

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATERSHED MANAGEMENT

ADOPTION OF THE AMENDMENT TO THE TRI-COUNTY WATER QUALITY
MANAGEMENT PLAN TO ESTABLISH A TOTAL MAXIMUM DAILY LOAD FOR
PHOSPHOROUS IN STRAWBRIDGE LAKE, BURLINGTON COUNTY.

Public Notice

Take notice that on **JUN 22 2003**, pursuant to the provisions of the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A-1 et seq., and the Statewide Water Quality Management Planning Rules (N.J.A.C. 7:15-3.4), an amendment to the Tri-County Water Quality Management Plan was adopted by the Department of Environmental Protection (Department). This amendment establishes a total maximum daily load (TMDL) for phosphorus in Strawbridge Lake, Moorestown Township, Burlington County, and recommends pursuing the removal or “de-listing” of Strawbridge Lake from the water quality limited surface waters list for chlordane, sedimentation, and heavy macrophyte growth. Present annual average phosphorus concentration in Strawbridge Lake (for total lake) is estimated to be 0.088 mg/L. In order for in-lake phosphorus concentrations to meet current water quality standards, the target level for phosphorus should be 0.032 mg/L (a 63.6% reduction in phosphorus concentration). This translates to a target TMDL for phosphorus of 787 kg/yr. Available data indicate that chlordane, sedimentation, and heavy macrophyte levels are currently acceptable in Strawbridge Lake. This amendment implements the requirements of the United States Environmental Protection Agency's (USEPA) Water Quality Planning and Management Regulations (40 CFR 130) to establish TMDLs for water bodies identified as water quality limited, as well as, the Department's regulations governing the identification of water quality limited surface waters and the TMDL development process, located at N.J.A.C. 7:15-6 and 7.

To address the issue of sedimentation, dredging of Strawbridge Lake was implemented and conducted in four phases: dredging of the Upper Basin (1997); dredging of the Middle Basin (1999); and dredging of the Lower Basin was done in two phases (started in the spring of 2000 with the completion in 2002). Heavy macrophyte growth will be controlled with the reduction in sediment by dredging and manual removal, as well as with reductions in phosphorus input from nonpoint sources through measures such as retrofitting of stormwater outfalls and construction of biofilter (pocket) wetlands around the lake.

Pursuant to 33 U.S.C. 1313(d), commonly referred to as Section 303(d) of the Federal Clean Water Act (33 U.S.C. 1251 et seq.), TMDLs are required to be developed for waterbodies that do not meet water quality standards after the implementation of technology-based effluent limitations. TMDLs represent the assimilative or carrying capacity of the receiving water taking into consideration point and nonpoint sources of pollution. A TMDL is developed as a

mechanism for identifying all the contributions to surface water quality impacts and setting goals for load reductions for specific pollutants as necessary to meet surface water quality standards. TMDLs may also be established to help maintain or improve water quality in waters that are not impaired.

Where TMDLs are required to address documented surface water quality impairment, changes are required to be made to the varying sources contributing to the water quality problem in order to reduce the total pollutant load received by the waterbody. Load reduction needs are established through TMDLs through assignment of wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint source discharges, a margin of safety and as applicable, reserve capacity.

Since nonpoint source pollution, by definition, does not come from discrete, identifiable sources, load allocations consist of the identification of categories of nonpoint sources that contribute to the parameters of concern. Specific load reduction measures for those categories of sources, to be implemented through best management practices (BMPs), are included in the analysis. These measures include local ordinances for stormwater management and nonpoint source pollution control, headwaters protection practices, or other mechanisms for addressing the priority issues of concern. There are no point source discharges to Strawbridge Lake; therefore, only LAs are established in the Strawbridge Lake TMDL.

Notice of the proposed amendment was published in the New Jersey Register on July 3, 2000 at 32 N.J.R. 2505(a). A public hearing was held on July 19, 2000. The phosphorous TMDL was established on August 15, 2000 and submitted to USEPA pursuant to N.J.A.C. 7:15-7.2(k) for review in accordance with 40 CFR 130.7. On December 8, 2000, USEPA approved the phosphorous TMDL.

