of nonpoint source pollution reduction practices” is “challenging,” and that “[t]hese challenges become even greater in the context of point source permit programs that require NPS partnerships such as adaptive management, water quality trading and the multi-discharger variance.” Without explaining how it will track nonpoint source reductions, WDNR points to a database system called BITS - which is “currently under development”- that will “allow[] externals to submit information.” This single paragraph about BITs does not define what “externals” are, or what type of “information” they will be allowed to submit, let alone explain how that information will be used to track whether the TMDL is working to actually reduce pollution from nonpoint sources. See Draft TMDL at 108. The Draft TMDL blandly promises that “[a] post-implementation monitoring effort will determine the effectiveness of the implementation activities associated with the TMDL.” But the specifics are notably absent, with the TMDL acknowledging that monitoring will only occur “as staff and fiscal resources allow” (Draft TMDL at 107) and stating that waterbodies “may be monitored on a rotational basis. . . .” (id. at 108).

Response: Additional text has been added to the TMDL report's reasonable assurance section; however, as addressed in previous comments the TMDL does not have a detailed implementation plan because the more detailed level of planning occurs at the HU12 and 9 Key Element planning level and is ongoing.

Most of the nonpoint source pollution reduction programs require external entities (counties, permittees, consultants, and others) to submit data regarding how they are using program funds. These funds are intended to reduce NPS pollution and to meet state soil and water standards through the implementation of management practices. To assist in the tracking and reporting of this data the BMP Implementation Tracking System (BITS) was developed (https://dnr.wisconsin.gov/topic/nonpoint/bmptracker). BITS is a web portal that efficiently facilitates this data submission and analysis, including the spatial component. It also allows the department to better track and demonstrate progress towards reaching nutrient reduction goals related to TMDLs, Statewide Nutrient Reduction Strategy, and other department and U.S. EPA *reporting requirements. BITS contains five separate modules with additional modules planned to accommodate other programs.*

- *Multi-Discharger Phosphorus Variance (MDV): Last updated in December of 2022, this module is for submitting information regarding nonpoint projects installed as part of the MDV program including plans and annual reports (https://dnr.wisconsin.gov/topic/Wastewater/phosphorus/StatewideVariance.html).*
- *Agricultural Targeted Runoff Management (TRM): This module was relapsed in March of 2021 and is used to submit final reports for TRM Grants (https://dnr.wisconsin.gov/aid/TargetedRunoff.html).*
- *Notice of Discharge (NOD): This module was released in August of 2021 and is used to submit final reports for NOD Grants (https://dnr.wisconsin.gov/aid/NOD.html).*
- *Urban Nonpoint Source Construction (UNPS-C): This module was released in September of 2022 and tracks final reports for UNPS Construction Grants (https://dnr.wisconsin.gov/aid/UrbanNonpoint.html).*
- *Urban Targeted Runoff Management (Urban TRM): The Urban Targeted Runoff Management (Urban TRM) module was released on Sept. 26, 2022. Use this module to submit final reports for Urban TRM grants (https://dnr.wisconsin.gov/aid/UrbanNonpoint.html).*

The response to comment 28 layouts the general TMDL monitoring framework to track broader trends within the NE Lakeshore TMDL study area. Additional, more targeted monitoring will occur on a rotational basis as reduction goals are achieved and as part of 9 Key Element Plans. The department has limited staff resources and funds for monitoring, so to optimize the available resources monitoring will be conducted once activities have been implemented at sufficient levels to detect a change in water quality parameters. This can be determined by evaluating the level of implementation and associated reductions achieved relative to the TMDL load allocation.

30) Recent scholarship underscores the need to collect in-stream data in CAFO-heavy areas such as the TMDL region. According to a recent study by researchers from Marquette University and University of Wisconsin, the expansion of CAFOs in the Sugar River region had a significant impact on TP loads downstream: "Compared to upstream TP loads, those downstream from the CAFOs increased by 91% after the expansions – over four times that of concentration increases – implying that the rate of downstream phosphorus transfer has increased due to CAFO expansion."[24] But the TMDL monitoring plan will not likely capture this type of information, which could help guide targeted efforts to reduce P loading in specific geographic areas.

