# Sector Load Growth Demonstration Technical Memorandum

## VERSION 1.0

**Point Source Load Sectors: MS4s, Construction, CAFOs, Municipal and Industrial WWTP, CSOs and Air Deposition and Emissions Subject to Federal Clean Air Act Requirements**
**Nonpoint Source Load Sectors: Ag, Forests Lands, OSWTS, Stormwater not covered by NPDES permits, Air Deposition Not Subject to Federal Clean Air Act Requirements**

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**Prepared by EPA Region III**

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## SCOPE

This technical memorandum is intended to assist the Bay jurisdictions[1] with their determination of whether the loads of nitrogen, phosphorus, and/or sediment are projected to increase for any particular sector and, therefore, whether the jurisdiction will need an offset program to accommodate handling those projected offsets should they occur, as opposed to handling such offsets on a case-by-case basis. This increase in the load(s) of nitrogen, phosphorus, and/or sediment is referred to as "growth".

This technical memorandum is not official agency guidance and is only applicable in the Chesapeake Bay Watershed. Its purpose is to elaborate EPA's expectations, set out in Appendix S and Section 10 of the Chesapeake Bay Total Maximum Daily Load (Bay TMDL), for the Bay jurisdictions' offset programs. Those programs are expected to be consistent with the Bay TMDL, including its allocations and assumptions and the common elements of Appendix S. This technical memorandum may be revised in the future.

This technical memorandum is not intended to establish a baseline for offsets. A separate technical memorandum is expected to be developed regarding the establishment of baselines. It also is not intended to determine whether any individual new or increased load needs to be offset; as stated in the Bay TMDL, any such new or increased load is expected to be offset. In many cases, it may be advantageous to have an offset program to ensure that the jurisdiction's Watershed Implementation Plan will be fully implemented and that the Bay TMDL allocations will be met.

## SECTOR GROWTH DEMONSTRATION

If a Bay jurisdiction has not set aside loads to account for growth – i.e., new and/or increased loads from any particular sector -- that jurisdiction is expected to either have in place an offset program[2] that meets the common elements of Appendix S of the Bay TMDL or demonstrate that such an offset program is not necessary because the jurisdiction projects that no sector will experience any new and/or increased loads.[3] EPA requested that each Bay

[1] The Bay jurisdictions are: Delaware, Maryland, Pennsylvania, New York, Virginia, West Virginia, and the District of Columbia.

[2] As described in the Bay TMDL, only offsets, not trades, are expected.

[3] Text of the Chesapeake Bay TMDL: http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/tmdlexec.html

jurisdiction submit its initial demonstration to EPA by February 28, 2013.[4] EPA also requested that each Bay jurisdiction commit to re-evaluating its initial submission periodically (at a minimum, after the midpoint assessment and before developing Phase III Watershed Implementation Plans) and to conduct a mathematical analysis following the issuance of this technical memorandum. All jurisdictions submitted these initial demonstrations and each committed to re-evaluating its initial submission periodically (at a minimum, after the midpoint assessment and before developing Phase III Watershed Implementation Plans). EPA is now asking the jurisdictions to submit the second part of these initial demonstrations, the mathematical analysis (i.e. numerical demonstration) as described in this final technical memorandum. **This numerical demonstration is due to EPA by August 16, 2013.**

EPA expects each Bay jurisdiction to numerically demonstrate whether a formal offset program is necessary. For that numerical demonstration, EPA expects each jurisdiction to conduct the following analysis for each source sector identified in the Bay TMDL:

- What are the forcasted or actual loads of nitrogen, phosphorus, and sediment for 2010, 2017, and 2025 for each major river-basin identified in the Bay TMDL and what trends (e.g., growth) are indicated by those loads. A jurisdiction can perform those calculations for additional years between 2010, 2017, and 2025, but is expected to at least calculate those three data points. To calculate past years' loads, the jurisdiction should use the same sector loads and conditions (land use, population, etc.) as used by the Chesapeake Bay Program for the 2010 progress run. If the Bay jurisdiction uses different 2010 loads, the analysis should focus on the trends in loads as opposed to the actual and absolute loads. In other words, a change in data for 2010 compared to what is used by the Chesapeake Bay Program cannot be the sole basis for demonstrating a lack of growth in a sector; and
- Whether an offset program is projected to be necessary for the Bay jurisdiction.

