TMDL: Lower Fox River Basin, Wisconsin
Date: MAY 18 2012

DECISION DOCUMENT FOR LOWER FOX RIVER BASIN, WI TMDL

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

On August 31, 2011, EPA received the Wisconsin Department of Natural Resources (WDNR)'s TMDL Report for the Lower Fox River Basin and Lower Green Bay.[1]

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

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

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

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

(1) the spatial extent of the watershed in which the impaired waterbody is located;
(2) the assumed distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources;
(4) present and future growth trends, if taken into consideration in preparing the TMDL (e.g., the TMDL could include the design capacity of a wastewater treatment facility); and

[1] Wisconsin Department of Natural Resources cover letter enclosing the Total Maximum Daily Load and Watershed Management Plan for Total Phosphorus and Total Suspended Solids in the Lower Fox River Basin and Lower Green Bay, prepared by The Cadmus Group, Inc. (U.S. EPA contract EP-C-08-002), March 2012 (hereafter TMDL Report).

(5) an explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments; chlorophyll _a_ and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

Comment:

The Lower Fox River, its tributaries, and Lower Green Bay are impaired waterbodies within the Lower Fox River Basin (LFR Basin) in northeastern Wisconsin (Figure 1). The Wisconsin Department of Natural Resources (WDNR) placed the stream segments listed in Table 1 and shown in Figure 1, below, on the State of Wisconsin 303(d) Impaired Waters List. The impaired stream segments are listed as impaired due to degraded habitat caused by excessive sedimentation and low dissolved oxygen caused by high phosphorus concentrations. Six stream segments are impaired for total phosphorus (TP) only, three stream segments are impaired for total suspended solids (TSS) only, and 17 stream segments are impaired for TP and TSS. The Lower Green Bay is impaired for TP and TSS. Accordingly, this TMDL is comprised of 45 stream segment designations, including 21 TSS TMDLs (17 + 3 + 1), and 24 TP TMDLs + (17 + 6 + 1) = 45.

WDNR's TMDL submittal excludes those portions of the Oneida Tribe of Wisconsin's Reservation, which are located within the LFR Basin, and which the State explains are not subject to WDNR's TMDL program.[2] This includes Trout Creek and those portions of Duck and Dutchman creeks within the reservation boundaries. To implement the TMDLs for the LFR Basin and Lower Green Bay, load reduction goals for reservation waters, including TP and TSS for Trout Creek and the on-reservation portions of Duck Creek and Dutchman Creek were calculated and then subtracted from the State's TMDL calculations for the rest of the Basin. EPA concurs with this approach and accordingly, our decision addresses only the portion of the Basin not included within the boundaries of the Oneida Reservation.

As part of the development of this TMDL project, the Oneida Tribe coordinated with WDNR in the development of its own Watershed Management Plan (WMP) for on-reservation sources. While the Oneida Tribe does not have federally approved water quality standards, nor authorization to implement a TMDL program pursuant to CWA 303(d), the TMDL Report notes that "Trout Creek and portions of Duck and Dutchman Creeks exhibit similar low dissolved oxygen and degraded habitat impairments due to excess phosphorus and sediment loading."[3] While the TMDL Report explains that the State's federally approved water quality standards do not extend to Indian country, WDNR and the Oneida Tribe worked together to establish a framework for voluntary reductions for on-reservation sources that would complement the State's TMDL for the Basin.[4] The Oneida WMP includes load reduction goals for TP and TSS for both point and nonpoint sources. Also included in the plan are one Concentrated Animal Feeding Operation (CAFO), two municipal wastewater treatment facilities (WWTF), and eight municipal separate storm sewer systems (MS4s). Load reduction goals for on-reservation sources are expected to be implemented through voluntary agreements that will complement the State's efforts outside the reservation.

Accordingly, although WDNR included calculations for both nonpoint source reductions and point source reductions for on-reservation waterbodies, those load reductions are not part of this TMDL

[2] TMDL Report, pp. 2-3, and depicted at Figure 3.
[3] TMDL Report, p. 3.
[4] TMDL Report, p. 3.

approval, as more specifically explained below. The load reductions attributable to the on-reservation stream segments that are identified by WDNR in the TMDL Report will function only as load reduction goals as detailed in the Oneida WMP. EPA concurs with this approach for this multi-jurisdictional watershed.

Figure 1. The Lower Fox River, its tributaries, and Lower Green Bay are impaired waterbodies within the Lower Fox River Basin (LFR Basin) in northeastern Wisconsin (Source TMDL Report, p. 13, Figure 3.)

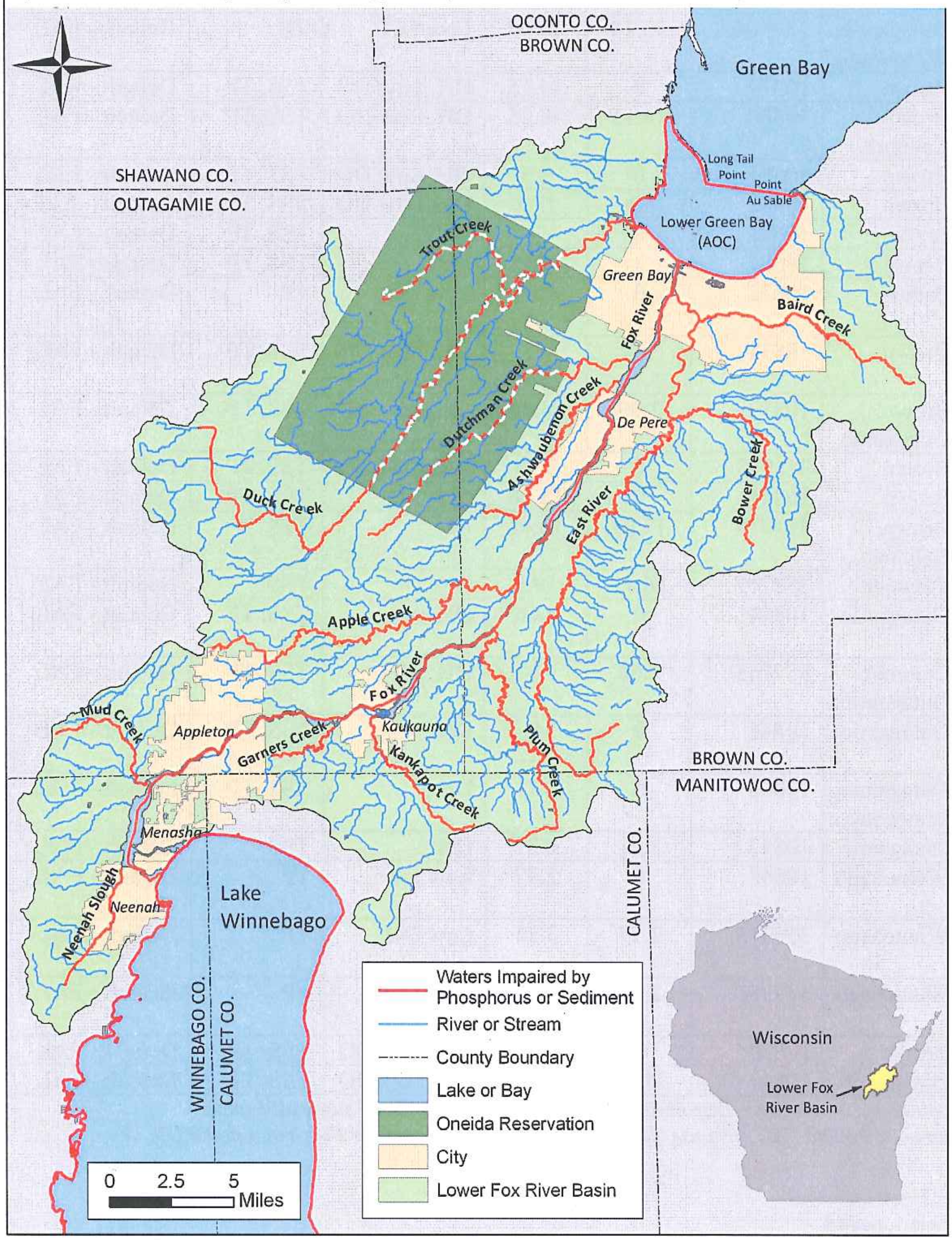

Table 1. Impaired segments on Wisconsin's 2008 303(d) list that are included in the Lower Fox River Basin and Lower Green Bay TMDL. This excludes waters within the exterior boundaries of the Oneida Nation of Wisconsin's Reservation.[5]

Waterbody Name	County	WATERS ID	Start Mile	End Mile	Impairments	Pollutants	Designated Use
Green Bay	Brown	357876	21 mi^2		DH, Low DO	TSS, TP	Default - FAL
Fox River	Brown	10678	0	7.39	DH, Low DO	TSS, TP	Default - FAL
Fox River	Brown, Outagamie	357301	7.39	32.18	Low DO	TP	Default - FAL
Fox River	Outagamie, Winnebago	357364	32.18	40.09	Low DO	TP	Default - FAL
East River	Brown	10679	0	14.15	DH, Low DO	TSS, TP	Default - FAL
East River	Brown, Calumet	10680	14.15	42.25	DH, Low DO	TSS, TP	Default - FAL
Baird Creek	Brown	10681	0	3.5	DH, Low DO	TSS, TP	Default - FAL
Baird Creek	Brown	10682	3.5	13.1	DH, Low DO	TSS, TP	Default – FAL
Bower Creek	Brown	10683	0	3	DH	TSS, TP	Default - FAL
Bower Creek	Brown	10684	3	13	DH	TSS, TP	Default - FAL
Dutchman Creek	Brown	10832	0	4.04	Low DO	TP	Default - FAL
Ashwaubenon Creek	Brown	10834	0	15	DH, Low DO	TSS, TP	Default - FAL
Apple Creek	Brown, Outagamie	10839	3.99	23.88	DH, Low DO	TSS, TP	Default - FAL
Apple Creek	Brown	313933	0	3.99	DH, Low DO	TSS, TP	Default - FAL
Plum Creek	Brown	10841	0	13.86	DH	TSS, TP	Default - FAL
Plum Creek	Brown, Calumet	357670	13.87	16.42	DH	TSS	Default - FAL
Plum Creek	Calumet	357719	16.42	19.5	DH	TSS	Default - FAL
Kankapot Creek	Outagamie	10844	0	2.66	DH	TSS, TP	Default - FAL
Kankapot Creek	Calumet, Outagamie	357763	2.66	9.57	DH	TSS, TP	Default - FAL
Garners Creek	Outagamie	10845	0	5	DH	TSS, TP	Default - FAL
Mud Creek	Outagamie, Winnebago	10846	0	3.71	DH	TSS, TP	Default – FAL
Mud Creek	Outagamie	10847	3.71	6.87	DH	TSS	Default - FAL
Neenah Slough	Winnebago	10848	0	2.77	Low DO	TP	Default - FAL
Neenah Slough	Winnebago	357915	2.77	3.54	Low DO	TP	Default - FAL
Neenah Slough	Winnebago	357955	3.55	6.12	Low DO	TP	Default - FAL
Duck Creek	Brown	10850	0	4.96	DH, Low DO	TSS, TP	Default - FAL
Duck Creek	Outagamie	10851	25.69	39.46	DH, Low DO	TSS, TP	Default - FAL

DH = Degraded habitat *DO = Dissolved oxygen* *TSS = Total suspended solids*
TP = Total phosphorus *Default FAL = No use classification survey completed for Fish and Aquatic Life Use*

[5] TMDL Report, Table 1, page 4.