Response: The goal of the study referenced in this comment was to quantify if three CAFOs had an impact on Sugar River TP concentrations. The authors built empirical models that intended to show treatment effects pre- and post-CAFO expansion, and the authors' interpretation of the results were that two of the three CAFOs in the study had a significant impact. The department reviewed the article and had concerns about the validity of the results:

A. *The locations of the CAFOs (located up or downstream from a monitoring station) and whether the agricultural operation became a permitted CAFO before or after a sampling event were the primary variables used to draw the conclusion that permitted CAFO expansion leads to increases in TP. The authors use the p-value of an interactive term on these two variables to show statistical significance. The two variables in the interactive term are:*

   I. *A binary term representing whether the CAFO was up or downstream of a TP sample.*
   II. *A binary term representing whether the sample was taken pre- or post-expansion of the CAFO.*

   This interactive term represents only four conditions (two CAFOs under pre- and post- permitted expansion), which is not sufficient for characterizing changes in water quality for 40 monitoring sites across a 780 km^2 watershed. Changes in TP concentrations could have resulted from any number of other unaccounted for sources in between the two CAFOs (of the three where statistical significance was found) and each monitoring site, and therefore any statistical correlation found between this interactive term and the TP response variable is likely a spurious correlation. Although this is a creative solution for simulating an experimental trial, it is not appropriate for characterizing change across a large drainage basin.

B. *This paper further argues that the above correlations can be used to imply that permitted expansion of CAFOs* cause *increases in TP concentration. This simply implies correlation equals causation. This is inappropriate for three reasons:*

   I. *The model structure has a high likelihood of generating spurious correlations due to reasons outlined above.*
   II. *The authors' interpretations were drawn from empirical models and therefore cannot be used to infer causation.*
   III. *It is nearly impossible to construct a true experimental design across a large watershed that would be sufficient for assessment of causation.*

C. *The authors state long-term increasing trends in flow and TP data on the Sugar River at Brodhead, but this contradicts their own data as well as comprehensive USGS studies of the entire period of flow record (over 100 years). The department's LTT monitoring data at Brodhead show a continuous decline in flow-corrected concentrations of both TP and TSS since 1989 using the WRTDS model[1] (Weighted Regression on Time, Discharge, and Season—a far more robust model for detecting change in water quality over time). A separate study from USGS that analyzes streamflow at Brodhead[2] found that even with increasing trends in annual precipitation, peak flows have decreased and baseflow has increased, leading to the conclusion that better agricultural practices have resulted in improvements in rainfall infiltration.*

D. *The authors use simple averages of the TP grab-sample data from citizen monitoring sites, including values flagged for having errors and sample expiration. The authors use watershed area ratios to scale flow data from the Sugar River at Brodhead to the grab-sample locations which does not account for actual land use or other conditions which could influence hydrology. The "upstream" and "downstream" locations from the CAFOs are often miles upstream and downstream from the three CAFOs, with hundreds of square miles of additional watershed areas between the CAFOs and monitoring sites.*

E. The authors present no analysis of variance or analyses of residuals. This is something that is normally conducted with an empirical study of this type. There is also no documentation on the degrees of freedom that that are they are utilizing. There are also several assumptions and opinions presented as fact, with the cited supporting literature not clearly supporting the claim.

F. The authors further imply that TP in the Sugar River is now on an upward trend, since the CAFOs were permitted, but that can only be arrived at if one cherry-picks the water quality monitoring record. The full long-term trend record shows a statistically significant decreasing concentration of TP and TSS, despite increasing rainfall. In truth, water quality is improving over the period of record, with concentrations now very closely approaching the water quality criteria.

1. https://wisconsindnr.shinyapps.io/riverwq/
2. Gebert, W. A., Garn, H. S., Rose, W. J., 2015, Changes in Streamflow Characteristics in Wisconsin as Related to Precipitation and Land Use. U. S. Geological Survey Report 2015-5140, version 1.1, January 2016.

