



## NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) INDIVIDUAL PERMIT TO DISCHARGE STORMWATER FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4s) TMDL PLAN INSTRUCTIONS

The Department of Environmental Protection (DEP) has developed these instructions to assist MS4 applicants and permittees (MS4s) in the preparation of MS4 TMDL Plans (TMDL Plans) for stormwater discharges to local surface waters with EPA-approved Total Maximum Daily Loads (TMDLs) (TMDL waters). MS4s identified in DEP's MS4 Requirements Table (available at [www.dep.pa.gov/MS4](http://www.dep.pa.gov/MS4)) as needing to develop a TMDL Plan must attach the TMDL Plan to the application for an individual permit. MS4s that have a TMDL Plan requirement are those that are identified in one or more TMDLs as having wasteload allocation(s) (WLA(s)) for sediment or nutrients, either as specific (individual) WLA(s) or as aggregate (bulk) WLA(s).

Please refer to DEP Document ID No. 3800-PM-BCW0100k for instructions on developing Pollutant Reduction Plans (PRPs).

### I. General Information

- A. **Terms:** The term "nutrients" refers to "Total Phosphorus" (TP) unless specifically stated otherwise in DEP's latest [Integrated Report](#). The terms "sediment," "siltation," and "suspended solids" all refer to inorganic solids and are hereinafter referred to as "sediment."

The term "storm sewershed" is defined in the PAG-13 General Permit as the land area that drains to the municipal separate storm sewer from within the jurisdiction of the MS4 permittee. This term is used in these instructions as well as the term, "TMDL Planning Area" (or "Planning Area") which refers to all the storm sewersheds that an MS4 must calculate existing loads and plan load reductions for.

The term "baseline load" is used in these instructions to refer to the pollutant load discharged by an MS4 as reported in a TMDL. A baseline load can be revised by 1) conducting a new modeling effort that utilizes the land use/land cover information from the original TMDL and 2) by considering the reductions achieved through structural BMPs installed prior to approval of a TMDL that were not considered during development of the TMDL.

The term "existing load" refers to the pollutant load that the MS4 estimates is draining to impaired waters from the Planning Area at the time of TMDL Plan submission. The existing load will be the same as the baseline load (regardless of whether or not the baseline load is revised) unless the MS4 accounts for reductions from structural BMPs installed between the date of TMDL approval and TMDL Plan submission.

- B. **Pollutant(s) of Concern:** The pollutant(s) of concern for TMDL Plans will be based on the following:

- If a WLA has been established in a TMDL for sediment, the MS4 is expected to develop the TMDL Plan based on the reduction of sediment.
- If WLAs have been established in a TMDL for sediment and nutrients, the MS4 is expected to develop the TMDL Plan based on the reduction of sediment and TP, unless the MS4 chooses to utilize a presumptive approach for TP. DEP will allow MS4s to calculate loads and pollutant reductions based on sediment, under the assumption that the achievement of TMDL Plan objectives for sediment will also achieve the objectives for TP. MS4s must identify use of the presumptive approach in its TMDL Plan if chosen.
- If a WLA has been established in a TMDL for nutrients alone (or surrogates for nutrients such as "excessive algal growth" and "organic enrichment/low D.O."), the MS4 is expected to develop the TMDL Plan based on the reduction of TP, unless the presumptive approach is chosen, as described above.

C. **TMDL Plan Objectives:** There are two objectives for a TMDL Plan:

1. **Long-Term Reduction** – plan for the reduction of pollutant load(s) to achieve the WLA(s) in the TMDL.

The TMDL Plan must describe a general plan as to how WLA(s) will ultimately be achieved.

2. **Short-Term Reduction** – plan for the short-term reduction of pollutant load(s) that will be achieved within the subsequent NPDES permit term (i.e., the 5-year permit term resulting from DEP's issuance of a permit in response to the receipt of the MS4's next submission of an individual permit application).

MS4s must achieve at least one of the following objectives within the 5-year permit term: 1) the WLA(s) in the TMDL, or 2) if the WLA(s) cannot be achieved, a load reduction of at least 10% for sediment and/or 5% for TP, compared to the existing load for these pollutants at the time of TMDL Plan submission. A load reduction of at least 10% for sediment may be used as the objective in lieu of a 5% reduction in TP under the presumptive approach.

**NOTE** – The presumptive approach cannot be used to assume that meeting TMDL Plan objectives for nutrients will result in meeting objectives for sediment.

**NOTE** – The minimum required reduction to be to be accomplished during the permit term is based on the existing pollutant load at the time of TMDL Plan submission, not at the time of the original TMDL approval. If an MS4 can demonstrate to DEP's satisfaction in its TMDL Plan that it has already achieved the WLA(s) of the applicable TMDL(s), the MS4 will not be required to implement further pollutant load reductions during the subsequent permit term.

D. **Existing Pollutant Load(s):** The estimation or determination of existing loads for TMDL Plans is different than the estimation of existing loads for PRPs. MS4s have two options in establishing the existing pollutant load(s) for pollutant(s) of concern for TMDL Plans:

1. MS4s may report the existing load(s) specified in the TMDL (i.e., the TMDL "baseline load"). The baseline load(s) may be represented in the TMDL as either:
  - o Load(s) that are specific to the MS4 (i.e., the load is listed in a table within the TMDL with the name of the MS4 identified); or
  - o Load(s) that are not specific to the MS4 (i.e., are represented in the TMDL as bulk/aggregate load(s) for all MS4s in the TMDL watershed), in which the MS4 will need to distribute its individual load(s) UNLESS a collaborative TMDL Plan is developed with all other MS4s identified in the TMDL.

For TMDLs with bulk/aggregate WLA(s) for a group of MS4s, the distribution of baseline load(s) and WLA(s) must be conducted in a way that ensures the pollutant reduction requirements in the TMDL are met.

2. MS4s may choose to calculate existing load(s) for a TMDL Plan through a new modeling effort using the MapShed model developed by the Pennsylvania State University ([www.mapshed.psu.edu](http://www.mapshed.psu.edu)) or a comparable, or more robust, continuous simulation model. Any new modeling effort must focus on the TMDL Planning Area and account for overland flow as well as downstream channel and bank erosion; therefore, modeling must be done at a scale that allows for the quantification of both impacts. **New modeling must utilize the same land use/land cover information that was used to develop the TMDL or other quality assured land use/land cover data from the time of TMDL approval.** DEP recommends that prior to and/or during any new modeling effort that MS4s contact DEP's Bureau of Clean Water, Water Quality Division, TMDL Section at (717) 787-5017 for guidance.