EPA expects that each Bay jurisdiction's numerical demonstration will be accompanied by a programmatic analysis, including:

- If any new or increased loads occurred or are projected to occur, a description of whether those loads have been offset and how;

[4] See letters from Jon M. Capacasa, Director, EPA Region 3 Water Protection Division, to each of the Bay jurisdictions, dated February 17, 2012, available at http://www.epa.gov/reg3wapd/pdf/pdf_chesbay/Phase2WIPEvals/Trading_Offsets/PortfolioOfTradingLetters.pdf

- A clear explanation of how the jurisdiction accounts for and offsets loads when land conversion takes place;
- A description of the system in place for tracking changes in loads to ensure accountability and verification;
- A date by which the jurisdiction had or will have in place an offset program that meets the common elements of Appendix S if it is determined that one is needed; and
- A commitment to periodically re-examine whether the inputs, underlying data, assumptions and methodologies of the demonstration remain valid, particularly in light of the Chesapeake Bay Program's analysis of growth and projections for future conditions that are underway as part of the Bay TMDL midpoint assessment.

EPA expects that each Bay jurisdiction will, in conducting the numerical demonstration and the programmatic analysis:

- Use the same sector definitions as used in the Bay TMDL, so that a direct comparison ("apples to apples") can be made between the results of the jurisdiction's numerical demonstration and the TMDL allocations;
- Incorporate any relevant underlying assumptions of the Bay TMDL (e.g., use design flow if wastewater WLAs are based on design flow, not actual flow);
- Use the best available science, data, and information as inputs to the analysis;
- Account for movement among sectors to be sure that an increase in anticipated loading does not get overlooked because of the predicted movement to another sector. For example, if forested land is developed to urban land. If no growth is predicted in loadings from a particular sector, and the basis for that includes movement of some portion of the loading to another sector, such a movement should be considered in the review of that other transferee sector.

A description of the basic steps EPA expects the Bay jurisdictions to use to calculate these loads is identified under each of the sectors below. EPA is not requiring the use of a particular methodology or dataset, however; alternative calculations and methodologies can be used by the jurisdictions as long as adequate documentation is provided, the assumptions are met, and the basic aspects of the analysis (listed in bullets above) are included. EPA does suggest that the jurisdictions consider using a calculation methodology consistent with Bay Watershed Model.

## Agriculture (includes CAFOs, other animal operations (e.g., AFOs), and row crops)

1. For each major river-basin, review past years' county-level agriculture data from sources such as the USDA Agricultural Census[5] and NASS Annual Surveys of Agriculture.

   Using the CBP partnership's Phase 5.3.2 Watershed model parameters, calculate the loadings for the following categories for 2010 and at least two (2) other years prior to 2010 (e.g., 2002 and 2007):

   a. Animal populations (poultry, cattle, dairy, sheep, goats, hogs, and horses); and
   b. Row crops for major crop types (corn, bean, etc).

2. Using the data calculated in 1 above, calculate the forecasted loadings for 2017 and 2025 for the above categories, considering application of WIP practices and regulation (i.e., NMP requirements), utilizing calculation methodology consistent with the Bay Model. (Note: Although the USDA's 10-year forecast for all agricultural commodities[6] does not provide watershed specific data, the state-level forecasts may be used as a cross-check for the agricultural sectors). In doing so, consider application of final Phase I and II WIP practices, location of BMPs (e.g., soil type, proximity to surface waters, etc.), permit requirements, and applicable state regulations.