31) As it stands, the Draft TMDL's implementation plan—to the extent one has been articulated—relies on hoped-for funding and staffing, and enrollment in existing programs, not on measurable progress in water quality improvements. Given that the TMDL does not include a comprehensive implementation plan or any clear plan for monitoring, the Draft TMDL does not meet Wisconsin's statutory obligations to provide reasonable assurances that reduction goals will be met.

We urge WDNR to develop an actionable implementation plan with specific and meaningful actions, schedules and monitoring plans. At the very least, a plan must include upstream and downstream monitoring near CAFOs to begin to get an understanding of how much waste is being discharged from these facilities. Tile drain monitoring should also be incorporated.

Response: The comment incorrectly refers to statutes. The requirements governing TMDL development are not in state statute but rather in administrative code, ch. NR 212 to be specific. There are no explicit requirements in ch. NR 212, Wis. Adm. Code, for a monitoring plan or implementation plan to be included in the TMDL. Much of the implementation will occur through WPDES permits and supporting guidance. For example, the permits for MS4s require both a plan and compliance schedule for meeting TMDL allocations and reductions. The TMDL's reasonable assurance section lays out strategies for nonpoint compliance with additional detailed information on agricultural baselines and targets laid out in Appendix M.

The reasonable assurance section adheres to U.S. EPA Guidance[1] which allows for voluntary and incentive-based approaches.

> *"For 303(d)-listed waters impaired solely or primarily by nonpoint sources, TMDL implementation may involve individual landowners and public or private enterprises engaged in agriculture, forestry, or urban development. The primary implementation mechanism will generally be the*

State section 319 nonpoint source management program coupled with State, local, and Federal land management programs, and authorities."

"For example, voluntary, incentive-based approaches at the State and local level can be used to implement management practices for controlling nonpoint source pollution. In addition, local regulations or ordinances related to zoning, land use, and storm water runoff are often used to abate polluted runoff."

Under s. NR 212.73(5), Wis. Adm. Code, the reasonable assurance section can factor in considerations including, but not limited to, receiving water characteristics including persistence, behavior, and ubiquity of pollutants of concern; the types of remedial activities necessary; and available regulatory and non-regulatory controls. It is important to note that these considerations revolve around the length of time it may take to meet water quality standards and not the core TMDL tenant that the aggregate sum of load allocations and wasteload allocations meets the assimilative loading capacity.

Chapter NR 212, Wis. Adm. Code, states that monitoring data shall be used for both the development of the TMDL and to track implementation and progress toward meeting water quality standards. Monitoring data was used extensively in the TMDL development process, and a monitoring plan has been developed to track implementation progress. Delisting procedures layout in WisCALM will be utilized to access waters for compliance with water quality standards.

The comment's reference to monitoring above and below CAFOs likely stems from the false conclusions in the article that was discussed in comment 30. There are ongoing studies on tile drainage and ongoing pilot studies funded through the Great Lakes Restoration Initiative to both better quantify the contribution from tile drainage and management practices to control and treat pollutant discharges from tile drainage. In addition, compared to the Maumee the overall amount of tile drained fields in the NE Lakeshore TMDL study area is significantly less.

1. "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)", U.S. EPA, August 8, 1997. https://www.epa.gov/sites/default/files/2015-10/documents/2003_10_21_tmdl_ratepace1997guid_0.pdf

32) Suggested text edits from U.S. EPA.

+ p. 19, Section 1.4, first sentence: Please add a period to the end of this sentence.

+ p. 22, sentence at top of page: The draft NEL TMDL mentions four uses; Fish and Aquatic Life, Recreation, Wildlife and Public Health and Welfare. Two sentences below, the document mentions, All five designated uses…, what is the fifth use? Or should that read as All four designated uses?

+ p. 26, Section 2.4.3, first sentence: Please fix spelling on "numric" to numeric.

+ p. 27, Section 3.1, 2nd paragraph, first and third sentences: The first and third sentences of this paragraph are repetitive. Please consider deleting one of them.
&
The second and fourth sentences (with three bullet points) are also repetitive. Please consider deleting one of them

+ p. 34, 2nd sentence in paragraph: Wisconsin mentions "This process is described in Appendix G." Should this be Appendix J instead of Appendix G?