The Department is publishing this notice of adoption of an amendment to the Tri-county Water Quality Management Plan pursuant to N.J.A.C. 7:15-3.4. All information related to this proposed amendment is located at the Department, Division of Watershed Management, and PO Box 418, 401 East State Street, Trenton, New Jersey 08625-0418. If you wish to receive a copy, the document and the response to comments can be obtained by calling the Division of Watershed Management at (609) 633-1441 or download the files from: <http://www.state.nj.us/dep/watershedmgt/publications.htm>. The Department's file is available for inspection between 8:30 a.m. and 4:00 p.m., Monday through Friday. An appointment to inspect the documents may be arranged by calling the Division of Watershed Management at (609) 633-3813. Additional copies of the amendments may be also obtained by calling this number. An electronic copy of the TMDL Report may be requested via electronic mail sent to: H20SHED@dep.state.nj.us.

Comments on this amendment received during the public comment period, including the public hearing, are summarized below with the Department's responses.

Summary of Public Comments and Agency Responses:

The following people submitted written and/or oral comments on the proposal:

1. James M. Stuhltrager, Mid-Atlantic Environmental Law Center of Widener University Environmental and Natural Resources Law Clinic
2. Maya Van Rossum, Delaware Riverkeeper, Washington Crossing, PA.
3. Christopher C. Obropta and Peter Kallin, Omni Environmental Corporation, Princeton, NJ.
4. Kay Smith, Moorestown Environmental Advisory Commission, at public meeting, July 19, 2000.

A summary of the comments to the proposal, and the Department's responses to those comments follow. The number(s) in brackets at the end of each comment corresponds to the commenter(s) listed above.

General and Procedural Comments:

Comment 1: Commentors asked for a description of the procedure that the Department will follow with respect to incorporating this TMDL with the TMDL for the entire Pennsauken Creek due June 30, 2002. (1)

Response to Comment 1: Based on the above-mentioned MOA, the Total Phosphorus TMDLs for the North and South Branches of Pennsauken Creek are scheduled to be established by the end of 2004. Monitoring studies are currently underway by the Department to provide information necessary to meet this deadline. As the results of these studies are obtained, it may be appropriate to refine the Strawbridge Lake TMDL with more detailed, site-specific data in the model. It is intended to use the Strawbridge Lake TMDL as a component of the Pennsauken Creek TMDL, unless data from the monitoring program results warrant revision of this TMDL calculation.

Comment 2: The commenters commend the State for drafting of this TMDL to be more comprehensive than other recently drafted lake TMDLs. (1,2)

Response to Comment 2: The Department acknowledges the support of the commenters.

Comment 3: A separate TMDL should be developed for sedimentation. (1)

Response to Comment 3: Sedimentation had been identified as an issue in this lake system because of the shallow depth of the lake. Dredging completed and underway addresses the depth issue in all three basins. The implementation plan for phosphorus will also address sedimentation rate as well, utilizing methods such as BMPs on agricultural land, creation of biofilter wetlands, and retrofitting of stormwater outfalls. The follow-up monitoring program is intended to determine the sedimentation rate. Input from lake users will be sought to determine if the current rate of sedimentation, after factoring in the implementation of multiple BMPs, is acceptable or if further action, such as construction of forebays, is necessary. Narrative has been added to the document to reflect the above response to the sedimentation listing. The Department believes that control of sedimentation will be achieved through this TMDL without the need for a separate TMDL.

Comments on Dillon-Rigler Model:

Comment 4: The Dillon-Rigler formulation was inappropriate to develop phosphorous loading capacity in this lake. The Dillon-Rigler and similar lake trophic status models describe phosphorous loading relations for oligotrophic and oligomesotrophic lakes. However, the relatively simple relationship in this model may not be appropriate for mesotrophic and is entirely inappropriate for eutrophic lakes because this model does not account for dissolved oxygen depletion and release of previously accumulated phosphorous. (1)