If a combined PRP and TMDL Plan is developed (see Section I.F), in which the PRP and TMDL Planning Areas are combined into one Planning Area, the existing loads for the Planning Area may only be derived using a new modeling effort (Option 2 above).

**NOTE** – If an MS4 is aware of the date(s) of data collection in support of TMDL development, land use/land cover information from this date rather than the TMDL approval date may be used.

**NOTE** – MapShed, or any other watershed model where channel erosion is explicitly modeled, should be run on a minimum of ~10 mi<sup>2</sup> area to properly account for downstream impacts and include impaired waters identified in the MS4 Requirements Table. Aggregation of these waters up to approximately the 12-digit HUC scale for modeling purposes is acceptable. Modeling may not be done at the individual storm sewershed or municipal scale where the extent of downstream impact is not included in load calculation.

**NOTE** – CAST/BayFAST may be used for remodeling efforts, as they apply loading information derived from the Chesapeake Bay Watershed Model; however, watershed/site-specific land use/land cover information must be substituted for defaults in load calculations at all scales (e.g., Planning Area and BMP-treated area), and any requirements in these instructions pertaining to “simplified method” loading calculations also apply to TMDL Plans/PRPs developed using CAST/BayFAST if **delivered loads/loading rates are used**.

**NOTE** – Baseline loads in older TMDLs typically did not account for load reductions from urban stormwater BMPs existing at the time of TMDL preparation. In such cases, MS4s may consider structural BMPs installed **prior to** the TMDL approval date in estimating existing loads. MS4s may also consider the load reductions achieved through structural BMPs installed after the TMDL was approved. Prior to the TMDL approval date, load reductions associated with structural BMPs installed under Chapter 102 NPDES permits may be credited in full. After the TMDL approval date, load reductions associated with structural BMPs installed under Chapter 102 NPDES permits may be credited only to the extent that the BMPs produce a net load reduction (see example below). Existing BMPs that are used to reduce the existing load(s) must be documented as functional (see Section II.D).

**Example 1** – Storm Township, a municipality with a small regulated MS4, is required to develop a TMDL Plan for sediment relating to discharges to Hollow Creek, which has a sediment TMDL that was approved by EPA in January 2002. The Township evaluates its options to estimate the existing sediment load and decides to utilize the baseline load in the TMDL report of 1 million lbs/yr. This baseline load is a bulk/aggregate load that must be distributed amongst the MS4s within the watershed. The MS4s meet and agree upon a methodology to distribute the baseline load, and the Township’s share is determined to be 100,000 lbs/yr. Through a search of records and general knowledge of the land features, the Township’s staff and consultant assemble a list of existing structural BMPs that may be used to reduce this existing load estimate:

- Flood control basin – construction completed in 1979;
- Retention pond on commercial shopping center property – construction completed in 2000 under a Chapter 102 NPDES permit;
- Floodplain restoration project where the restored area is serving as post-construction stormwater management for construction of a new warehouse – construction completed in 2014 under a Chapter 102 NPDES permit.
- Raingarden on Township property – construction completed in 2012 (no NPDES permit).

Each of these BMPs continue to be maintained and are functional, and none of these BMPs were considered in the TMDL for Hollow Creek. The flood control basin and retention pond provide load reduction benefits of 3,000 lbs/yr and 2,000 lbs/yr, respectively. Upon demonstration (through calculation or modeling), these benefits can be credited in full to reduce the existing load estimate because they were installed prior to the approval date of the TMDL. For the floodplain restoration project, the Township must compare sediment load to the surface water before and after completion of the project. Utilizing historical land cover information, the Township estimates that prior to construction of the warehouse and floodplain restoration, loading to the improved section of surface waters was 8,000 lbs/yr. After construction, loading is estimated at 7,000 lbs/yr (which considers the increase in impervious surface). The Township may take the net improvement (1,000 lbs/yr) as credit toward reducing the existing load. Finally, the raingarden is estimated to reduce 500 lbs/yr of sediment, and this amount can be deducted in full from the existing load, although completed after the TMDL approval date, because it was not associated with a Chapter 102 NPDES permit. The Township can therefore use an estimate of 93,500 lbs/yr for its existing load (100,000 – 3,000 – 2,000 – 1,000 – 500).

Remodeled TMDL load calculations will typically use updated methods to better estimate the load that existed at the time of the original TMDL load calculation, using the same land use/land cover information as was used for the original TMDL. In a remodeling effort, TMDL Plans may account for all BMPs, including Chapter

102 BMPs, installed after approval of the original TMDL as long as changes in impervious surface in the drainage area of those BMPs are considered in the effort. In other words, the TMDL Plan must include the impacts of increased development/imperviousness in order to count load reductions from BMPs installed during the construction process. Chapter 102 BMPs installed after TMDL Plan development would be assumed to result in zero net loading change (i.e., no progress toward TMDL objectives), unless there is a demonstration that pollutant loading is less following an earth disturbance project compared to prior conditions.

**NOTE** – MS4s that calculate existing load(s) through a new modeling effort will need to plan for the same percent reduction in pollutant loads as prescribed by the TMDL. See Example 2 below.

**Example 2** – The baseline sediment load in a TMDL for an MS4 is reported as 100,000 lbs/yr and the specific WLA is 40,000 lbs/yr (i.e., a 60% reduction). The MS4 undertakes the following steps to refine its baseline sediment load and TMDL Plan objectives:

Step 1: Remodel to Revise Baseline Load – The MS4 opts to use MapShed to reevaluate its baseline load. This analysis revises the baseline load by using the land use distribution at the time of TMDL approval. MapShed determines that the revised baseline sediment load is 90,000 lbs/yr (i.e., a reduction of 10%). The WLA is also reduced by 10% and becomes 36,000 lbs/yr. The amount of sediment that must be reduced remains at 60% per the TMDL, but is reduced from 60,000 lbs/year (in TMDL) to 54,000 lbs/yr (90,000 lbs/yr revised baseline load – 36,000 lbs/yr revised WLA). There were no structural BMPs installed prior to TMDL approval, so the MS4 does not seek to refine the baseline load further in this step.