+ p. 38, 2nd and 3rd paragraphs: It appears that the 2nd and 3rd paragraphs are repeats of each other. Please revies accordingly.

+ p. 52, Figure 9: Re: the labeling in the first box for Subbasin A. Should this be $L_{HRU, A}$ instead of $L_{HRU, B}$?

+ p. 55, Section 3.6.2.2, first two sentences: Please check on the first few sentences of this section, the text includes the title of Figure 11 and breaks up the existing paragraph.

+ p. 80, 2nd to last sentence on page: Is there supposed to be a permit number inserted into the parenthesis? I wasn't sure if (Permit number) was a placeholder for an addition of a WI specific permit number.

Response: Thank you for catching these errors and suggesting appropriate edits. The changes have been made.

References and Citations for Submitted Comments:

1) Ni, X., Yuan, Y., Liu, W. (2020). Impact factors and mechanisms of dissolved reactive phosphorus (DRP) losses from agricultural fields: A review and synthesis study in the Lake Erie basin. *J. of Science of the Total Environment*, 714 (citing other scholarly articles and noting that "[w]hen addressing causes of the re-eutrophication of Lake Erie, researchers have shifted their focus from total phosphorus (TP) to dissolved reactive phosphorus (DRP)."). **(Attachment 1);** *see also* Ohio's TMDL for the Maumee River in the Western Basin of Lake Erie, at 3, *available at* https://epa.ohio.gov/static/Portals/35/tmdl/MaumeeNutrient/MaumeeTMDL-OfficialDraft.pdf ("Research shows that the proportion of total phosphorus load that is in the dissolved form has significantly increased since the late 1990s (Rowland et al., 2021); this increase has been related to the modern proliferation of HABs.")

2) Annex 4 Objectives and Targets Task Team Final Report to the Nutrients Annex Subcommittee, May 11, 2015, at 2, *available at* https://binational.net/wp-content/uploads/2015/06/nutrients-TT-report-en-sm.pdf.

3) *Id.*

4) (**Attachment 1)**

5) Baker, D.B., Confesor, R., Ewing, D.E., Johnson, L.T., Kramer, J.W., Merryfield, B.J. (2014). Phosphorus loading to Lake Erie from the Maumee, Sandusky and Cuyahoga rivers: The importance of bioavailability, *Journal of Great Lakes Research*, 40 (3) 502-17. **(Attachment 2)**

6) Meyer, A., Raff, Z, and Porter, S. (July 13, 2022). Remotely Sensed Imagery Reveals Animal Feeding Operations Increase Downstream Dissolved Reactive Phosphorus (prepublication) at 7 (**Attachment 3**); *see also* Williamson, T.N. et al (Jan. 2019). Delineation of tile-drain networks using thermal and multispectral imagery—Implications for water quantity and quality differences from paired edge-of-field sites, *Journal of Soil and Water Conservation*, 74 (1) 1-11, *available at* https://www.jswconline.org/content/jswc/74/1/1.full.pdf.

7) Green, David. *Frank Gibbs: Liquid Manure is Too Wet*, State Line Observer (2006). **(Attachment 4).** *See also* Shipitalo, et al. *Potential of Earthworm Burrows to Transmit Injected Animal Wastes to Tile Drains*, Soil Sci. Soc. Am. J. 64:2103–2109 (2000). **(Attachment 5)**.

8) Smith, D.R., et al. (2015). Phosphorus losses from monitored fields with conservation practices in the Lake Erie Basin, USA. *AMBIO*, 44 (Supplement 2), 319-331, doi:10.1007/s13280-014-0624-6. *See also* Hoorman, J.J. et al. (Nov. 2004). "Liquid Animal Manure Application on Drained Cropland: Preferential Flow Issues and Concerns Workshop Summary", at p. 4, *available at* https://www.academia.edu/37500316/LIQUID_Animal_Manure_Application_on_Drained_Cropland_Preferential_Flow_Issues_and_Concerns_Workshop_Summary

(Recommending that systematically tiled fields receiving liquid manure should be tilled prior to liquid manure application and cautioning against injection of liquid manure on no-till fields).