3. Compare the past-years' and forecasted future years' loadings calculated in 1 and 2 above to determine whether there is a trend of growth in any portion of this sector.[7] If

[5] Data from USDA Census of Agriculture are available for 1992, 1997, 2002, and 2007 at: http://www.agcensus.usda.gov/Publications/2007/index.php. Data from the USDA NASS annual surveys are available at: http://quickstats.nass.usda.gov/

[6] These data are available at: http://www.usda.gov/oce/commodity/archive_projections/USDAAgriculturalProjections2021.pdf. The most recent report was released in February of 2012, and includes projections through 2021. Jurisdictions will need to extrapolate from 2021 to 2025.

[7] Note that it may not be possible to discern a trend in acreage for certain crops and/or for certain animal populations due to their high variability over the period of record. In such cases, feedback from industry, agricultural economists, and information from the USDA's 10-year projections may provide the best means for identifying potential trends.

growth is forecasted to occur, EPA will expect the Bay jurisdiction to develop a credible offset program.

## Urban and suburban stormwater (MS4s, construction, industrial, and stormwater not covered by NPDES Permits)

1. For each major river-basin, review past years' data and calculate the loadings for the following categories for 2010 and at least two (2) other years prior to 2010 (e.g., 2002 and 2007):

    a. Total impervious acres;

    b. Total pervious acres;

    c. Total regulated impervious acres subject to MS4, industrial stormwater and construction permits under the NPDES program;

    d. Total regulated pervious acres subject to MS4, industrial stormwater and construction permits under the NPDES program;

    e. Total impervious acres not subject to MS4, industrial stormwater or construction permits; and

    f. Total pervious acres not subject to MS4, industrial stormwater or construction permits.

2. Using the data calculated in 1 above, calculate the forecasted loadings for 2017 and 2025 for the above categories.

    In doing so, consider application of final Phase I and II WIP practices, location of impervious and pervious acres and BMPs (e.g., soil type, proximity to surface waters, etc.), permit requirements, and applicable state regulations, and use calculation methodology consistent with the Bay Watershed Model. Also, distinguish changes resulting from new development (identify previous land use) and redevelopment, and the stormwater management requirements associated with each type of development.

3. Compare the past-years' and forecasted future years' loadings calculated in 1 and 2 above to determine whether there is a trend of growth in any portion of this sector. If growth is projected to occur, EPA will expect the Bay jurisdiction to develop a credible offset program.

## Municipal and Industrial WWTPs and CSOs

1. For each major river-basin, review past years' data and calculate the loadings for the following categories for 2010 and at least two (2) other years prior to 2010 (e.g., 2002 and 2007):

    a. Municipal wastewater facilities;

    b. Industrial or commercial facilities;

    c. CSOs; and

    d. Determine population served by category a.

2. Using the data calculated in 1 above, calculate the forecasted loadings for 2017 and 2025 for the above categories a-c and population in category d. In doing so, consider application of final Phase I and II WIP practices and applicable state regulations, permits and long-term control plans, and use calculation methodology consistent with the Bay Watershed Model.

3. Compare the past-years' and forecasted future years' loadings calculated in a-c in 1 and 2 as well as population in d above to determine whether there is a trend of growth in any portion of this sector. If growth is forecasted to occur, EPA will expect the Bay jurisdiction to develop a credible offset program.

## Onsite Wastewater Treatment Systems (OSWTSs, or Septics)

1. For each major river-basin, review past years' data and calculate the loadings for the following categories for 2010 and at least two (2) other years prior to 2010 (e.g., 2002 and 2007):

    a. Total number of OSWTSs; and

    b. Total population on OSWTSs.

2. Using the data calculated in 1 above, calculate the forecasted loadings for 2017 and 2025 for the above categories. In doing so, consider application of final Phase I and II WIP practices and applicable state regulations, and use calculation methodology consistent with the Bay Watershed Model.