**NOTE** – This step is optional. MS4s may elect to use the baseline load reported in a TMDL as the existing load at the time of TMDL Plan submission, rather than conduct modeling to revise the baseline load.

Step 2: Evaluate Post-TMDL BMPs to Evaluate Existing Load: – The MS4 is aware of the construction of four non-Chapter 102 structural BMPs within its TMDL Planning Area that were installed after the TMDL was approved, all of which continue to be adequately maintained. Each BMP is analyzed independently for pollutant load reductions, and the collective sediment load reduction is 20,000 lbs/yr. The revised baseline load is therefore adjusted, and 70,000 lbs/yr becomes the MS4's existing load (90,000 lbs/yr – 20,000 lbs/yr = 70,000 lbs/yr). The WLA is not revised due to reductions achieved through BMPs after TMDL approval; however, the amount that must be reduced to achieve the WLA is reduced from 54,000 lbs/yr to 34,000 lbs/yr. There were additional structural BMPs installed after TMDL approval under Chapter 102 NPDES permits, but the MS4 is unable to demonstrate that a net load reduction is achieved by any of these BMPs.

Step 3: Decision on Load to Reduce in Permit Term – The MS4 determines that reducing 34,000 lbs/yr of sediment in order to meet the WLA of 36,000 lbs/yr of sediment cannot be achieved during the next 5-year permit term, so it elects to pursue BMPs for the reduction of 7,000 lbs as its permit term TMDL Plan objective (i.e., 10% of revised existing load of 70,000 lbs/yr).

**Example 3** – The baseline TP load for a group of MS4 municipalities in a TMDL developed to control nutrients is 1,000 lbs/yr and the bulk WLA is 250 lbs/yr (75% reduction). The group works together on a collaborative TMDL Plan and undertakes the following steps to determine a revised existing load and the TMDL Plan objectives:

Step 1 – The TMDL determined baseline loads for the entire urbanized area. The group decides to parse areas that are not part of the TMDL Planning Area. The group decides to run the MapShed model on the TMDL Planning Area. This results in a revised baseline TP load estimate for the group of 800 lbs/yr (20% reduction from the TMDL). The WLA is reduced to 200 lbs/yr (also a 20% reduction from the TMDL). A reduction of 600 lbs/yr is necessary to achieve the WLA.

Step 2 – The group decides to evaluate several non-Chapter 102 structural BMPs installed within the TMDL Planning Area after TMDL approval. It determines that some BMPs are not being maintained and therefore are not candidates for pollutant load reductions, but two are being maintained. These BMPs are evaluated independently and the collective TP load reduction, using BMP effectiveness

values from Chesapeake Bay expert panel reports is 100 lbs/yr. The existing TP load is reduced to 700 lbs/yr ( $800 - 100 = 700$ ) and the reduction to meet the WLA is reduced to 500 lbs/yr ( $600 - 100 = 500$ ).

Step 3 – The group determines that reducing 500 lbs/yr of TP during the next 5-year permit term is infeasible, so it elects to pursue BMPs for the reduction of 35 lbs/yr as its short-term TMDL objective (i.e., 5% of the revised existing load of 700 lbs/yr).

- E. **BMP Effectiveness:** All MS4s must use the BMP effectiveness values contained within DEP's BMP Effectiveness Values document (3800-PM-BCW0100m) or Chesapeake Bay Program expert panel reports for BMPs listed in those resources when determining pollutant load reductions in TMDL Plans, except as otherwise approved by DEP. For example, PRPs/TMDL Plans may also apply thoroughly vetted mechanistic models with self-contained BMP modules (e.g. Storm Water Management Model (SWMM), WinSLAMM) to demonstrate achievement of reduction targets. Application of these data intensive models could allow for a streamlining of the planning and design phases of the stormwater control process that may provide future cost savings as municipalities move toward implementation of the plan. Such resources must be documented in the TMDL Plan, and must reflect both overland flow and in-stream erosion components.

**NOTE** - Calculation of sediment load reductions for PRP/TMDL Plan purposes using the *Expert Panel to Define Removal Rates for Individual Stream Restoration Projects* report should be done as follows:

- Where existing sediment loads are calculated using the Chesapeake Bay loading rates (i.e., the "simplified method" referred to in DEP's PRP Instructions, 3800-PM-BCW0100k), the Sediment Delivery Ratio (SDR) of 0.181 must be applied and the effectiveness value contained in Table 3 of the Expert Panel Report applies (44.88 lb/ft/yr TSS). The effectiveness values in document 3800-PM-BCW0100m implicitly apply the SDR; thus, sediment load reductions calculated from stream restoration projects must be consistent.

Alternately, sediment reduction from streambank restoration projects when existing loads are calculated using the simplified method may be estimated using the Protocols outlined in Section 5 of the report and must then apply the 0.181 SDR along with the 50% efficiency uncertainty factor.

- Where existing sediment loads were calculated using modeling at a local watershed scale, the default rate to be used is 115 lb/ft/yr. This default rate comes from a convergence of MapShed modeled streambank erosion loads from a group of urbanized watersheds, the 248 lb/ft/yr default edge-of-field (EOF) rate in the Expert Panel Report with the 50% efficiency uncertainty factor specified for the Protocols applied, and field data that was collected following the BANCS methodology where projects have been implemented and load reductions calculated using the Protocols.

Alternately, sediment reduction from streambank restoration projects when existing loads are calculated using modeling at a local scale may be estimated using the Protocols outlined in Section 5 of the report and must then apply the 50% efficiency uncertainty factor.

**NOTE** – Use of default effectiveness values (44.88 lb/ft/yr and 115 lb/ft/yr) will be accepted for the subsequent permit term. It is recommended that the data required to complete load calculations using the Protocols be collected during the design phase for use in subsequent load reduction calculations.

**NOTE** - Desktop MapShed users may not use the streambank restoration or street sweeping components included in the MapShed BMP editor for pollutant reduction calculations. Pollutant reductions associated with streambank restoration projects must use the methods described above; whereas, reductions from street sweeping must be calculated in accordance with the *Recommendations of the Expert Panel to Define Removal Rates for Street and Storm Drain Cleaning Practices* or the BMP Effectiveness Values document.