Location Description/Spatial Extent:

LFR Basin. The LFR Basin is 641 square miles (mi^2) in size and is located in northeast Wisconsin. The LFR Basin includes the following counties: Brown, Calumet, Outagamie, and Winnebago. The Oneida Tribe of Wisconsin's Reservation is comprised of 102.5 mi^2, 96.8 mi^2 of which are within the LFR Basin. As explained above, the State has excluded the Reservation from this TMDL submittal. Figure 1 above shows the location of the Oneida Reservation within the Lower Fox River (LFR) Basin. The LFR main stem originates from Lake Winnebago and drains to Green Bay, which is a part of Lake Michigan. The LFR main stem is 39 miles long, impounded by 12 dams, and navigable through 17 locks. Although the LFR main stem has impoundments along its stretch, the river is continually flowing and its flow is not impeded by the impoundments.

Lower Green Bay, Lake Michigan. Green Bay is partially separated from Lake Michigan by the Door County Peninsula. Not all of Green Bay is in the Lower Fox River Basin. The Lower Fox River Basin drains to Lower Green Bay, which is defined for the purposes of this TMDL as the southernmost end of Green Bay (21 mi^2), extending out to a line between Point Au Sable and Long Tail Point (see Figure 1 above). In addition, the boundary of the Lower Fox River Watershed was expanded to include those areas of land that also drain directly to Lower Green Bay, to account for all loading to that portion of Green Bay (Figure 1).

Population and Future Growth:

Most of the LFR Basin is urbanized; it is the second largest urbanized area in Wisconsin. The majority of the urbanized area is located along the LFR main stem and its tributaries. The Basin's population size is 404,000. A portion of the existing load for both TP and TSS has been set aside for future growth of point sources. One of the point source dischargers, GW Partners LLC (NPDES permit # 0001121) ceased operations. The TP and TSS load from that facility have been set aside as reserve capacity (6,362 lbs/yr for TP and 52,979 lbs/yr TSS).

WDNR did not include reserve capacity for future expansion of MS4 communities for two reasons: 1) Any potential growth of MS4 communities will likely take place through conversion of agricultural land to urban land, resulting in the reallocation of a portion of the LA to WLA since the new urban land would most likely be a part of a Municipal Separate Storm Sewer System (MS4); and, 2) New urban development and/or urban redevelopment in an MS4 community are required to meet performance standards under Wis. Admin. Code NR §151.004. The performance standards include requirements for the reduction of TSS loads, and meeting infiltration requirements.[6]

Land Use:

Table 2 presents the land uses in LFR Basin. Approximately 50% of the basin consists of agricultural land (including barnyards), 35% consists of urban land (regulated MS4 areas, non-regulated areas, and construction sites). Approximately 15% consists of natural areas, which WDNR considered background sources of phosphorus and sediment in the basin.[7]

[6] TMDL Report, pp. 24, 42 (Section 6.5.2).
[7] TMDL Report, p. 7.

Table 2. Land uses in LFR Basin, including the Oneida Reservation[8]

Land Use	Acres	% Land Use
Agriculture (includes barnyards)	202,580	50.2
Urban (non-regulated)	34,955	8.7
Urban (regulated MS4)	104,598	25.9
Construction sites	2,275	0.6
Natural areas (forests & wetlands)	59,249	14.7
Total	**403,657**	**100**

Problem Identification/Pollutant of Concern:

Total Phosphorus:
WDNR noted that the LFR Basin and Green Bay have had nuisance algal blooms, poor water quality, and low DO for many years. This has led to a poor fish and macroinvertebrate community and reduced recreational use. WDNR determined that TP was the pollutant of concern which must be addressed to mitigate these impairments. Reduction of the TP loads, along with a reduction in related TSS loads, will improve water quality and return the waterbodies to the appropriate designated uses.[9]

WDNR evaluated TP datasets for the LFR, spanning 30 years, collected by the Green Bay Metropolitan Sewerage District's (GBMSD) ambient water quality monitoring program, and by University of Wisconsin-Green Bay (UWGB). WDNR focused its data evaluation with a beginning date of 1993 to eliminate the potential impacts from zebra mussels which invaded Green Bay in 1991 (Section 2.3.1 of the TMDL). WDNR found that summer (May to October) median TP concentrations between 1993 and 2008 ranged from 0.12 to 0.28 mg/L for LFR main stem to Lower Green Bay and 0.09 to 0.22 mg/L for Lower Green Bay.[10]

WDNR also evaluated TP datasets from the Lower Fox River Watershed Monitoring Program for the tributaries to the LFR main stem. The tributaries used were Apple Creek, Ashwaubenon Creek, Baird Creek, Duck Creek, and East River. WDNR found that summer median TP concentrations between 2004 and 2006 ranged from 0.2 to 0.31 mg/L in Apple Creek; 0.275 to 0.4 mg/L in Ashwaubenon Creek; 0.12 to 0.19 mg/L in Baird Creek; 0.16 to 0.195 mg/L in Duck Creek; and 0.18 to 0.355 mg/L in East River. WDNR did not have data from the remaining tributaries.[11]

Surrogate measures: To address the impairments, WDNR determined that phosphorus is the pollutant that must be addressed to attain the designated uses listed in Table 1 above. Phosphorus enters the stream mainly bound to soil particles that transport it during runoff from overgrazed pastures adjacent to the stream channel and nutrient rich manure spread within close proximity (e.g. 30 feet) of the stream. Phosphorus loading in water bodies can cause eutrophication of streams and reservoirs and is characterized by excessive plant growth, dense algal growth, and higher fluctuations of DO levels due to algal oxygen production during photosynthesis, consumption of oxygen during respiration at night, and bacterial consumption of oxygen in the decaying process of dead algae and plant material. Severe dissolved oxygen fluctuations stress fish and aquatic insects.[12]

[8] TMDL Report, Table 2, p. 8.
[9] TMDL Report, pp. 1-2.
[10] TMDL Report, p. 10.
[11] TMDL Report, pp. 10-11.
[12] TMDL Report, pp. 1-2.

Total Suspended Solids:
WDNR noted that the LFR Basin and Green Bay have had poor water quality, poor water clarity, and poor aquatic plant growth for many years. This has led to a poor fish and macroinvertebrate community and reduced recreational use. WDNR determined that sediment, in particular TSS, was the pollutant of concern to address these impairments. Reduction of the TSS loads, along with a reduction in related TP loads, will improve water quality and return the waterbodies to the appropriate designated uses.[13]

WDNR evaluated TSS datasets from the GBMSD ambient water quality monitoring program and UWGB for the LFR. As with TP, WDNR focused its data evaluation starting from 1993. WDNR found that summer TSS median concentrations (May to October) from 1993 to 2008 ranged from 26 to 62 mg/L for LFR to Lower Green Bay and 20.0 to 38.8 mg/L for Lower Green Bay.

WDNR evaluated TSS datasets from the Lower Fox River Watershed Monitoring Program for the tributaries. The tributaries are Apple Creek, Ashwaubenon Creek, Baird Creek, Duck Creek, and East River. WDNR found that summer median concentrations (May to October) from 2004 to 2006 ranged from 13 to 22 mg/L in Apple Creek; 22 to 34 mg/L in Ashwaubenon Creek; 5.4 to 20 mg/L in Baird Creek; 4.8 to 7.6 mg/L in Duck Creek; and 40 to 74.5 mg/L in East River.[14]

Surrogate measures: To address the degraded habitat impairments, WDNR determined that sediment (specifically TSS) is the pollutant that must be addressed to attain the designated use listed in Table 1. TSS consists of solid organic and inorganic materials suspended in the water. These include silt, plankton, algae and industrial wastes. Fine sediment covers the stream substrate and fills in pools, reducing the suitable habitat for fish and macroinvertebrate communities. Sedimentation of pools reduces the amount of available cover for juvenile and adult fish. Sedimentation of riffle areas reduces the reproductive success of fish by reducing the exposed gravel substrate necessary for appropriate spawning conditions. Sedimentation also increases turbidity, reducing light penetration necessary for photosynthesis in aquatic plants. Increased turbidity also reduces the feeding efficiency of visual predators and filter feeders, and lowers the respiratory capacity of aquatic invertebrates by clogging their gill surfaces.[15] To account for the organic portion of the TSS budget for the Lower Fox River, the TSS current loading included production of internal biotic solids (e.g., plankton) in the water column. Biotic solids were accounted for in the TMDL calculation. Biotic solids are produced in the water column in response to temperature, light, and nutrients.[16]

Source identification: WDNR identified numerous sources of TP and TSS in the Basin.

Total Phosphorus:
Point sources of TP in the Basin include municipal wastewater treatment facilities (WWTF) and industrial facilities. Phosphorus is a component of the effluent discharged from municipal WWTFs, and may be a component in industrial discharge. WDNR noted 14 municipal WWTFs and 20 industrial dischargers in the Basin. Stormwater discharge from municipal separate storm sewer systems (MS4) can contain phosphorus from erosion of urban lands from sources such as lawn fertilizer, pet and animal waste, and other organic material. A variety of sites regulated under general permits (i.e., construction, CAFOs) are also potential sources of phosphorus.

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[13] TMDL Report, p. 2.
[14] TMDL Report, p. 11.
[15] TMDL Report, p. 2.
[16] TMDL Report, pp. 11, 22-23.

Nonpoint sources are also significant contributors of phosphorus. Runoff from agricultural lands can contribute phosphorus, either from the land application of manure or chemical fertilizers. Agricultural tiles can exacerbate this situation as water enters the tiles and is channeled directly to waterbodies. Soils that are high in phosphorus (either naturally or from human activities) can erode and enter waterbodies. Once in the system, the phosphorus can dissolve into the water, and be available for use. Runoff from pasture lands near streams can contribute phosphorus. Urban stormwater runoff that is not regulated under an MS4 permit can also contain phosphorus from fertilizers and animal waste. Wildlife (geese, etc.) and runoff from forest lands are also natural background sources of phosphorus.[17]

Total Suspended Solids:
WDNR identified several sources of TSS in the watershed. Point sources include regulated stormwater, including from MS4s, where runoff from rain events can contain significant amounts of sediment. Runoff from construction sites and other point source dischargers can contribute sediment from precipitation events as well. Municipal WWTFs and industrial facilities are considered by WDNR to be relatively minor dischargers of TSS.