Response to Comment 4: The Diagnostic-Feasibility Study of Strawbridge Lake (F.X. Browne, 1993), which utilized the Dillon-Rigler Model, was approved by EPA through the Clean Lakes Program and forms the technical basis for the TMDL calculations. The empirical model developed by Dillon and Rigler (1975) was used in the Diagnostic-Feasibility Study of Strawbridge Lake because, after a survey of commonly used models, the Dillon-Rigler model gave the best predictive results for phosphorus concentration in the Lower Basin. In addition, Strawbridge Lake's hydrologic and morphological characteristics fit the assumptions within the model. The Dillon-Rigler model is described in EPA's Clean Lakes Manual, *Quantitative Techniques for the Assessment of Lake Quality*. It is true that the Dillon-Rigler formulation was originally fitted to data from phosphorus-poor Canadian Shield lakes. However, the usefulness of this model was subsequently verified on a large set of northern temperate lakes, such as Strawbridge Lake. The Dillon-Rigler model is not intended to explicitly account for in-lake processes such as oxygen depletion and nutrient recycling, but can be employed to calculate target loads for a range of desired total phosphorus in-lake concentrations; the Dillon-Rigler model was used in the Diagnostic-Feasibility Study for this purpose. While the model is not restricted in applicability to any particular trophic status, it is known to significantly underestimate phosphorus in lakes under limited circumstances. Particularly, this problem can occur in lakes with an average influent phosphorus concentration greater than 0.3 mg/l. This limitation is not of concern here as the average influent phosphorus concentration of Strawbridge Lake Lower Basin, as estimated by multiplying areal phosphorus loading time by average depth, is 0.092 mg/l.

Comment 5: The average total phosphorous concentration in the Lower Basin was determined to be 0.188 mg/l. However, the number utilized was only 0.088 mg/l. New Jersey should recalculate the necessary load reduction by substituting the correct number. (1)

Response to Comment 5: The figure 0.088 mg/l is the correct number. It represents the current calculated phosphorus concentration in the Lower Basin using a larger historical data set (June 1992 – April 1993), which also encompassed the FX Brown Associates, 1993 data set. The figure 1.88 mg/l represented the average Lower Basin concentration for the April 1992- August 1992 only, as discussed by F. X. Browne Associates, 1993. Land uses have changed substantially, as described in the TMDL report. However, much of the land use change that has occurred (i.e. conversion of agricultural land to residential and commercial development), in many cases improves water quality with respect to phosphorus.

Comments on the Effects of Dredging:

Comment 6: Post-dredging water quality data from the Upper and Middle Basins indicate that the State cannot assume that dredging will decrease phosphorous concentration in the lake. (1)

Response to Comment 6: The calculated phosphorus pre-dredging concentration in the Upper and Middle Basins is below applicable Surface Water Quality Standards criteria based on the summer 1992 data and meets standards based on the 1992-1993 data. The Department believes that the post-dredging data cited were taken too soon to properly represent the post-dredging phosphorous concentration. The Department has been advised by Moorestown Township that, as the sediments were dredged, they were “stored” adjacent to the lake to de-water, before being disposed of. It is likely that as these sediments dried, and before and during actual removal to the disposal area, a significant portion of the finer particles of these phosphorous laden dredged materials were deposited back into the lake from wind, rain and snow runoff. This is why, in the TMDL document, it is stated that “monitoring should take place 1 year after all dredge materials are removed from the site.” (Emphasis added) This would give the lake system time to equilibrate and not be unduly influenced by re-deposited phosphorous-laden particulates.

Given that almost half the lake is filled with unconsolidated sediments, it is reasonable to assume these sediments represent an important source of phosphorous. To confirm current phosphorus concentrations, the Department is working with the Delaware River Keeper to develop a plan to conduct post-dredging monitoring of all three basins.

Comment 7: The use of a yearly instead of daily load does not comport with the statute or EPA’s implementing regulations, which only allow for deviations from a daily load for those pollutants that cannot be expressed as mass per time. Moreover, because the mean detention time for Strawbridge Lake is less than one day, the utility of using a yearly loading is questionable. (1)

Response to Comment 7: EPA regulations, 40 CFR § 130.2(i), state that “TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure.” The Department believes that for lake nutrient TMDLs it is appropriate to express the TMDL on a yearly basis. It is not reasonable to allocate storm-driven source loads using a daily time scale, since storm-driven nonpoint sources are episodic in nature. Furthermore, long-term average pollutant loadings are more critical to overall lake water quality than the load or even concentration on any particular day. Finally, most available empirical lake models, such as the Dillon-Rigler model used in this analysis, use annual loads rather than daily loads to estimate in-lake concentrations. As a side note, the Department did discover an error in the base reports regarding detention time. This error has been addressed in the final document. However, this error did not effect the results reached in the initial analysis.