**NOTE** – If BMP effectiveness values are updated in DEP's BMP Effectiveness Values document or in Chesapeake Bay Program expert panel reports between the time the PRP is approved and the time the final report is developed to document compliance with the permit, those updated effectiveness values may optionally be used.

- F. **Combining Planning Obligations:** MS4s with multiple TMDL Plan development obligations may develop one TMDL Plan for submission to DEP, if desired. If this is done, MS4s may elect to address each TMDL water separately or in combination. If done in combination, unless specifically restricted in the TMDL, the MS4 has flexibility when locating BMPs between the TMDL Planning Areas. If the MS4 elects to meet the percent reduction requirements (10% sediment or 5% TP) in lieu of meeting the WLA(s) within the first permit term, it may elect to reduce pollutants by a greater percentage in one TMDL Planning Area over another, as long as the overall reduction for the planning effort achieves the percent reduction requirements.

MS4s may also combine TMDL Plans with PRPs, and the same flexibility is provided as discussed above. In addition, where TMDL Plans demonstrate: 1) WLA(s) have been achieved, or 2) WLA(s) will be achieved during the permit term, or 3) sediment and/or TP will be reduced by 10% and/or 5% during the permit term within the TMDL Planning Area, this satisfies all PRP requirements for any impaired waters within the watershed of the TMDL waters for the subsequent NPDES permit term. As stated in Section I.D, where TMDL and PRP Planning Areas are combined, existing loads must be determined based on a new modeling effort.

**Example 4** – An MS4 must develop a TMDL Plan for Smith Run and a TMDL Plan for Jones Creek. The MS4 decides to submit one TMDL Plan to DEP instead of two. Both TMDL Plans will address sediment. The MS4 determines that it has not met the sediment WLA in either TMDL, and cannot do so within the 5-year permit term, so it elects to reduce the existing load of sediment by 10% overall in both TMDL Planning Areas. The MS4 maps the TMDL Planning Areas for Smith Run and Jones Creek and calculates, through the MapShed model, the combined sediment load from both TMDL Planning Areas (500,000 lbs/yr). The MS4 calculates the required sediment load reduction for the combined area (50,000 lbs/yr), and selects BMPs to meet the required reduction. The MS4 determines that two structural BMPs and a non-structural BMP can be implemented short-term to achieve a reduction of 50,000 lbs/yr, but the majority of these reductions will be located in the Smith Run TMDL Planning Area. This is acceptable; however, the TMDL Plan must also describe how the TMDL-required load reductions for both Smith Run and Jones Creek will be achieved long-term.

**Example 5** – An MS4 must develop a TMDL Plan for Brook Run as well as a PRP for the Chesapeake Bay. The MS4 decides to combine the TMDL Plan and the PRP. The TMDL Planning Area for Brook Run encompasses 1,000 acres, but the area draining to waters within the Chesapeake Bay watershed is larger – 2,000 acres – and includes the Brook Run TMDL Planning Area. Brook Run is impaired for nutrients and sediment, and sediment is selected as the target pollutant. The target pollutant for the Chesapeake Bay PRP is also sediment. The existing sediment load of the entire planning area of 2,000 acres is calculated using the MapShed model, and a sediment load of 2,000,000 lbs/yr is estimated. The MS4 then considered all structural BMPs that are maintained within the overall planning area and determined that 400,000 lbs/yr is being removed by those BMPs. Using a 10% sediment reduction target (i.e., the common target for both the TMDL Plan and PRP), the MS4 determines that 160,000 lbs/yr of sediment will need to be reduced during the permit term ( $2,000,000 \text{ lbs/yr} - 400,000 \text{ lbs/yr} \times 0.1$  (10%)). The BMPs to reduce 160,000 lbs/yr should preferentially be located in the Brook Run drainage area, but may be located anywhere within the Chesapeake Bay planning area if it is not feasible to locate them in the Brook Run watershed during the upcoming permit term. The TMDL Plan must also address how the TMDL-required load reduction for Brook Run will be achieved long-term.

**Example 6** – Five contiguous MS4 municipalities must develop TMDL Plans for Flat River, and decide to develop a collaborative TMDL Plan. Each MS4 has additional PRP obligations. There are a total of fifteen Appendix E PRP listings in the five MS4 municipalities according to the MS4 Requirements Table – ten are located within the Flat River watershed and five are not. The five that are not are impaired for nutrients, while Flat River and its tributaries are impaired for both nutrients and sediment. None of the MS4s discharge directly to Flat River; all discharges are to its tributaries. The group of MS4s decides to submit one plan to DEP that addresses all TMDL and PRP requirements. For the Flat River watershed, the group maps the planning area for all outfalls that discharge to the Flat River tributaries, and uses MapShed to estimate the existing sediment load at 5,000,000 lbs/yr. No structural BMPs exist in the Planning Area to evaluate for refining the existing load. The TMDL requires a 4% sediment reduction. A reduction of 200,000 lbs/yr is therefore needed to meet the WLA, which is less than the alternative of reducing existing sediment load by 10%; therefore, the group elects to select BMPs that will achieve the sediment WLA in the TMDL. In doing so, the ten PRP requirements for the Flat River watershed will be

satisfied. Separate analyses must be conducted for the five PRPs located outside of the Flat River watershed.

- G. **Offsets.** An MS4 may propose stormwater pollutant reduction BMPs outside of the TMDL and/or PRP Planning Area for possible approval as offsets toward meeting TMDL and/or PRP load reduction requirements. Unless approved otherwise by DEP, such projects must be located within the jurisdiction of the developer of the TMDL Plan and/or PRP, and treat or manage stormwater that would drain to the impaired waters of interest under a TMDL Plan or PRP. In all cases where offsets are proposed, an individual permit is required.