Nonpoint sources are also significant contributors of TSS. Runoff from agricultural lands can erode soils, and delivery of the sediment to surface waters can be increased by agricultural tiles, as explained above. Runoff from pasture lands near streams can contribute sediment, as animals churn up the soil or trample the banks of smaller streams. Urban stormwater runoff that is not regulated under an MS4 permit can also contain sediment washed off of the land surface. There are also natural background sources of sediment, as natural stream processes erode streambanks and stream channels.[18]

Tables 3 and 4 present current TP and TSS loadings from each source within the Basin. Agriculture accounts for nearly half of the total TP and TSS loadings in the Basin. Industrial discharges and municipal WWTFs are the next highest source of TP in the Basin, whereas urban runoff (regulated MS4s) is the next highest source of TSS. Further detail on nonpoint and point sources can be found in the TMDL Report, in Section 4.0, Source Assessment.

[17] TMDL Report, pp. 23-26.
[18] TMDL Report, pp. 23-26.

Table 3. Current TP loadings within the LFR Basin and including loading from sources located within the boundaries of the Oneida Reservation[19]

Source	Point or Nonpoint Source	Total Phosphorus (lbs/yr)	% TP current loading
Natural Background	Nonpoint	5,609	1.02
Agriculture (includes land application of manure from CAFOs)	Nonpoint	251,382	45.73
Urban (non-regulated)	Nonpoint	15,960	2.90
Urban (regulated MS4)	Point	65,829	11.98
Construction Sites	Point	7,296	1.33
General Permits (includes production areas from CAFOs)	Point	2,041	0.37
Industrial dischargers	Point	114,426	20.82
Municipal WWTFs	Point	87,160	15.86
TOTAL (in-Basin)		**549,703**	**100**

Table 4. Current TSS loadings within the LFR Basin and including from sources located within boundaries of the Oneida Reservation[20]

Source	Point or Nonpoint Source	Total Suspended Solids (lbs/yr)	% TSS current loading
Natural Background	Nonpoint	1,264,433	0.72
Agriculture (includes land application of manure from CAFOs)	Nonpoint	93,101,945	52.77
Urban (non-regulated)	Nonpoint	4,491,399	2.55
Urban (regulated MS4)	Point	31,505,733	17.86
Construction Sites	Point	7,015,420	3.98
General Permits (includes production areas from CAFOs)	Point	616,532	0.35
Industrial Dischargers	Point	2,435,778	1.38
Municipal WWTFs	Point	1,170,510	0.66
Biotic Solids	Nonpoint	34,833,037	19.74
TOTAL (in-Basin)		**176,434,787**	**100**

Out of Basin Sources: Sections 4.1.5 and 6.3 of the TMDL Report discuss out-of-Basin sources of TP and TSS to Lower Green Bay and the LFR Basin. WDNR determined that the Fox-Wolf Basin accounts for 43% of the TP load and 56% of the TSS load delivered to Lower Green Bay (at the outlet of the Lower Fox River main stem). WDNR determined that TP and TSS loads from Lake Winnebago (and the Upper Fox and Wolf Basins) must be reduced if the goals established by this TMDL are to be met. WDNR has accounted for and included a 40% reduction goal (286,782 lbs/yr) for TP loads entering the

[19] Table 6 and Figure 19, page 32, of the TMDL report. TP loading from sources located within the boundaries of the Oneida Reservation was excluded from the State's calculations for total Basin loading, as further explained below.

[20] Table 7 and Figure 20, page 33, of the TMDL report. TSS loading from sources located within the boundaries of the Oneida Reservation was excluded from the State's calculations for total Basin loading, as further explained below.

Basin at the outlet of Lake Winnebago, and a 48.3% reduction goal (61,472,726 lbs/yr) for TSS loads entering the Basin at the outlet of Lake Winnebago to meet the goals of this TMDL.[21]

EPA finds that the TMDL Report satisfies all requirements concerning this first element.

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

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

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

Comment:

Section 3.0 of the TMDL Report describes designated uses, narrative criteria, and numeric criteria applicable to this Basin.

The goal of the LFR Basin and Lower Green Bay TMDLs is to reduce sediment and phosphorus loads to a level sufficient to meet the numeric and narrative water quality standard (WQS) for phosphorus, narrative WQS for TSS, and the designated uses.

Narrative Standards for TP and TSS and Designated Uses: WDNR identified the narrative standard in Wis. Admin. Code NR § 102.04 (1) as the applicable standard to address both excessive sedimentation and phosphorus. This provision states "Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state." More specifically, WDNR considers excessive sediments to be included in the term "objectionable deposits." Wis. Admin. Code NR § 102.04(1)(a). WDNR explained that "Algal blooms associated with excessive phosphorus loading are also considered 'objectionable deposits,' and are characterized as 'floating debris, scum and material,' which produce 'color, odor, taste, or unsightliness' that interferes with both the fish and aquatic life and recreational uses of the water body."[22] The designated uses applicable to the impaired segments are set forth in Wis. Admin. Code NR § 102.04(3) (b)-(d).[23] The Aquatic Life designated use for all impaired segments within the LFR Basin is 'warm

[21] TMDL Report at 31 and 41.
[22] TMDL Report at 19.
[23] See also TMDL Report, pp. 18-19.

water fishery.' Because of the low dissolved oxygen and degraded habitat caused by TP and TSS, WDNR determined that the Aquatic Life Use is not supported.

Numeric Standards for TP (excluding Green Bay): TP contributes to algal growth and blooms which reduce light penetration. High levels of TP can also cause low levels of dissolved oxygen by stimulating the growth and decay of algae. State regulations define the applicable numeric water quality standard for phosphorus in the LFR Basin:

> (1) GENERAL. This section identifies the water quality criteria for total phosphorus that shall be met in surface waters.
>
> (3) STREAMS AND RIVERS. To protect the fish and aquatic life uses established in s. NR102.04 (3) on rivers and streams that generally exhibit unidirectional flow, total phosphorus criteria are established as follows:
>
> > (a) A total phosphorus criterion of 100 μg/L is established for the following rivers . . .
> >
> > > 14. Fox River from outlet of Lake Puckaway near Princeton to Green Bay, excluding Lake Butte des Mortes and Lake Winnebago. . . .
> >
> > (b) . . . all other surface waters generally exhibiting unidirectional flow that are not listed in par. (a) are considered streams and shall meet a total phosphorus criterion of 75 μg/L.[24]

Therefore, WDNR has proposed the numeric water quality criterion that applies to the main stem of the LFR from Lake Winnebago to Green Bay as a summer median concentration of 0.10 mg/L (100 μg/L); and the numeric water quality criterion that applies to all tributary streams in the LFR Basin as a summer median concentration of 0.075 mg/L (75 μg/L).[25]

Numeric Targets for TP (excluding Green Bay): The numeric TP targets developed for the LFR Basin TMDLs are the same as the TP water quality standards (100 μg/L for the mainstem and 75 μg/L for the tributaries) under Wis. Admin. Code NR §§ 102.06(1) and 102.06(3).[26]

Target Development for TP and TSS for Lower Green Bay: WDNR has not developed numeric TP or TSS criteria for Lower Green Bay.[27] The narrative criterion for TSS is Wis. Admin. Code NR § 102.04 (1) as noted above. The State has identified the applicable narrative criteria for TP as Wis. Admin. Code NR §102.06 (5) (c), which states:

> "To protect fish and aquatic life uses established in s. NR 102.04(3) and recreational uses established in NR 102.04(5) on the Great Lakes, total phosphorus criteria are established as follows:
>
> > (c) For the portion of Green Bay from the mouth of the Fox River to a line from Long Tail Point to Point au Sable, the water clarity and other phosphorus-related conditions

[24] Wis. Admin. Code NR §§ 102.06(1) and 102.06(3).
[25] TMDL Report, p. 20.
[26] TMDL Report, p. 20.
[27] TMDL report, pp 18-21

that are suitable for support of a diverse biological community, including a robust and sustainable area of submersed aquatic vegetation in shallow water areas."

WDNR began the development of TSS and TP targets for Lower Green Bay in 2007.[28] Several targets for TP and TSS were selected to determine water quality impacts and required load reductions. All options were calculated to meet a target concentration at the mouth of the Lower Fox River. One of the target options reviewed by WDNR was 0.10 mg/L TP and a TSS target of 20 mg/L. WDNR noted that the TP and TSS targets are closely related, as a significant portion of the TSS impairment in the LFRLGB watershed is due to biotic solids, which in turn are directly related to TP levels.

To further refine the preliminary TP and TSS targets, WDNR formed an Ad-hoc Science Team. [29] The team consisted of staff from the WDNR, University of Wisconsin-Green Bay, UW-Milwaukee Water Institute, GBMSD, UW-Sea Grant, Oneida Reservation, and EPA. The Ad-hoc Science Team analysis determined that improving the water clarity in the Bay would restore the rooted aquatic plant growth in the Bay. The rooted aquatic plants are important in the ecosystem for adding fish habitat, reducing sediment transportation, and utilizing TP to reduce its availability for algae. WDNR determined that high levels of suspended sediments and phosphorus (contributing to algal growth/biotic solids) significantly reduce light penetration and therefore reductions in TSS and TP would result in improved water clarity.[30]

Visibility through the water column is a direct function of water clarity or, inversely, its attenuation properties. Data from 1993-2005 measuring light penetration (termed E_{PAR}) was modeled by WDNR and the Ad-hoc Science Team to determine the level at which light penetration would result in sufficient aquatic plant growth. A multiple regression model was developed to determine the response of E_{PAR} to reductions in TSS and TP. A simple regression model was also developed to show the relationship between E_{PAR} and light penetration based upon Secchi depth, a common measurement of light penetration.[31]

The multiple regression analysis performed by the Ad-hoc Science Team determined that achieving the TP target (0.10 mg/L) and the TSS target (20 mg/L) at the mouth of the Lower Fox River would result in increased light penetration that would be sufficient to increase the submerged aquatic vegetation and result in a diverse biological community.[32]

WDNR also used the multiple regression analysis to determine the resulting TP concentrations in Lower Green Bay once the TP criteria for the watershed (0.10 mg/L and 0.075 mg/L) were attained.[33] The analysis predicts a TP concentration of 0.06 mg/L in the Bay, well below the target for the Bay.