3. Compare the past-years' and forecasted future years' loadings calculated in 1 and 2 above to determine whether there is a trend of growth in any portion of this sector. If

growth is forecasted to occur, EPA will expect the Bay jurisdiction to develop a credible offset program.

## FOREST LANDS

Forest lands have the lowest pollutant loading rates of all land use categories in the Chesapeake Bay model, Forest loads are a result of air deposition and cannot be further reduced through BMPs in the TMDL context. In contrast to other sectors, a trend of increasing forest cover over time results in reduced pollutant loads, while the loss of forest cover to higher loading land uses (development or agriculture) results in a growth in loads that should be offset. The calculations below should identify trends in forest cover (i.e. land conversion) that could be factored into the sector load forecasts for other sectors outlined above.

1. The harvested forest land use (approximately 1% of forest land in the Bay) does have higher pollutant loading rates, which can be partially reduced through forest harvesting BMPs. For each major river-basin, review past years' data and calculate the loadings for the following categories for 2010 and at least two (2) other years prior to 2010 (e.g., 2002 and 2007):
    a. Total forest area;
    b. Total harvested forest area; and
    c. Total acres converted from forests to other sectors

2. Using the data calculated in 1 above, calculate the forecasted loadings for 2017 and 2025 for the above categories. In doing so, consider application of final Phase I and II WIP practices and applicable state regulations, and use calculation methodology consistent with the Bay Watershed Model.
3. Compare the past-years' and forecasted future years' loadings calculated in 1 and 2 above to determine whether there is a trend of growth in 1a, 1b, and/or 1c above (i.e., an increase in the load of nitrogen, phosphorus, and/or sediment coming from 1b and 1c above). If growth is forecasted to occur, EPA will expect the Bay jurisdiction to develop a credible offset program.

## Air Emissions and Deposition

Sector load management of air emissions in the Bay TMDL is considered to be unnecessary at this time. Atmospheric deposition loads in the Chesapeake Bay watershed are controlled primarily for $NO_x$ by the National Ambient Air Quality Standards (NAAQSs) for ground level ozone and PM 2.5. The NAAQSs are set for human health and are not to be exceeded. Emission sources are tracked and controlled by State and Federal air protection programs with new controls initiated for new emission sources though State Implementation Plans (SIPs) or other control mechanisms, such as new rules and regulations, in order to ultimately achieve and maintain the air quality standards. In addition, atmospheric deposition loads are tracked in the Chesapeake Bay Program (CBP) partnership's airshed and watershed mass balance models and any increase or decrease in emission loads to the Chesapeake Bay is accounted for during the CBP partnership's major assessment periods[8].

Ammonia ($NH_3$) emissions from agriculture also are a large source of nitrogen loading to the Chesapeake Bay. Increases in animal numbers will lead to increases in ammonia emissions. These loads should be explicitly included in the assessment of the projected future loads from the agriculture sector.

Although atmospheric deposition is one of the highest load sources of nitrogen to the Chesapeake Bay watershed, those loads are decreasing at a rate higher than any other source sector, including nitrogen loads from fertilizers, manures, or point sources (Bay TMDL Appendix L, Figure L-1). The $NO_x$ portion of atmospheric deposition has a higher rate of decrease than ammonia due to emission controls on electric generating units, model sources and others, but ammonia deposition also has a slight downward trend as shown by the negative slope in Figure 5-6 of the Watershed Model documentation (2011)[9].

[8] The CBP partnership's major assessment periods typically occur every seven years. The last assessment period occurred in 2011.

[9] USEPA (U.S. Environmental Protection Agency). 2010. *Chesapeake Bay Phase 5.3 Community Watershed Model*. EPA 903S10002 - CBP/TRS-303-10. U.S. Environmental Protection Agency, Chesapeake Bay Program Office, Annapolis MD. December 2010.