Examples of projects where offsets may be approved by DEP include but are not limited to a reduction of impervious areas outside of the Planning Area and BMPs at agricultural operations that are outside of the planning area but within the drainage area of the impaired waters of interest. DEP may grant offsets for the amount (lbs) of pollutants expected to be reduced after baseline and regulatory requirements are met. For the purpose of TMDL Plans and PRPs, baseline requirements are, in general, load reduction requirements established in TMDLs for sectors that do not require NPDES permits. For example, if a TMDL specifies that a sediment load reduction of 80% is necessary from the unregulated or non-urban stormwater sector in order to meet water quality standards, DEP may approve offsets for a reduction in impervious area outside of the planning area for the amount (lbs) of sediment removed after the 80% reduction requirement is met. Where published load reduction requirements are inapplicable or unavailable, DEP's Bureau of Clean Water will establish the baseline. MS4s that are seeking approval for offsets are encouraged to contact DEP during the development phase of plans in order to understand the amount of offsets that may be approved in an individual permit for a proposed project.

An operation and maintenance (O&M) plan as well as assurances for ongoing O&M must be submitted as an attachment to any TMDL Plan and/or PRP proposing the implementation of BMPs for offsets. Permittees must report actual O&M activities on Annual MS4 Status Reports to continue receiving approval for the use of offsets.

- H. **Joint or Collaborative TMDL Plans:** MS4s may develop and submit a joint TMDL Plan (which may include PRPs), regardless of whether the MS4s will be submitting a "joint individual permit application" or are already co-permittees. In general, the MS4s participating in a joint TMDL Plan should have contiguous land areas. Maps submitted with joint TMDL Plans must reflect the Planning Areas of all participating parties.

For all joint TMDL Plans, the participating parties must execute and submit with the plan an agreement for the planning, design, construction, and O&M of BMPs and for future adaptations to the Plan. DEP recommends that such agreements include the following topics:

- Scope of the Agreement
  - Complete TMDL Plan implementation (or individual BMP implementation)
- Roles and Responsibilities
  - How projects will be selected
  - Selection of engineering and other contracted services
  - Long-term O&M
  - Adaptive management of the Plan (or the individual BMPs) over the permit term
  - Commitment to using the Plan (or to implementing the individual BMP)
- Allocations of Cost and pollutant reduction
  - Methodology for sharing the cost
  - Methodology for distributing the pollutant reductions
- Timeline for implementation
  - Schedule of milestones to complete and implement the plan (or the individual BMP)

MS4s participating in collaborative efforts are encouraged to contact DEP's Bureau of Clean Water during the development phase for feedback on proposed approaches.

- I. **BMP Selection:** MS4s may select BMPs from the Pennsylvania Stormwater Best Management Practices Manual (363-0300-002), BMPs recognized by the EPA Chesapeake Bay Program, or other BMPs where the pollutant reduction efficiency is known or may be determined. Land use changes are not BMPs but may be used to demonstrate pollutant load reductions. For land use changes and BMPs implemented within a TMDL Planning Area as part of an NPDES permit requirement (e.g., post-construction stormwater management BMPs for Chapter 102 NPDES permits), pollutant load reduction credit may be claimed based on an analysis of pre- and post-construction or land use conditions, where the credit is a demonstrated net decrease in pollutant load. BMP effectiveness values must be consistent with sources identified in section I.E of these instructions.

**NOTE** – Street sweeping may be proposed as a BMP for pollutant loading reductions if 1) street sweeping is not the only method identified for reducing pollutant loading, and 2) the BMP effectiveness values contained in 3800-PM-BCW0100m or Chesapeake Bay Program expert panel reports are utilized.

## II. Required TMDL Plan Elements

Each TMDL Plan must include the following elements. The paragraph numbers in these instructions correspond to the organization of the TMDL Plan. For example, Section A of the TMDL Plan must be “Public Participation,” Section B must be the map, Section C must be “Pollutants of Concern,” etc.

**NOTE** – Where a TMDL Plan is combined with a PRP, the format of the Plan must conform to these instructions.

- A. **Public Participation.** The MS4 shall complete the following public participation measures listed below, report in the TMDL Plan that each was completed and attach copies of applicable information.

- The applicant shall make a complete copy of the TMDL Plan available for public review.
- The applicant shall publish, in a newspaper of general circulation in the area, a public notice containing a statement describing the plan, where it may be reviewed by the public, and the length of time the permittee will provide for the receipt of comments. The public notice must be published at least 45 days prior to the deadline for submission of the TMDL Plan to DEP. **Attach a copy of the public notice to the TMDL Plan.**
- The applicant shall accept written comments for a minimum of 30 days from the date of public notice. **Attach a copy of all written comments received from the public to the TMDL Plan.**
- The applicant shall accept comments from any interested member of the public at a public meeting or hearing, which may include a regularly scheduled meeting of the governing body of the municipality or municipal authority that is the permittee.
- The applicant shall consider and make a record of the consideration of each timely comment received from the public during the public comment period concerning the plan, identifying any changes made to the plan in response to the comment. **Attach a copy of the permittee’s record of consideration of all timely comment received in the public comment period to the TMDL Plan.**

For TMDL Plans developed on a regional scale by multiple MS4 permittees or by co-permittees, the collaborating permittees may implement these public participation requirements as a joint effort as long as the notice of the availability of the TMDL Plan and the notice of a public meeting or hearing reaches the target audience groups of all permittees involved in the joint effort.

- B. **Map.** Attach a map that identifies **land uses and/or impervious/pervious surfaces** and the **storm sewershed boundary** associated with each MS4 outfall that discharges to TMDL waters, and calculate the storm sewershed drainage area. In addition, the map must identify the proposed location(s) of structural BMP(s) that will be implemented to achieve required pollutant load reductions.

The map may be the same as that used to satisfy MCM #3 of the permit, with the addition of land use and/or impervious/pervious surfaces, the storm sewershed boundary, and locations of proposed BMPs, or may be a different map.

The map must be sufficiently detailed to identify the planning area relevant to satisfying TMDL Plan objectives, and to demonstrate that BMPs will be located in appropriate TMDL Planning Areas to meet the objectives. For a single MS4, the planning area constitutes the storm sewersheds of all MS4 outfalls within the permittee's jurisdiction. For MS4s participating in a joint TMDL Plan, the planning area constitutes the storm sewersheds of all MS4 outfalls within the jurisdictions of all MS4s in the joint effort. Planning areas may be reduced through parsing.

See Figure 1 of the PRP Instructions (3800-PM-BCW0100k) for an example storm sewershed map developed for a single MS4 applicant's PRP to address two impaired surface waters.