As part of its process for developing target levels for TP, WDNR also assessed the relationship between TP and blue-green algae in the Lower Green Bay. Blue-green algae can pose risks to pets and recreational users of the Bay, and can be a significant aesthetic problem. Neither the EPA nor the WDNR have specific water quality criteria for blue-green algae. Research on this issue is ongoing, and WDNR expects that the TMDL can be revised as new data are available or criteria are established. The

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[28] Baumgart, WDNR, 2008
[29] TMDL report, pp20-21 and footnote 11
[30] TMDL report, Appendix A
[31] TMDL Report, p 20.
[32] Maraldo *et al*, WEF, 2009
[33] TMDL Report, Appendix A, Table 15

State analyzed data on blue-green algae in Lower Green Bay and compared the data to phosphorus levels.[34] WDNR's analysis showed that blue-green algae should be reduced from 71% of the biomass to 56% at the 0.10 mg/L TP target for the Bay, and to 42% of the algal biomass at the potential TP endpoint of 0.06 mg/L.[35] EPA concurs that WDNR's projected reductions in TP will result in reductions of blue-green algae in the Bay.

WDNR determined that specific numeric water quality targets for TSS were not required for the tributaries and main stem of the Lower Fox River. During the TSS target development process, WDNR noted that Lower Green Bay is the portion of the Basin most sensitive to the effects of TSS. WDNR calculations showed that the reductions needed to achieve the water quality target of 20 mg/L in the Bay were greater than the reductions needed to demonstrate individual tributary water quality attainment.[36] Therefore, WDNR expects that the TSS loads calculated to meet the narrative water quality target for Lower Green Bay will ensure attainment of the designated uses in the tributaries and mainstem. As further discussed in Section 6 below, WDNR further reduced the TSS target to 18 mg/L to account for a Margin of Safety.

EPA concurs with the State's approach to determining the TSS and TP targets for which the TMDL has been established. EPA agrees that TSS is an appropriate surrogate to express the State's narrative water quality standard for "objectionable deposits" and the attainment of the aquatic life and recreational uses of the Bay and Lower Fox River watershed. The modeling information relied upon by the State and Ad hoc Science Team in developing the targets has taken into account meaningful parameters and has adequately accounted for the assumptions made in data analysis to arrive at these targets. The reductions in TSS and TP will likely increase light penetration in the Bay which would lead to significant positive impacts on submerged aquatic vegetation and improved recreational activities.

Table 5. TMDL TSS and TP Targets and Standards

Waterbody	Total Phosphorus (TP)	Total suspended solids (TSS)
Lower Green Bay	0.1 mg/L*	18 mg/L*
Fox River mainstem	0.1 mg/L**	18 mg/L***
Fox River tributaries	0.075 mg/L**	18 mg/L***

* - target
** - criteria
*** - targets derived to meet both Lower Green Bay and Lower Fox River watershed designated uses

EPA finds that the TMDL Report satisfies all requirements concerning this second element.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

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

The pollutant loadings may be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. §130.2(i)). If the TMDL is expressed in terms other than a daily load, e.g., an annual load, the submittal should explain why it is appropriate to express the TMDL in the unit of measurement

[34] TMDL report, Appendix A, Figure 22
[35] TMDL Report, Appendix A, Table 15
[36] Baumgart, WDNR, 2008

chosen. The TMDL submittal should describe the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

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

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

Comment:

Loading Capacity:

Summary: The loading capacities for each impaired waterbody for TP and TSS are shown from pages 44 to 87 of the TMDL Report which are hereby incorporated by reference and summarized below in Tables 6 and 7. The TMDL Report also includes several appendices detailing how WDNR made load determinations. A summary of the modeling methods used to develop the TMDL is presented below, followed by the details and rationale for loading capacity development.

Model Description: The Soil and Water Assessment Tool (SWAT) model developed by the U.S. Department of Agriculture's Agricultural Research Service is used to calculate simulated, predicted pollutant loadings primarily from agricultural/non-urbanized land uses. In 2005, WDNR developed a SWAT model for calculating TP and TSS loads in the LFR subbasin. WDNR further refined and built upon this model to develop the LFRLGB TMDLs. The following specific additions and enhancements were made to the 2005 SWAT model for the LFRLGB TMDLs:

- An urban stormwater component was added to address pollutant loadings from MS4s;
- New data sets were developed by the University of Wisconsin-Green Bay to account for continuous flow, TP, and TSS from the Lower Fox River Watershed Management Plan (LFRWMP) and were incorporated into the model;[37]
- The urban run-off portion of the model was recalibrated and validated utilizing urban run-off data from several studies in Wisconsin.

WDNR utilized a variety of data sources for use in the SWAT model.[38] SWAT model overview, inputs and methods, watershed and subwatershed delineations, calibration, parameter uncertainty analysis, and model results are found in Appendix B of the TMDL report.[39]

WDNR calibrated the model by adjusting inputs to obtain the best fit between the observed and simulated values. WDNR utilized continuous flow data and daily TP and TSS data from a USGS –

[37] Website for the LFRWMP Monitoring Program: http://www.uwgb.edu/watershed/data/index.htm
[38] Table 16, Appendix B of the TMDL Report
[39] TMDL Report at 23-24, and Appendix B.

WDNR monitoring station on Bower Creek. Following calibration of the model, WDNR validated the model by testing the model's ability to predict flow and loads at times or locations other than those in the calibration phase, without adjusting model parameters. The validation was performed by running the calibrated model using data from five watersheds that were collected by the LFRWMP between 2004 and 2008. WDNR then compared modeling results to the actual observed conditions. WDNR determined that the model was able to estimate flow, TSS loads, and TP loads at the LFRWMP monitored sites with a reasonable degree of accuracy. WDNR judged the model to be reliably able to predict flow and loads of TSS and phosphorus from the LFR watersheds. WDNR provided a summary of the results of the calibration and validation as part of its TMDL Report,[40] and these show the predicted model results reasonably approximate the observed data, with r^2 (coefficient of determination, or measurement of variation) values ranging from 0.66 to 0.88, which meet or exceed the expectations in the Quality Assurance Project Plan for this project.

EPA has reviewed the information provided by WDNR and agrees that the State's SWAT model for this TMDL has been appropriately calibrated and validated, and reasonably represents watershed processes. Model selection and development are consistent with EPA guidance,[41] and the State has submitted sufficient documentation in the TMDL Report as discussed above, to demonstrate that the model is capable of being a reasonable predictor of conditions in the watershed.

WDNR has calculated the TP loading capacity for the LFR Basin and Lower Green Bay as 207,877 pounds/year (570 lbs/day). Table 7 below displays WDNR's calculations of the contribution of phosphorus from each sub-Basin and provides an estimate of the phosphorus loading capacity from all sources in the Basin. This does not include the TP loading associated with the Oneida Reservation, which WDNR subtracted from its calculations.[42] Today's decision approves only Wisconsin's share of the LFR Basin and Lower Green Bay TP loading capacity.

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[40] TMDL Report, Appendix B, pp115-122

[41] Protocol for Developing Nutrient TMDLs, 1999; and Compendium of Tools for Watershed Assessment and TMDL Development, 1997

[42] TMDL Report, pp. 40-41. Load reduction goals for sources located within the Oneida Reservation are further detailed in the tables found at pp. 43-87 of the TMDL Report.

Table 6. TMDLs for Total Phosphorus (TP) in LFR Basin and Lower Green Bay for State waters

Sub-Basin	Current TP Loading for State (lbs/yr)	Suggested Allocated Load for Oneida (lbs/yr)	Load Allocation for State (lbs/yr)	Wasteload Allocation for State (lbs/yr)	TMDL for State (lbs/yr)	TMDL for State (lbs/day)
East River	48,748	0	9,171	5,421	14,592	40
Baird Creek	12,748	0	2,623	2,178	4,801	13
Bower Creek	27,777	0	5,578	2,386	7,964	22
Apple Creek	35,088	0	8,920	3,637	12,557	34
Ashwaubenon Creek	11,886	1,150	2,579	2,058	4,637	13
Dutchman Creek	4,791	3,638	724	1,901	2,625	7
Plum Creek	31,569	0	5,536	1,657	7,193	20
Kankapot Creek	20,050	0	3,897	1,651	5,548	15
Garners Creek	6,575	0	1,185	1,764	2,949	8
Mud Creek	6,594	0	1,444	2,810	4,254	12
Duck Creek	38,691	9,138	9,888	4,223	14,111	39
Trout Creek	0	2,495	0	0	0	0
Neenah Slough	11,912	0	3,410	2,348	5,758	16
Lower Fox River (main stem)	237,339	0	5,363	108,900	114,263	313
Lower Green Bay	12,652	0	4,308	2,317	6,625	18
TOTAL (in-Basin)	**506,420**	**16,421**	**64,626**	**143,251**	**207,877**	**570**

The process WDNR used to determine the phosphorus loading capacity for each subbasin is summarized below.[43]

1. Using its SWAT model for the Basin, WDNR calculated TP load and flow values for each of the 69 subwatersheds. Each subwatershed represents a tributary or main stem.
2. WDNR used the TP load and flow values from SWAT to calculate the average annual volume weighted concentration (VWCs) for each subwatershed, with the average annual VWC equal to the average annual TP load divided by the average annual volume of water
3. Each subwatershed's average annual VWC was multiplied by an adjustment factor of 0.56.[44] An adjustment factor was used to convert from the baseline estimated annual VWC to a summer median. WDNR determined the adjustment factor by comparing the sampling data from the five LFRWMP sites and dividing the observed summer values by the calculated baseline annual VWC values.
4. Each subwatershed's summer median concentration was compared to the State's numeric TP standard, 0.075 mg/L for tributaries, or 0.1 mg/L TP for the main stem. If the summer median was greater than the TP standard, then the average annual TP load from the average annual VWC equation was reduced until the summer median could meet the TP standard. If the

[43] TMDL Report, Appendix C.
[44] TMDL Report, appendix C, p. 123

summer median was less than or equal to the TP standard then no TP reductions were needed. The TP loads that were calculated to meet the TP standard were designated as the subwatershed allocated load.

5. The calculated loads for each upstream subwatershed were then used in the calculations for downstream subwatersheds, and then used in calculating loads for the main stem of the Lower Fox River.
6. All subwatershed allocated loads and the loading from Lake Winnebago (calculated using a USGS regression equation) were routed to the outlet of the Lower Fox River into Lower Green Bay because the Lower Green Bay is the most sensitive to TP effects.[45]
7. The average annual VWC for the watershed was calculated at the outlet of the Lower Fox River to determine the baseline loading to the Bay (the most sensitive waterbody to TP effects). The average annual VWC at the outlet of the Lower Fox River was multiplied by an adjustment factor, 1.48, to convert from the baseline estimated annual VWC watershed to a summer median. WDNR determined the adjustment factor by comparing the sampling data from three monitoring sites at the downstream end of the Lower Fox River (operated by the GBMSD) and dividing the observed summer values by the calculated baseline annual VWC value.
8. WDNR compared the summer median concentration for the outlet into Lower Green Bay to the TP target standard of 0.1 mg/L and determined that additional reductions were needed to achieve the TP target at the outlet of Lower Green Bay. The State determined that it needed to assign a 40% reduction for TP loads originating from Lake Winnebago to meet the TP target standard of 0.1 mg/L in addition to the TP reductions needed in the LFRLGB Basin. This 40% reduction for TP loads originating from Lake Winnebago will be addressed in a separate TMDL determination for Lake Winnebago.