Comments on Seasonal Variation:

Comment 8: New Jersey’s methodology fails to identify how seasonal variations were taken into account. The dates and flow conditions of the sampling events were not specified. New Jersey violates the Act by failing to distribute the loading to account for seasonal variations. (1)

Response to Comment 8: As described in the TMDL report, the target value for the phosphorus TMDL is adjusted to account for seasonal variation. The Dillon-Rigler model predicts steady state phosphorus concentration. To account for seasonal variation, a peak to mean ratio was developed using data from the outlet of Strawbridge Lake. Two samples were taken twice a day on 20 occasions from June 1992 to April 1993 (Omni, 2000, Appendix B). Three values were thrown out because they were outliers and not consistent with the other sample taken on the same day. The 90th percentile rank was used as the peak to account for data variability and to be consistent with the process used by the Department to define impaired water bodies. The seasonal variation was thereby determined to be 56%, resulting in a target phosphorus concentration of 0.032 mg/l. The Act requires that seasonal variations be accounted for, not that seasonal TMDLs be developed. Seasonal TMDLs can be developed for certain parameters under certain conditions. They are less conservative because they do not require the same source reductions throughout the year. In this case, seasonal variations were accounted for by setting the peak phosphorus concentration to 0.05 mg/l. During other times of the year, the concentration will be lower. More information regarding the results and sampling data can be obtained from the referenced source *Final Status Report for the Strawbridge Lake 319(h) Restoration Project* (Omni Environmental, 2000).

Comments on Margin of Safety:

Comment 9: TMDLs are supposed to include either an explicit Margin of Safety (MOS) or an implicit MOS (i.e. addressed through conservative assumptions in establishing the TMDL). The Strawbridge Lake TMDL does not contain an explicit MOS. Furthermore, the Unit Areal Loads are not conservative compared to EPA publications so as to provide an implicit MOS. (1)

Response to Comment 9: As described in the TMDL report, a MOS is required in order to account for uncertainty in the loading estimates, physical parameters and the model itself. The MOS, as pointed out by the commenter, can be either explicit or implicit. An implicit MOS may consist of the use of conservative assumptions used in establishing the TMDL. This TMDL includes an implicit MOS based upon use of conservative assumptions.

The Unit Areal Loads were taken from the Diagnostic-Feasibility Study of Strawbridge Lake, published as a Clean Lakes Report and are appropriate for the land uses in the Strawbridge Lake watershed. While they are conservative relative to many values in the literature, especially the value for agriculture, the values are not particularly conservative when compared to USEPA's 1980 publication. The TMDL document has been modified to stipulate that loading assumptions are conservative because they do not account for in-stream decay and the effect of implementation of several types of BMPs that would reduce loads from those noted in literature values.

Comments on Implementation Plan:

Comment 10: The implementation aspects of this TMDL should establish a precedent for future TMDLs to chart a course on achieving water quality standards (1, 2, 3)

Response to Comment 10: The Department acknowledges the support of the commentors.

Comment 11: Although New Jersey takes a good first step by allocating loading capacity to individual land use categories, the Department should also distribute these “pre-allocations” to the entities that will be responsible for implementing the TMDL (e.g. municipalities), since 70% of the estimated loading to Strawbridge Lake is from urban residential and commercial/industrial land use areas. The commenter recommends specifying the need to install infiltration basins by responsible entities. (1)

Response to Comment 11: The Department acknowledges the commenter’s qualified support for its approach to allocate loadings to individual land use categories. The loadings are distributed on page 13 of the Department’s report on the *Establishment of Total Maximum Daily Load (TMDL) for Phosphorus in Strawbridge Lake, Moorestown Township, Burlington County, NJ* (September 2000): “The selected scenario is to apply the reductions equally in all three sub-watersheds, and to focus on sources that can be affected by BMP implementation.”

Upon adoption of the Departments proposed rules for municipal stormwater permitting (see 35 N.J.R. 169(a); January 6, 2003), municipalities will be required to adopt a Stormwater Management Plan, within one year of the Plan adoption, they will have to adopt ordinances to implement the Plan.



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