- C. **Pollutant(s) of Concern.** Identify the pollutant(s) of concern for each storm sewershed (see Section I.B of these instructions).
- D. **Existing Load for Pollutant(s) of Concern.** Calculate or report the existing load, in lbs per year, for the pollutant(s) of concern in the TMDL Planning Area. See section I.D of these instructions and **Attachment A** for guidance.

As noted previously, the options for evaluating existing load for TMDL Plans differs from PRPs. TMDL Plans must use: 1) the baseline load established in a TMDL, or 2) a load that is distributed from a bulk existing load for a group of MS4s in a TMDL, or 3) a recalculated load as determined using the MapShed model or equivalent.

If MapShed or equivalent will be used to estimate existing load, the same model should also be used to estimate future pollutant load for different BMP implementation scenarios to ensure consistency with input parameters between existing and future loading.

MS4s may claim credit for constructed structural BMPs as discussed in Section I.D, assuming those BMPs continue to be maintained and are functioning as designed. In order to claim credit, identify all such structural BMPs in Section D of the TMDL Plan along with the following information:

- A detailed description of the BMP;
- Latitude and longitude coordinates for the BMP;
- Location of the BMP on the storm sewershed map;
- The permit number, if any, that authorized installation of the BMP;
- Calculations demonstrating the pollutant reductions achieved by the BMP;
- The date the BMP was installed and a statement that the BMP continues to serve the function(s) it was designed for; and
- The operation and maintenance (O&M) activities of the BMP, O&M frequencies, and party(ies) who are responsible for O&M.

The MS4 permittee may optionally submit design drawings of the BMP for previously installed or future BMPs with the TMDL Plan.

- E. **Wasteload Allocation(s) (WLA(s)).** For TMDLs with specific WLA(s), report the specific WLA(s) established for the MS4(s). For TMDLs with bulk WLA(s), distribute the portion of the WLA(s) that are specific to the MS4 UNLESS all MS4s identified in a TMDL develop a joint TMDL Plan.

**NOTE – DEP strongly encourages MS4s that are subject to bulk WLAs to work cooperatively in developing TMDL Plans.**

- F. **Analysis of TMDL Objectives.** In this section of the Plan, MS4s must present the following:
1. Long-Term Reduction – The pollutant load reduction required to meet the WLA(s), in lbs/yr, and percentage of existing load.
  2. Short-Term Reduction – The MS4's decision on which objective will be pursued for the subsequent permit term, i.e., either 1) achieve the WLA(s) or 2) reduce existing load by 10% (sediment) or 5% (TP), as well as the pollutant load reduction, in lbs/yr.

- G. **Select BMPs To Achieve the Minimum Required Reductions in Pollutant Load.** This section must be divided into two parts if the MS4 determines it will be unable to achieve the WLA(s) in the subsequent permit term: 1) short-term reductions for the permit term, and 2) long-term reductions to meet the WLA(s). If an MS4 determines it will be able to achieve the WLA(s) during the permit term, only the information presented below for short-term reductions is necessary.

#### Short-Term Reductions for the Permit Term

Specific BMP(s), their location(s) and estimated date(s) of implementation must be identified along with calculations demonstrating that the TMDL objective will be achieved. The analysis should be similar to the examples presented in the PRP Instructions (see Attachments C and D therein). The number, type and location of BMPs may be modified following DEP's approval of the TMDL Plan, and the process for modifying TMDL Plans will be specified in the individual permit.

For all structural BMPs, MS4s must report the anticipated operation and maintenance (O&M) responsibilities and the anticipated provider of O&M as part of the TMDL Plan.

If offsets are proposed, the MS4 must calculate and document the anticipated amount of offsets. As noted above, MS4s proposing offsets are encouraged to contact DEP's Bureau of Clean Water during plan development for further information.

Historic street sweeping practices should not be considered in calculating credit for future practices. All proposed street sweeping practices may be used for credit if the minimum standard is met for credit (see 3800-PM-BCW0100m). In other words, if sweeping was conducted 1/month and will be increased to 25/year in the future, the MS4 does not need to use the "net reduction" resulting from the increased sweeping; it may take credit for the full amount of reductions from 25/year sweeping.

The names and descriptions of BMPs and land uses reported in the TMDL Plan should be in accordance with the Chesapeake Bay Program Model, to the extent possible. The names and descriptions are available through [CAST](#) (log into [www.casttool.org](http://www.casttool.org), select "Documentation," select "Source Data" and see worksheets named "Land Use Definitions" and "BMP Definitions").

#### Long-Term Reductions to Meet the WLA(s)

In this section of the TMDL Plan (where applicable), the MS4 must present, at a minimum, a conceptual plan for how the WLA(s) will be achieved, long-term. This section may be less detailed than the section addressing short-term reductions, but nonetheless should describe a feasible plan toward achieving the WLA(s). Calculations are not required, but are recommended. An estimate on the number of years it will take the MS4 to achieve the WLA(s) should be reported based on the preliminary analysis.

- H. **Identify Funding Mechanism(s).** Prior to approving coverage DEP will evaluate the feasibility of implementation of an MS4's TMDL Plan. Part of this analysis includes a review of the applicant's proposed method(s) by which BMPs will be funded. Applicants must identify project sponsors and partners and probable funding sources for each BMP. DEP does not expect that sources identified in the TMDL Plan be guaranteed, but does expect that applicants propose their preferred funding options with alternatives in the event the preferred options do not materialize.
- I. **Identify Responsible Parties for Operation and Maintenance (O&M) of BMPs.** Once implemented the BMPs must be maintained in order to continue producing the expected pollutant reductions. Applicants must identify the following for each BMP selected for the subsequent permit term:
- The anticipated party(ies) responsible for ongoing O&M;
  - The activities involved with O&M for each BMP; and
  - The anticipated frequency at which O&M activities will occur.

MS4 permittees will need to identify actual O&M activities in Annual MS4 Status Reports submitted under the permit.