WDNR has calculated the TSS loading capacity for the LFR Basin and Lower Green Bay as 71,270,334 pounds/year (195,157 lbs/day). Table 7 summarizes WDNR's calculations of the contribution of TSS from each sub-basin to estimate the TSS loading capacity from all sources in the Basin. This does not include the TSS loading associated with the Oneida Reservation. Today's decision approves only Wisconsin's share of the LFR Basin and Lower Green Bay TSS loading capacity.

[45] Baumgart, WDNR,2008; Maraldo *et al*, WEF, 2009

Table 7. TMDLs for Total Suspended Solids (TSS) in LFR Basin and Lower Green Bay for State waters, excluding sources located within the Oneida Reservation

Subbasin	Current TSS loading for State (lbs/yr)	Suggested Allocated Load for Oneida (lbs/yr)	Load Allocation for State (lbs/yr)	Wasteload Allocation for State (lbs/yr)	TMDL for State (lbs/yr)	TMDL for State (lbs/day)
East River	19,796,496	0	5,372,899	1,858,231	7,231,130	19,798
Baird Creek	3,791,217	0	1,644,191	730,586	2,374,777	6,503
Bower Creek	10,318,235	0	3,281,917	657,996	3,939,913	10,787
Apple Creek	12,736,271	0	5,104,609	1,107,103	6,211,712	17,007
Ashwaubenon Creek	3,741,309	664,170	1,619,183	579,709	2,198,892	6,021
Dutchman Creek	1,825,178	2,022,278	397,105	678,689	1,075,794	2,945
Plum Creek	12,038,905	0	3,431,865	126,453	3,558,318	9,742
Kankapot Creek	7,253,520	0	2,257,953	486,773	2,744,726	7,515
Garners Creek	2,863,318	0	713,508	745,537	1,459,045	3,994
Mud Creek	2,924,841	0	661,659	1,442,509	2,104,168	5,761
Duck Creek	15,746,106	4,321,078	5,866,317	1,229,080	7,095,397	19,426
Trout Creek	0	1,234,199			0	0.0
Neenah Slough	4,846,168	0	1,815,705	1,032,648	2,848,353	7,799
Lower Fox River (main stem)	23,980,196	0	2,486,647	8,628,786	11,115,433	30,432
Lower Green Bay	4,301,706	0	1,601,496	664,262	2,265,758	6,203
Biotic Solids	34,833,037	0	15,046,918	0	15,046,918	41,224
TOTAL (in-Basin)	**160,996,503**	**8,241,725**	**51,301,972**	**19,968,362**	**71,270,334**	**195,157**

The process used to determine the TSS load capacity for each subbasin is summarized below.

1. Using its SWAT model for the Basin, WDNR calculated TSS load and flow values for each of the 69 subwatershed. Each subwatershed represents a tributary or main stem.
2. WDNR calculated internal biotic solids using data from previous WDNR studies for the LFR main stem.
3. WDNR calculated the TSS loading from the outlet of Lake Winnebago by using a USGS regression equation that takes into account flow and TSS concentrations[46].
4. WDNR then analyzed the three categories of information described above and derived a combined load expressed as an average annual VWC. Average annual VWC was set as equal to the average annual TSS load divided by the average annual volume of water.
5. The average annual VWC at the outlet of the Lower Fox River was multiplied by an adjustment factor of 1.38, to convert from the baseline estimated annual VWC watershed to a summer median. WDNR determined the adjustment factor by comparing the sampling data from three monitoring sites at the downstream end of the Lower Fox River (operated by the GBMSD) and dividing the observed summer values by the calculated baseline annual VWC value.

[46] TMDL report, Appendix C, p 124

6. WDNR analyzed the relationship between TSS and TP exiting Lake Winnebago, and calculated that the 40% TP reduction needed to meet the TP target standard was equivalent to a 48.3% reduction in TSS load from Lake Winnebago.[47] This 48.3% reduction for TSS loads originating from Lake Winnebago will be addressed in a separate TMDL determination for Lake Winnebago.
7. WDNR also determined the biotic solids load for each sub-watershed and calculated a 56.8 % reduction in biotic solids at the mouth of the Lower Fox River as a result of attaining the TP target standard.
8. Once the subwatershed loads, Lake Winnebago loads, and biotic solids loads were calculated, WDNR compared the summer median concentration for the outlet to Lower Green Bay to the TSS target of 18 mg/L (which includes MOS, as discussed below) and determined that additional reductions were needed to attain the TSS target. The VWC for each sub-watershed was compared to the average VWC (65.9 mg/L) needed for each subwatershed to attain the TSS target. WDNR additionally reduced the loading for those sub-watersheds where the VWC was over 65.9 mg/L until the subwatershed VWC equaled 65.9 mg/L.

Based on the our review of the State's methodology, as discussed above, EPA concurs with the State's modeling approach and assumptions made in determining TP and TSS loads. The TMDL Report and supporting data support the approach and are consistent with EPA guidance.

Critical Conditions: Section 5.2 of the TMDL Report states that the critical conditions for TP occur during the summer months since elevated temperatures, flow, and sunlight conditions promote nuisance aquatic plant growth. WDNR determined that critical conditions for TSS occur during those wet weather events that result in stream bank erosion and upland erosion. These types of wet weather events take place mainly during the spring and summer.[48]

EPA finds that the TMDL Report satisfies all requirements concerning this third element.

4. Load Allocations (LAs)

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

Comment:

Load Allocation: The TP load allocation (LA) is 64,626 lbs/yr (177 lbs/day). The TSS LA is 51,301,972 lbs/yr (140,484 lbs/day). Table 9 below shows the TP and TSS LAs and current loads for the LFR Basin and Lower Green Bay. The LAs for each impaired waterbody for TP and TSS are shown from pages 44 to 87 of the TMDL Report which are hereby incorporated by reference and summarized in Tables 9 and 10 below.

WDNR calculated LAs for each sub-watershed using the SWAT model, and calculated LAs for natural background, non-regulated urban areas, and agriculture. The SWAT model utilized land use data to determine the TSS and TP loads entering the waterbodies. The natural background load was determined

[47] TMDL report, Appendix C, pp128-131
[48] TMDL Report, pp. 36.

based upon the forest and wetlands land use category.[49] The non-regulated urban stormwater allocations are based upon the portion of urbanized land in each subwatershed that does not lie within the boundaries of an MS4 permit. The agricultural allocations are the remaining loads in each sub-watershed after the natural background, non-regulated urban stormwater, and point source loads were subtracted from the subwatershed loading capacity.

Table 9. Summary of Current TP & TSS Nonpoint Source Loads and Load Allocations for LFR Basin and Lower Green Bay for State waters excluding sources located within the Oneida Reservation

Source	Current TP Nonpoint Source Load (lbs/yr)	Load Allocation for State TP (lbs/yr)	LA TP for State (lbs/day)	Current TSS Nonpoint Load for State (lbs/yr)	LA TSS for State (lbs/yr)	LA TSS for State (lbs/day)
Agriculture (includes land application of manure from CAFOs)	190,351	45,928	126	80,606,293	31,067,083	85,057
Urban (non-regulated)	12,232	14,049	38	4,065,725	4,065,725	11,130
Natural Background	4,046	4,649	13	1,122,246	1,122,246	3,073
Biotic Solids	n/a	n/a	n/a	34,833,037	15,046,918	41,224
Total	**206,629**	**64,626**	**177**	**120,627,301**	**51,301,972**	**140,484**

The State's modeling approach and assumptions made in determining load allocations as described in the TMDL Report are consistent with EPA guidance.

EPA finds that the TMDL Report satisfies all requirements concerning this fourth element.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to individual existing and future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit.

The individual WLAs may take the form of uniform percentage reductions or individual mass based limitations for dischargers where it can be shown that this solution meets WQSs and does not result in localized impairments. These individual WLAs may be adjusted during the NPDES permitting process. If the WLAs are adjusted, the individual effluent limits for each permit issued to a discharger on the impaired water must be consistent with the assumptions and requirements of the adjusted WLAs in the TMDL. If the WLAs are not adjusted, effluent limits contained in the permit must be consistent with the individual WLAs specified in the TMDL. If a draft permit provides for a higher load for a discharger than the corresponding individual WLA in the TMDL, the State/Tribe must demonstrate that the total WLA in the TMDL will be achieved through reductions in the remaining individual WLAs and that localized impairments will not result. All permittees should be notified of any deviations from the initial individual WLAs contained in the TMDL. EPA does not require the establishment of a new TMDL to

[49] TMDL report, p. 7.

reflect these revised allocations as long as the total WLA, as expressed in the TMDL, remains the same or decreases, and there is no reallocation between the total WLA and the total LA.

Comment:

Wasteload Allocation: The overall TP wasteload allocation (WLA) for LFR and Lower Green Bay is 143,251 lbs/yr (389 lbs/day). The overall TSS WLA is 19,968,362 lbs/yr (54,673 lbs/day).[50]

Table 10 below summarizes the TP and TSS WLAs and current loads for the LFR Basin and Lower Green Bay. The process used to determine the WLAs is summarized below.[51].

Total Phosphorus: The WLAs for general NPDES permit holders and construction sites were set equal to baseline loads. WDNR estimated the number of facilities covered under general industrial stormwater permits, and estimated the stormwater run-off loadings from these sites to be 10% of the loadings from the non-regulated urban lands, based upon input from the WDNR Stormwater program. The WLAs for construction sites were determined by analyzing the change in urban areas between the first SWAT model analysis in 2001 and the 2005 land use analysis developed for this TMDL project. The amount of acreage that had become "urbanized" was simulated in the SWAT model and the resulting loads calculated for each subwatershed. WDNR did not apply any reductions to the either of these source types.

As part of this decision, EPA is clarifying that it does not concur with WDNR statements in the TMDL Report in which WDNR stated that general permit holders and construction permit holders are considered "in compliance" with the WLAs if they are in compliance with the permit. EPA's decision today does not address or assume compliance with any NPDES permit or WLA. A determination that any NPDES discharger is in compliance with its permit is a function of the appropriate NPDES program authority, and is not part of any TMDL approval.