9) Smith, D., King, K. & Williams, M. (2015). What is causing the harmful algal blooms in Lake Erie? *Journal of Soil and Water Conservation*, 70 (2) at 28A

10) https://dnr.wisconsin.gov/topic/CAFO/NutrientManagementPlan.html

11) See U.S. EPA Region 5 Comments on Ohio's Preliminary Modeling Results for the Maumee Watershed Nutrient TMDL, dated 08/17/2022, at 4 **(Attachment 6).**

12) https://dnr.wi.gov/botw/SetUpBasicSearchForm.do.

13) Even if P *concentration* from leachate is "indirectly accounted for in the WDNR analysis through adjustment of the manure P2O5 concentration" (Appendix G at 5), the *volume* of leachate is still unaccounted for.

14) Raff, Z., and Meyer, A (2021). CAFOs and Surface Water Quality: Evidence from Wisconsin, *Amer. J. Agr. Econ.* at 1 **(Attachment 7).**

15) Waller, D., Meyer, A., Raff, Z., Apfelbaum, S. (January 17, 2021). Shifts in precipitation and agricultural intensity increase phosphorus concentrations and loads in an agricultural watershed, *J. of Env. Mgmt*, at 1 **(Attachment 8).**

16) U.S. EPA, Guidance for the Implementation of Water Quality-Based Decisions: The TMDL Process (April 1991), EPA 440/4-91-001, at 15, *available at* https://nepis.epa.gov/Exe/ZyPDF.cgi/00001KIO.PDF?Dockey=00001KIO.PDF;

R.C. 6111.562(B)(5). *See also* 33 U.S.C. § 1313(d)(1)(C); U.S. EPA, Protocol For Developing Nutrient TMDLs (Nov. 1999) EPA 841-B-99-007, at 9-2, *available at* https://nepis.epa.gov/Exe/ZyPDF.cgi/20004PB2.PDF?Dockey=20004PB2.PDF ; U.S. EPA, Supplemental Information for TMDL Reasonable Assurance Reviews (Feb. 15, 2012), https://www.epa.gov/sites/default/files/2020-07/documents/supplemental_information_for_tmdl_reasonable_assurance_reviews_feb_2012.pdf

17) *Id.*

18) *Am. Farm Bureau Fed'n v. U.S. E.P.A.*, 984 F. Supp. 2d 289, 297 (M.D. Pa. 2013), aff'd, 792 F.3d 281 (3d Cir. 2015).

19) U.S. EPA, Correspondence Re: Lake Champlain Phosphorus TMDL Disapproval (January 24, 2011) *available at* https://www.epa.gov/sites/production/files/2015-09/documents/2002-lake-champlain-tmdl-disapproval-decision.pdf.

20) https://widnr.widen.net/s/vbhv2qsbhs/largedairycafo-general-wpdespermit.

21) Alliance for the Great Lakes, Western Lake Erie Basin Drinking Water Systems: Harmful Algal Bloom Cost of Intervention (May 2022), *available at* https://greatlakes.org/wp-content/uploads/2022/05/FINAL-COI-Report-051622.pdf.

22) *See* U.S. EPA, Correspondence Re: Lake Champlain Phosphorus TMDL Disapproval (January 24, 2011) *available at* https://www.epa.gov/sites/production/files/2015-09/documents/2002-lake-champlain-tmdl-disapproval-decision.pdf.

23) U.S. EPA, Guidelines for Reviewing TMDLs under Existing Regulations issued in 1992 (May 20, 2002), at p.5, *available at* https://www.epa.gov/sites/default/files/2015-10/documents/2002_06_04_tmdl_guidance_final52002.pdf.

24) Waller, D., Meyer, A., Raff, Z., Apfelbaum, S. (January 17, 2021). Shifts in precipitation and agricultural intensity increase phosphorus concentrations and loads in an agricultural watershed, *J. of Env. Mgmt*, at 1 **(Attachment 8).**