WDNR set loads from municipal WWTFs and industrial dischargers that had a baseline average annual effluent concentration less than 1.0 mg/L equal to the dischargers' average annual baseline load. If the baseline average annual effluent concentration was greater than 1.0 mg/L, and the facility's baseline average annual load accounted for less than 1% of the total baseline load for the subbasin, WDNR set the facility's WLA equal to its average annual baseline load. If the baseline average annual effluent concentration was greater than 1.0 mg/L, and the facility's baseline average annual load accounted for more than 1% of the total baseline load for the subbasin, the facility's WLA was set to meet a 1 mg/L average annual effluent concentration. [52]

WDNR set loads from municipal WWTFs and industrial dischargers discharging to the main stem that had a baseline average annual effluent concentration less than 0.2 mg/L equal to the dischargers' average annual baseline load. Facilities having a baseline average annual effluent concentration greater than 0.2 mg/L and a baseline average annual load less than 1% of the total baseline load for the subbasin had a WLA set to their average baseline load. For facilities having a baseline average annual effluent concentration greater than 0.2 mg/L and a baseline average annual load greater than 1% of the total

[50] TMDL Report, pp. 43-87.
[51] TMDL Report, Appendix C, p 127.
[52] TMDL Report . Appendix C, p. 127.

baseline load for the subbasin, the facility's WLA is set to meet a 0.2 mg/L average annual effluent concentration.[53]

Where the load from regulated urban MS4s accounts for less than 30% of the total baseline load for a subbasin, WDNR set the WLA for MS4s equal to 70% of their baseline load. This results in a reduction goal of 30% from the MS4's baseline load. WDNR expects that 30% is the average approximate reduction in TP if MS4s achieve a 40% TSS reduction. If the load from regulated urban MS4s accounts for greater than 30% of the total baseline load for a subbasin, the WLA for MS4s was set equal to the load that results in a percent reduction equal to the MS4's percent contribution to the controllable baseline load for the subbasin.[54]

Total Suspended Solids: WDNR set the WLA for general NPDES permit holders equal to baseline loads. WDNR estimated the number of facilities covered under general industrial stormwater permits, and estimated the stormwater runoff loadings from these sites to be 10% of the loadings from the non-regulated urban lands, based upon input from the WDNR Stormwater program. WDNR did not apply any reductions to this source type. The WLAs for construction sites were determined by analyzing the change in urban areas between the first SWAT model analysis in 2001 and the 2005 land use analysis developed for this TMDL project. The amount of acreage that had become "urbanized" was simulated in the SWAT model and the resulting loads calculated for each subwatershed. Loads from construction sites were assigned a WLA set equal to 20% of their baseline load. WDNR reasoned that this would result in a reduction goal of 80% from their baseline loads, which is consistent with stormwater permit requirements.[55]

As part of this decision, EPA is clarifying that it does not concur with WDNR statements in the TMDL Report in which WDNR stated that general permit holders and construction permit holders are considered "in compliance" with the WLAs if they are in compliance with the permit. EPA's decision today does not address or assume compliance with any NPDES permit or WLA. A determination that any NPDES discharger is in compliance with its permit is a function of the appropriate NPDES program authority, and is not part of any TMDL approval.

WDNR assigned a WLA for municipal WWTFs and industrial dischargers equal to their average annual baseline load. If the load from regulated urban MS4s accounts for less than 40% of the total baseline load for the subbasin, the WLA for MS4s was set equal to 60% of their baseline load. This results in a reduction goal of 40% from the MS4's baseline load, which WDNR based on the State's regulation at Wis. Admin. Code NR § 151. WDNR determined that if the load from regulated urban MS4s accounts for greater than 40% of the total baseline load for the subbasin, the WLA for MS4s was set equal to the load that results in a percent reduction equal to the MS4's percent contribution to the controllable baseline load for the tributary basin.[56]

[53] TMDL Report,. Appendix C, p. 127.
[54] TMDL Report, Appendix C, p. 127.
[55] TMDL Report, Appendix C, p. 132.
[56] TMDL Report, Appendix C p. 132.

Table 10. Current sector-specific TP & TSS Loads and Wasteload Allocations for LFR Basin and Lower Green Bay excluding sources located within the Oneida Reservation

Source	Current TP Load (lbs/yr)	Wasteload Allocation TP (lbs/yr)	WLA TP (lbs/day)	Current TSS Load (lbs/yr)	WLA TSS (lbs/yr)	WLA TSS (lbs/day)
Urban (MS4)	60,446	40,982	112	29,701,762	14,465,394	39,605
Construction	6,800	6,800	19	6,465,278	1,293,057	3540
General Permits (including CAFOs)	1,861	1,861	5	605,279	605,279	1657
Industrial Dischargers	108,064	42,327	113	2,382,799	2,382,799	6525
Municipal WWTFs	86,777	44,919	123	1,168,854	1,168,854	3201
WWTF Reserve Capacity	6,362	6,362	17	52,979	52,979	145
Total	**270,310**	**143,251**	**389**	**40,376,951**	**19,968,362**	**54,673**

There are 15 NPDES-regulated CAFOs in the LFR Basin, which includes one CAFO located within the boundary of the Oneida Reservation, and which is not addressed in Wisconsin's TMDL Report. WDNR assumed that CAFOs covered under the state's general permit are in compliance with no-discharge permit requirements, and therefore assumed that loading from CAFOs is zero (0).[57] Land application of manure from CAFOs is not included in the assumption of zero discharge. Rather, WDNR accounted for loading of phosphorus and sediments from land spreading in its calculation of the nonpoint source loads in the LFR Basin.[58]

Tables 11-16 summarize pollutant loadings from each source based upon discharger type.

[57] TMDL Report, pp. 26.
[58] TMDL Report, pp. 26.

Table 11. TSS WLAs for Industrial dischargers for State waters excluding sources located within the Oneida Reservation[59]

Facility Name	Outfall	Permit	TSS (lbs/yr)	TSS (lbs/day)
Appleton Coated LLC		0000990	249,129	682
Arla Foods Production LLC – Holland		0027197	682	2
Belgioso Cheese – Sherwood		0027201	2,432	7
Cellu Tissue – Neenah		0000680	53,937	148
Fox Energy LLC		0061891	5,042	14
Galloway Company		0027533	621	2
Georgia Pacific Consumer Products LP {ex FJGBE}		0001261	105,698	289
Georgia Pacific Consumer Products LP {ex FJGBW}		0001848	175,717	481
Green Bay Packaging - Green Bay		0000973	108,259	296
Neenah Paper, Inc.		0037842	81,301	223
Menasha Electric & Water Utility	101	0027707	239	1
NewPage Wisconsin Systems – Kimberly		0000698	111,969	307
Pechiney Plastic Packaging - Menasha 001		0026999	3,373	9
Procter & Gamble		0001031	155,432	426
Provimi Foods – Seymour		0044628	544	1
SCA Tissue North America	001 002	0037389	136,023	372
Schroeder's Greenhouse		0046248	341	1
Thilmany LLC – DePere		0001473	29,003	79
Thilmany LLC – Kaukauna		0000825	1,122,241	3,073
Wisconsin Public Service Corp., Pulliam		0000965	40,816	112
TOTAL INDUSTRIAL			**2,382,799**	**6,525**

[59] TMDL Report, Table 3 and pp. 43-87.

Table 12. TP WLAs for Industrial dischargers for State waters excluding sources located within the Oneida Reservation[59]

Facility Name	Outfall	Permit	TP (lbs/yr)	TP (lbs/day)
Appleton Coated LLC		0000990	4174	11
Arla Foods Production LLC – Holland		0027197	341	1
Belgioso Cheese – Sherwood		0027201	143	0
Cellu Tissue – Neenah		0000680	749	2
Fox Energy LLC		0061891	570	2
Galloway Company		0027533	56	0
Georgia Pacific Consumer Products LP {ex FJGBE}		0001261	3826	10
Georgia Pacific Consumer Products LP {ex FJGBW}		0001848	6558	18
Green Bay Packaging - Green Bay		0000973	629	2
Neenah Paper, Inc.		0037842	927	3
Menasha Electric & Water Utility	101	0027707	72	0
NewPage Wisconsin Systems – Kimberly		0000698	5648	15
Pechiney Plastic Packaging - Menasha 001		0026999	1166	3
Procter & Gamble		0001031	238	1
Provimi Foods – Seymour		0044628	74	0
SCA Tissue North America	001 002	0037389	3623	10
Schroeder's Greenhouse		0046248	36	0
Thilmany LLC – DePere		0001473	313	1
Thilmany LLC – Kaukauna		0000825	11976	33
Wisconsin Public Service Corp., Pulliam		0000965	1208	11
TOTAL INDUSTRIAL			**42,327**	**113**

Table 13. TSS WLAs for Municipal WWTPs for State waters excluding sources located within the Oneida Reservation[59]

Facility Name	Outfall	Permit	TSS (lbs/yr)	TSS (lbs/day)
Appleton		0023221	169,857	465
GBMSD - De Pere		0023787	50,297	138
Forest Junction		0032123	2,471	7
Freedom San. Dist. #1		0020842	2,953	8
Grand Chute - Menasha West		0024686	225,925	619
Green Bay MSD		0020991	354,861	972
Heart of the Valley		0031232	147,003	402
Neenah - Menasha		0026085	180,258	494
Sherwood		0031127	1,713	5
Town of Holland SD #1	001 003	0028207	27,786	76
Wrightstown		0022497	5,150	14
Wrightstown SD#1		0022438	472	1
Wrightstown SD#2		0022357	108	-
		TOTAL MUNICIPAL	**1,168,854**	**3,201**

Table 14. TP WLAs for Municipal WWTPs for State waters excluding sources located within the Oneida Reservation[59]

Facility Name	Outfall	Permit	TP (lbs/yr)	TP (lbs/day)
Appleton		0023221	7556	21
GBMSD - De Pere		0023787	4943	14
Forest Junction		0032123	122	0
Freedom San. Dist. #1		0020842	542	1
Grand Chute - Menasha West		0024686	3110	9
Green Bay MSD		0020991	17349	48
Heart of the Valley		0031232	3467	9
Neenah – Menasha		0026085	6275	17
Sherwood		0031127	295	1
Town of Holland SD #1	001 003	0028207	809	2
Wrightstown		0022497	246	1
Wrightstown SD#1		0022438	170	0
Wrightstown SD#2		0022357	35	0
		TOTAL MUNICIPAL	**44,919**	**123**

Table 15. TP WLAs for Urban MS4s for State waters excluding sources located within the Oneida Reservation[60]

MS4	FIN	TP (lbs/yr)	WLA for TP (lbs/day)
City of Appleton	31098	1691	15
City of De Pere	31088	6287	7
City of Green Bay	33657	7083	20
City of Kaukauna	31102	1723	5
City of Menasha	31110	1664	3
City of Neenah	31112	1661	5
Town of Buchanan	31099	569	2
Town of Grand Chute	31102	3022	8
Town of Greenville	31103	692	2
Town of Harrison	31104	328	1
Town of Lawrence	31092	1303	4
Town of Ledgeview	31093	1232	3
Town of Menasha	31111	2246	6
Town of Neenah	31113	528	1
Town of Scott	31095	295	1
University of Wisconsin Green Bay	37165	195	1
Village of Allouez	31085	1176	3
Village of Ashwaubenon	31086	2384	7
Village of Bellevue	31087	1837	5
Village of Combined Locks	31100	293	1
Village of Howard	31091	1984	5
Village of Kimberly	31107	602	2
Village of Little Chute	31108	1194	3
Village of Suamico	31096	996	3
TOTAL WLA for MS4s		**40,982**	**112**

[60] TMDL Report, Table 4 and pp. 43-87.

Table 16. TSS WLAs for Urban MS4s for State waters excluding sources located within the Oneida Reservation[60]

MS4	FIN	TSS (lbs/yr)	WLA for TSS (lbs/day)
City of Appleton	31098	1778092	4868
City of De Pere	31088	745853	2043
City of Green Bay	33657	1642845	7435
City of Kaukauna	31102	721463	1584
City of Menasha	31110	368996	1401
City of Neenah	31112	782075	2293
Town of Buchanan	31099	354659	819
Town of Grand Chute	31102	2387358	3598
Town of Greenville	31103	221344	606
Town of Harrison	31104	188688	517
Town of Lawrence	31092	314352	861
Town of Ledgeview	31093	356082	975
Town of Menasha	31111	624986	1711
Town of Neenah	31113	203894	559
Town of Scott	31095	85724	235
University of Wisconsin Green Bay	37165	75193	206
Village of Allouez	31085	366383	1003
Village of Ashwaubenon	31086	904446	2476
Village of Bellevue	31087	630594	1726
Village of Combined Locks	31100	128262	351
Village of Howard	31091	709415	1943
Village of Kimberly	31107	199077	545
Village of Little Chute	31108	377596	1034
Village of Suamico	31096	298017	816
TOTAL WLA for MS4s		**14,465,392**	**39,605**

Table 17. CAFOs and WLAs for State waters excluding sources located within the Oneida Reservation[61]

CAFOs	Permit	WLA for TSS and TP (lbs/day)
Country Aire Farms	59200	0
Brickstead Dairy	64378	0
Meadowlark Dairy L.L.C.	61905	0
Neighborhood Dairy, L.L.C.	62618	0
New Horizons Dairy LLC	63428	0
Ranovael Dairy	62821	0
Rueden Beef LLC	63312	0
Schuh View Dairy L.L.C.	59129	0
Stencil Farms	56731	0
Thompsons Gold Dust Dairy	58386	0
Tidy View Farm, Inc.	56839	0
Tinedale Farms L.L.C.	58947	0
United Meadows Dairy	64106	0
Verhasselt Farm	49034	0
Weise Brothers Farms	59056	0

The State's modeling approach and assumptions made in determining wasteload allocations as described in the TMDL Report are consistent with EPA guidance.

EPA finds that the TMDL Report satisfies all requirements concerning this fifth element.

6. Margin of Safety (MOS)

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

Comment:

WDNR explains that the TMDL includes an implicit margin of safety (MOS) based upon conservative assumptions in the modeling used to determine the allocations for TP and TSS. The conservative assumption is an over-prediction of flows and loads in the SWAT model. This over-prediction varies by

[61] TMDL Report, Table 5 and pp. 43-87.

watershed and pollutant, but WDNR determined that it is fairly consistent throughout the watershed.[62] The over-prediction results in greater reductions than what might actually be needed to achieve the standards, according to WDNR.

WDNR included an additional 10% explicit MOS for TSS to account for uncertainty in determining the proportion of biotic solids compared to the TSS solids, as well as meeting the load reduction goal for biotic solids, as the biotic solids are also responsive to other non-TSS conditions (e.g., temperature, light, etc.). The 10% MOS was applied during the modeling process by reducing the TSS target from 20 mg/L to 18 mg/L. The load capacities discussed in Section 3 above were calculated to meet the revised target of 18 mg/L TSS.

EPA has reviewed the MOS and determined that it is consistent with EPA guidance and policy. The SWAT model slightly overestimated loads entering the waterbodies, even after the calibration and validation work were completed. In addition, the model calibration and validation demonstrate that even with the overestimation of loads, the system is adequately characterized by the model and the additional 10% MOS is adequate. EPA concurs with WDNR's rationale in applying and interpreting implicit MOS for the LFRLGB TMDLs.

EPA finds that the TMDL Report satisfies all requirements concerning this sixth element.

7. Seasonal Variation

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

Comment:

TMDLs must consider temporal (e.g., seasonal or interannual) variations in discharge rates, receiving water flows, and designated use impacts.[63] WDNR accounted for the seasonal variation in the TMDL by a variety of methods. First, daily precipitation and temperature data from several locations in the watershed were incorporated into the SWAT model. These were used to develop a climate data set from 1976-2000. This captures the seasonal variations in precipitation patterns that affect nonpoint source discharge rates (i.e., loading to the waterbodies). Second, the SWAT model uses a daily time step in developing the loads to the waterbodies from each of the subwatersheds. In other words, the model tracked the movement of TP and TSS into the waterbody each day, in part based upon the daily precipitation and variations in crops throughout the year. The model captured the seasonal variations in precipitation, such as spring rains, snowmelt, and summer droughts. Although these were averaged into annual loads, the effects of the seasonal variations in precipitation and runoff were incorporated into the annual loading calculations (Appendix B). Third, the model was calibrated using several years of daily flow data. These flow data also captured the seasonal variations in receiving water flows due to spring rains/snowmelt, summer drought, etc. Fourth, the TSS target was specifically developed to address the water clarity and algal issues in Lower Green Bay. As explained in the TMDL[64], the recreational use is

[62] TMDL Report, Appendix B, pp. 120-122
[63] USEPA Protocol for Developing Nutrient TMDLs, 1999
[64] TMDL Report, pp. 10-17

impaired due to low water clarity and algal blooms in the summer. By targeting the specific season when recreational use is highest, the TSS targets the seasonal impact on the recreational use.[65]

EPA finds that the TMDL Report satisfies all requirements concerning this seventh element.

8. Reasonable Assurances

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

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

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

Comment:

WDNR has planned activities to provide for reasonable assurances to implement the WLAs and LAs for the LFR Basin and LGB TMDLs (Section 7 of the TMDL Report). Reasonable assurance will be provided for individual permits by including limits that are consistent with the approved TMDL WLAs and may include adaptive management under Wis. Admin. Code NR § 217.06. WDNR explained that reasonable assurance will be provided for general permits by determining if additional requirements are needed to ensure that the permitted activity is consistent with TMDL goals.[66]

The TMDL Report explains that existing WDNR water pollution control programs and funding under grant programs will provide for reasonable assurance that the LAs in the LFR Basin and LGB TMDLs will be implemented. Wisconsin's Nonpoint Source (NPS) Program provides a variety of financial and technical programs that will ensure that the LAs will be addressed and has the opportunity to be implemented.

Under WDNR's NPS Program, the following activities provide for reasonable assurance that nonpoint sources of pollution would be controlled and/or prevented: 1) Polluted runoff performance standards and prohibitions for agricultural and non-agricultural facilities and practices, and 2) Pollution abatement by administering and providing cost-sharing grants to fund BMPs through various WDNR grant programs.[67]

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[65] TMDL Report, p. 42.
[66] TMDL Report, p. 88.
[67] TMDL Report, pp. 88-90.

The counties within the LFR Basin will develop Land and Water Resource Management (LWRM) Plans under the Department of Agriculture, Trade, and Consumer Protection's (DATCP) Soil and Water Resource Management Program. The LWRM Plans includes activities that advance land and water conservation and prevent NPS pollution. Upon approval of the LWRM Plan by DATCP, the county will receive state cost-sharing grants for BMP installation. WDNR, DATCP and all counties within the LFR Basin will work with landowners to implement agricultural and non-agricultural performance standards and manure management prohibitions to address sediment and nutrient loadings in the LFR Basin.[68]

The TMDL Report explains that federal funding such as Environmental Quality Incentive Program (EQIP), Conservation Reserve Program (CIP), and Conservation Reserve Enhancement Program (CREP) will be used as sources of funding for projects involving reduction in TP and TSS loads within the LFR Basin. Page 90 of the TMDL Report provides details on each source of funding.[69]

State funding such as the Targeted Runoff Management (TRM) Grant Program, the Notice of Discharge (NOD) Grant Program, the Urban Nonpoint Source and Storm Water Management Grant Program, and the River Planning and Protection Grant Program can be used to fund nonpoint source projects to improve the quality of Wisconsin's water resources by decreasing the impacts of nonpoint pollution.

The TMDL Report explains that the Oneida WMP describes point and nonpoint source reduction methods. Point source reductions include onsite treatment of stormwater for all new buildings, regulation of sediment from construction sites and proper erosion control under the EPA Construction Site General Permit, and implementing post-construction maintenance and monitoring of stormwater systems under the MS4 permit program.

The TMDL Report also explains that the Oneida Tribe implements a nonpoint source program addressing pollution from runoff from agricultural land use, residential construction, suburban lawns, and golf courses. Oneida's nonpoint source program works with tribal and non-tribal farmers to install agricultural BMPs and to comply with the nutrient management plan. The Oneida Reservation also partners with WDNR, counties, and other agencies to coordinate nonpoint source projects on a watershed-level.[70]

EPA finds that the TMDL Report satisfies all requirements concerning this eighth element.

9. Monitoring Plan to Track TMDL Effectiveness

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

Comment:

[68] TMDL Report, p. 90.
[69] TMDL Report, p. 90.
[70] TMDL Report, p. 91.

Section 7.3 of the TMDL states that the Basin will be closely monitored. WDNR plans to perform a post-TMDL sampling event to determine if measurable results have been gained upon approval of the TMDLs. In addition to collecting monitoring data in a 5-year rotational basis, WDNR also plans to partner with local interest groups to support their monitoring efforts.[71]

The TMDL Report further explains that WDNR will work in partnership with the Oneida Tribe in the implementation of a tribal water quality monitoring program. Under this program, the Tribe will conduct monitoring for TP and TSS, and the data will be evaluated to assess water quality changes.

EPA finds that the TMDL Report satisfies all requirements concerning this ninth element.

10. Implementation

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

Comment:

Section 7.1.3 of the TMDL report states that water quality planning has been ongoing for the past 30 years, with much collaboration throughout the Basin to try to restore the designated beneficial use and achieve standards. These efforts are both within the WDNR and in collaboration with other external entities. Over the years, the efforts have become more coordinated and grown to a larger scale to include a more holistic approach to watershed improvement planning. The next step following approval of the TMDLs will be to develop an implementation plan describing how the TMDL goals will be achieved. This will not include the waters within the boundaries of Oneida Nation, which are covered under a separate, voluntary program as explained above.[72]

EPA finds that the TMDL Report satisfies all requirements concerning this tenth element.

11. Public Participation

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

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[71] TMDL Report, p. 92.

[72] TMDL Report, p. 91.

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

Comment:

The TMDL Report explains the process of public involvement in the development process of this TMDL. Three teams were formulated to provide various types of input throughout the TMDL development process: 1) Outreach Team (led by University of Wisconsin (UW) Sea Grant Institute), 2) Ad Hoc Science team (led by WDNR), and 3) Technical Team (led by WDNR). The teams have met multiple times ranging over the course of 2 to 4 years.

The Outreach Team consisted of UW-Sea Grant Institute, UW-Extension, UW-Green Bay, Baird Creek Preservation Foundation, Oneida Tribe of Indians, Brown County Land and Water Conservation Department, Green Bay Metropolitan Sewerage District (GBMSD), WDNR, EPA, and Bay Lake RPC. The purpose of the team was to include early, active, and continuous involvement of all affected parties and communities as partners and provide an opportunity for stakeholders to provide input throughout the TMDL development process. The Outreach Team was tasked to communicate questions and concerns of affected parties, particularly in the agricultural and municipal stormwater community. Through stakeholder meetings, surveys, newsletters, fact sheets, and webpages, the Outreach Team was able to provide a means for communication and collaboration.[73]

The Ad Hoc Science Team consisted of local, technical expertise from UW-Green Bay, GBMSD, UW-Milwaukee, UW-Sea Grant Institute, and WDNR. The team was tasked to develop numeric targets and restoration goals for the TMDLs.[74]

The Technical Team consisted of EarthTech/AECOM, McMahon and Associates, Wisconsin Paper Council, Georgia Pacific, Brown County Lake and Water Conservation Department, Outagamie County Land and Water Conservation Department, Calumet County Land and Water Conservation Department, GBMSD, City of Green Bay, UW-Extension, UW-Discovery Farms, and UW-Green Bay. The team was tasked to assess best management (BMP) options. The assessment of BMPs included identifying options and analyzing options for benefits, effectiveness, costs, feasibility, and adverse consequences.[75]

The TMDL Report was made available for public comment for 30 days starting on June 24, 2010. WDNR held a public meeting on July 12, 2010, in Grand Chute, WI, and reported extensive community participation. Additionally, WDNR made the TMDL Report available on its website: http://dnr.wi.gov/org/water/wm/wqs/303d/FoxRiverTMDL/. Members of the public could also contact WDNR to obtain a copy of the TMDL Report. While WDNR made available data upon which it relied in developing this TMDL, EPA notes that some unpublished and "raw" data were available upon request from other agencies, as noted by one commenter.[76] While EPA appreciates that the amount of data WDNR considered in developing this TMDL was voluminous, EPA urges WDNR to make as much data as possible readily available to the public directly through WDNR's record for its decisionmaking, rather than referring stakeholders and members of the public to other agencies.

[73] TMDL Report, pp. 93-95
[74] TMDL Report, pp. 96
[75] TMDL Report, pp. 95
[76] TMDL Report, Appendix H, p. 150.

WDNR received numerous comment letters during the public comment period. WDNR reviewed these comments and provided responses in Appendix H of the TMDL Report.

Several comments addressed the TMDL targets and the data used to develop the TMDL. Comments were raised on the selection of the TSS target and the process used to evaluate impairments based upon TSS. WDNR explained that, unlike for phosphorus, there are no approved numeric criteria for TSS and therefore WDNR relied on modeling and recommendations from the Ad Hoc Science Team to determine appropriate targets based on available data. The ultimate goal of the TSS target is to improve clarity in the Lower Green Bay, and restore the aquatic vegetation and related biological community. As explained in Section 3 of today's Decision Document, WDNR's TMDL Report documents the methodology and data used by the state in developing the TMDL for TSS. EPA agrees that WDNR followed applicable guidance, including the *Protocol for Developing Sediment TMDLs, USEPA 1999*, to determine the appropriate TSS targets and to link them to the impairments.

WDNR received comments requesting that the State establish the TP target level so as not to contribute to cyanobacterial blooms during the summer. In its response, the State notes that the listed impairment for Lower Green Bay is related to excessive phosphorus and the related issue of low levels of dissolved oxygen; not the issue of cyanobateria. The State's response explains, however, that addressing the issue of low levels of dissolved oxygen is expected to reduce the frequency and density of cyanobacteria.[77] As explained in Section 2 of today's Decision Document, EPA notes that while the science regarding cyanobacteria and phosphorus is improving, it is still unclear how reductions in phosphorus will impact cyanobacteria. EPA agrees that, as WDNR noted, the TMDL can be revised to account for necessary changes as the science regarding cyanobacteria further develops.

WDNR received many comments regarding how the State will provide reasonable assurance for the TMDL and how reductions will be implemented. As noted by WDNR, a detailed implementation plan will be developed by the State which will describe activities, programs, and funding that will be used to achieve the goal of the TMDL. WDNR explained that:

> Individual WPDES permits issued to municipal and industrial wastewater discharges to surface water will include limits that are consistent with the approved TMDL wasteload allocations. . . . Once a TMDL has been state and federally-approved, the permit for a point source that has been allocated a WLA by the TMDL may not be reissued without a limit that is consistent with the WLA. WDNR may modify an existing permit to include WLA-derived limits or wait until the permit is reissued to include WLA-derived limits. Facilities operating under general permits will be screened to determine whether additional requirements may be needed. . . . [78]

For nonpoint sources, the State explained that it intends to employ many different existing tools, including those available under the State's CWA Section 319 program, to implement and enforce controls on nonpoint source discharges including programs targeting agricultural practices, manure storage, nutrient management, and urban and agricultural runoff management.[79] WNDR received several comments regarding its method for allocating load reductions for agricultural sources. The TMDL Report explains that WDNR set load allocations for TP and TSS for agricultural areas equal to the "achievement of the remaining reductions needed to meet the TMDL after loads have been allocated

[77] TMDL Report, Appendix H, p. 151.
[78] TMDL Report, p. 88.
[79] TMDL Report, p. 88-90.

to all other sources."[80] EPA guidance provides wide latitude to regulators to structure source assessments, recognizing that for sediment sources in particular, because of the diffuse nature of the source, grouping sources is an appropriate approach.[81] The State has identified agricultural sources as being the primary contributor to TP and TSS loading in the Basin. The State's approach of subtracting other sectors of contributors, including background sources, from the overall load reduction needed for achieving the TMDL, to define a load allocation for this sector is not inconsistent with EPA guidance.

WDNR also received numerous comments regarding how WLAs were determined for the TMDL and how reductions would be implemented in specific WPDES permits. First, EPA agrees that WDNR need not specify reductions for nonpoint sources prior to establishing reductions necessary from point sources, as requested by some commentors. Pursuant to EPA guidance, implementing agencies have considerable discretion to balance needed reductions from both types of sources.[82] Second, as discussed in Sections 4 and 5 of today's Decision Document, WDNR explained how it derived both WLAs and LAs for this TMDL by determining the contribution share of these sources, together with contribution from background or natural conditions, seasonal variations, and a margin of safety, so as to meet applicable WQS for both TP and for TSS. The State's methodology is set forth in the TMDL Report at Appendices C and D, and EPA concurs that this approach is appropriate. Third, the State's process for implementing the TMDL through establishing WQBELs for WPDES permits for all types of dischargers is outside the scope of the TMDL program and today's decision. WDNR has explained that it will monitor progress under an implementation plan and will make further adjustments to WLAs and LAs if needed to achieve the applicable WQS. EPA is not required to and does not approve implementation plans. Following approval of the TMDL, WDNR has explained that it intends to develop an implementation plan for the wasteload and load allocations set out in the TMDL.[83] EPA agrees that an implementation plan is the appropriate means to work out specific allocation and reduction issues, but that the overall reductions to be achieved must be consistent with the TMDL as approved.

Finally, WDNR has explained that it need not consider technical feasibility for making load allocations in this TMDL. EPA notes that the procedures outlined in 40 C.F.R. Part 132, including those for establishing TMDLs, apply to all Great Lakes States and Tribes. The regulations provide an exception, however, for States and Tribes to apply their own procedures, consistent with federally authorized program requirements, in controlling the discharge of certain pollutants, including phosphorus and TSS. 40 C.F.R. 132.4(e)(2). While the specific procedures outlined in 40 C.F.R. Part 132, Appendix F may not apply to this TMDL, EPA's position remains that technical feasibility is a relevant consideration in developing TMDLs. EPA has consistently advised that:

> [A]llocations should be technically feasible and should be consistent with other local, state, or federal programs that might apply (i.e., institutional constraints). In some cases, allocation options are constrained by technical feasibility, and sources must implement all possible management practices and available technologies to satisfy TMDLs or other regulatory limits. However, in other cases, regulatory limits are less constraining, and EPA encourages the use of allocations that are based on competing measures of desirability such as cost-effectiveness and

[80] TMDL Report, pp. 128, 132.
[81] U.S. EPA, *Protocol for Developing Sediment TMDLs,* 1999, pp.5-2 – 5-6.
[82] EPA, Guidance for Water Quality-based Decisions: The TMDL Process (April 1991), pp. 23-25.
[83] TMDL Report, p. 91, Appendix H, p. 153.

equity and fairness. Other factors that should be considered when making allocation decisions include relative source contributions, ability of small entities to pay, and prior load reductions.[84]

As stated above, an implementation plan is the appropriate means to work out specific allocation and reduction issues. Should planned allocations and reductions prove technically infeasible to implement, WDNR will need to implement others to ensure that the overall reductions to be achieved remain consistent with the TMDL as approved, so that applicable water quality standards are met.

EPA finds that the TMDL Report satisfies all requirements concerning this eleventh element.

12. Submittal Letter

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

Comment:
The EPA received the final Lower Fox River and Lower Green Bay TMDLs on August 31, 2011, accompanied by a submittal letter dated August 30, 2011. In the submittal letter, WDNR stated that the submission includes the final TMDLs for total phosphorus and TSS.

EPA finds that the TMDL Report satisfies all requirements concerning this twelfth element.

13. Conclusion

After a full and complete review, EPA finds that the TP and TSS TMDLs for Lower Fox River Basin and Lower Green Bay as identified in Table 1 satisfy all of the elements of an approvable TMDL. This approval document is for 27 waterbody segment impaired by total phosphorus and 18 waterbodies impaired by TSS for a total of 45 TMDLs. These TMDLs address degraded habitat, low Dissolved Oxygen (DO), eutrophication, and turbidity impairments.

EPA's approval of this document does not extend to those waters that are within Indian Country, as defined in 18 U.S.C. § 1151. EPA is taking no action to approve or disapprove TMDLs for those waters at this time. EPA or eligible Indian Tribes as appropriate will retain responsibilities under CWA Section 303(d) for those waters.

[84] U.S. EPA, Office of Water, "Allocation: Definitions and Options," http://water.epa.gov/scitech/datait/models/allocation/def.cfm, accessed May 17, 2012.