### III. Submission of TMDL Plan

Attach one copy of the TMDL Plan with the individual permit application that is submitted to the regional office of DEP responsible for reviewing the application. In addition, one copy of the TMDL Plan (not the application) must be submitted to DEP's Bureau of Clean Water (BCW). BCW prefers electronic copies of TMDL Plans, if possible. Email the electronic version of the TMDL Plan, including map(s) (if feasible), to [RA-EPPAMS4@pa.gov](mailto:RA-EPPAMS4@pa.gov). If the MS4 determines that submission of an electronic copy is not possible, submit a hard copy to: PA Department of Environmental Protection, Bureau of Clean Water, 400 Market Street, PO Box 8774, Harrisburg, PA 17105-8774.

### IV. TMDL Plan Implementation and Final Report

Under the individual permit, the permittee must achieve the required pollutant load reductions within 5 years following DEP's issuance of the permit, and must submit a report demonstrating compliance with the minimum pollutant load reductions as an attachment to the first Annual MS4 Status Report that is due following expiration of the permit.

For example, if DEP issues a permit to a permittee on June 1, 2018, the required pollutant load reductions must be implemented by June 1, 2023 and the final report documenting the BMPs that were implemented (with appropriate calculations) must be attached to the annual report that is due September 30, 2023.

## ATTACHMENT A

### PARSING GUIDELINES FOR MS4s IN TMDL PLANS

Please refer to Attachment A of the PRP Instructions (3800-PM-BCW0100k) for information on where it is possible to parse (remove) land area in the course of developing PRPs. Those instructions are also applicable to TMDL Plans.

Parsing may also be undertaken where a TMDL utilized the entire land area of a municipality instead of the storm sewershed of outfalls discharging to TMDL waters (TMDL Planning Area). In such cases the MS4 is not required to take responsibilities for pollutant loads generated outside of the TMDL Planning Area, and may therefore parse out that area.

Two possible parsing methods are outlined in this document. DEP may accept other methods proposed in TMDL Plans not identified herein if based on sound science and if all other MS4s subject to a bulk WLA use the same method. **All parsing must be supported by appropriate calculations and mapping.**

#### 1. Land Area Approach

- A. Determine the total land area of the municipality within the TMDL watershed (e.g., 10,000 acres).
- B. Determine the total land area served by the MS4 within the municipality and within the TMDL watershed (e.g., 6,000 acres).
- C. Calculate the ratio of land areas by dividing the land area determined in Step B to the land area determined in Step A (e.g., 6,000 acres / 10,000 acres) and apply it to both the existing MS4 pollutant load(s) and the WLA(s) that are assigned to the MS4 in the TMDL. The required percent (%) reduction of pollutant load should not change.

Example:

Inputs: Existing pollutant load = 5,000 lbs/yr, WLA = 3,500 lbs/yr, % reduction = 30%

- Step A: 10,000 acres
- Step B: 6,000 acres
- Step C: Ratio = 6,000/10,000 = 0.6

Outputs:

- Parsed existing load = 0.6 x 5,000 lbs/yr = 3,000 lbs/yr
- Parsed WLA = 0.6 \* 3,500 lbs/yr = 2,100 lbs/yr
- New % reduction  $[(3,000 - 2,100)/3,000] \times 100 = 30\%$

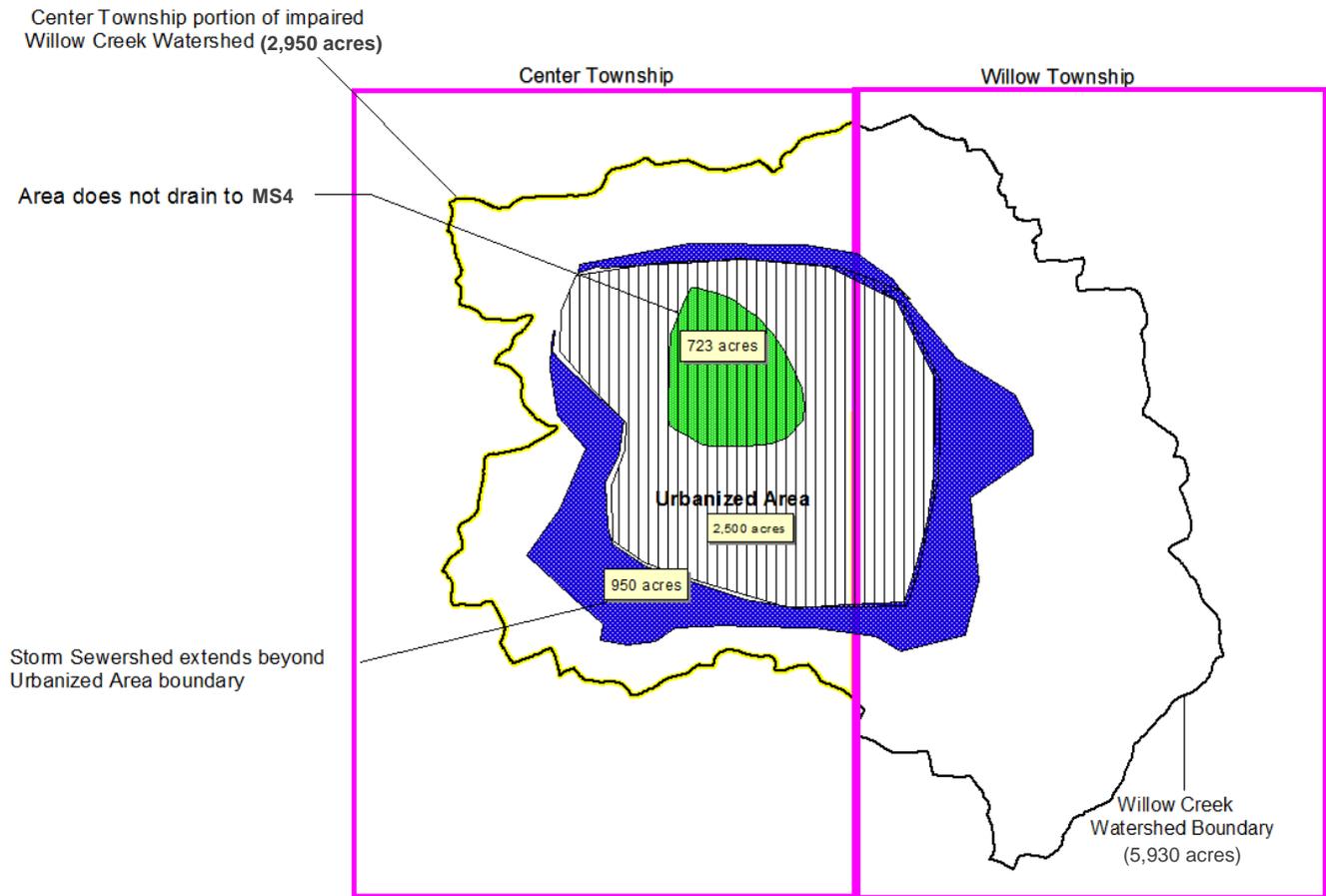
#### 2. Weighted Land Use Approach

The principle of this approach may be stated as follows:

*If the TMDL calculated the WLA based on the entire land area for a municipality that is contained in the impaired watershed, an MS4 permittee may parse (reduce) the WLA using the proportion of the load generated from the TMDL Planning Area. This may be done on a land area basis as described in Example 1. Alternately, another criterion, such as impervious area, may be applied as described in the following example.*

**Example:** A TMDL was developed and approved for the Willow Creek watershed in 2005. At that time, a bulk WLA was calculated using the entire watershed area. Center Township wishes to use the weighted land use approach to determine its parsed WLAs in the Willow Creek Watershed TMDL (see Figure 1, below). The impaired watershed is 5,930 acres total, including municipalities outside of Center Township. The pink line represents municipal boundaries. The yellow line represents the impaired watershed boundary within Center Township (2,950 acres). The striped area is the UA within Center Township (2,500 acres), and the blue area represents land outside of the UA in Center Township that drains into the MS4 (950 acres). The green area represents land within the UA that does not drain into the MS4 (723 acres). The TMDL Planning Area is represented by the following formula: UA + Additional Land Draining to MS4 – Land within UA Not Draining to MS4. In this example, the storm sewershed is 2,727 acres (2,500 acres + 950 acres – 723 acres).

**Figure 1: Example Storm Sewershed Analysis**



Responsible area for Center Township in parsing calculation:  $( \text{Urbanized Area} + \text{Storm Sewershed} ) - \text{Area not draining to MS4}$

within both the Center Township municipal boundary and the Willow Creek Watershed boundary

Once the planning area is calculated, determine the land uses in the planning area. A GIS-based analysis or assessment using other mapping tools is generally necessary.

Recalculate the existing loads and WLAs using the existing and allowable loading rates by land use from the TMDL. Using the Center Township example from Figure 1, the following steps could be taken:

1. Locate the table in the TMDL containing existing (baseline) loads and loading rates for the impaired watershed (Table 1):

**Table 1: Existing Loading Table in Example TMDL for Willow Creek Watershed**

| Source        | Area (ac)    | Sediment (lbs/yr) | Unit Area Load (lbs/ac/yr) |
|---------------|--------------|-------------------|----------------------------|
| HAY/PAST      | 50           | 3,095             | 61.9                       |
| CROPLAND      | 100          | 125,640           | 1,256.4                    |
| FOREST        | 500          | 2,600             | 5.2                        |
| WETLAND       | 150          | 405               | 2.7                        |
| TRANSITION    | 130          | 298,883           | 2,299.1                    |
| LO_INT_DEV    | 4,000        | 341,200           | 85.3                       |
| HI_INT_DEV    | 1,000        | 66,200            | 66.2                       |
| Stream Bank   |              | 702,500           |                            |
| <b>Totals</b> | <b>5,930</b> | <b>1,540,523</b>  |                            |

2. If available, locate the TMDL Existing Load and WLA tables for the portion of Center Township within the Willow Creek watershed (may be same table depending on TMDL). However, if unavailable, loads may have to be split out by township and planning area. Table 2 (TMDL Existing Load) and Table 3 (WLA) show an example of such a split using loading rates from the entire watershed as well as an impervious area weighted distribution of streambank erosion.

**Table 2: Existing Loading Table Developed for Center Township**

| Source        | Area (ac)    | Sediment (lbs/yr) | Existing Unit Area Loading Rate (lbs/ac/yr) |
|---------------|--------------|-------------------|---|
| HAY/PAST      | 25           | 1,548             | 61.9  |
| CROPLAND      | 39           | 49,000            | 1,256.4                                     |
| FOREST        | 262          | 1,362             | 5.2   |
| WETLAND       | 20           | 54                | 2.7   |
| TRANSITION    | 61           | 140,245           | 2,299.1                                     |
| LO_INT_DEV    | 2,173        | 185,357           | 85.3  |
| HI_INT_DEV    | 370          | 24,494            | 66.2  |
| Stream Bank   |              | 339,950*          |   |
| <b>Totals</b> | <b>2,950</b> | <b>742,010</b>    |   |

\* To determine the stream bank load applicable to Center Township, assume:

LO\_INT\_DEV = 34% Impervious

HI\_INT\_DEV = 70% Impervious

TRANSITION = 50% Impervious

| Sources of Streambank Erosion | Willow Creek Watershed Total (ac) | Center Twp (ac) | Center Twp Impervious Acres (ac) | Willow Twp (ac) | Willow Twp Impervious Acres (ac) |
|-------------------------------|-----------------------------------|-----------------|----------------------------------|-----------------|----------------------------------|
| LO_INT_DEV                    | 4,000                             | 2,173           | 739                              | 1,827           | 621                              |
| HI_INT_DEV                    | 1,000                             | 370             | 259                              | 630             | 441                              |
| Transition                    | 130                               | 61              | 31                               | 69              | 35                               |
|                               | <b>5,130</b>                      | <b>2,604</b>    | <b>1,028</b>                     | <b>2,526</b>    | <b>1,097</b>                     |

Center Township has 48.4% of the total impervious acres (1,028 / (1,028+1,097)). Thus, Center Township will take 48.4% of Watershed stream bank load in their existing load (48.4% \* 702,500 = 339,950 lbs) (Table 2).

**Table 3: Allowable Loading (WLA) Table Developed for Center Township**

| Source        | Area (ac)    | Sediment (lbs/yr) | Reduction | Allowable Unit Area Loading Rate (lbs/ac/yr) |
|---------------|--------------|-------------------|-----------|--|
| HAY/PAST      | 25           | 1021              | 34%       | 40.9   |
| CROPLAND      | 39           | 32340             | 34%       | 829.2  |
| FOREST        | 262          | 1362              | 0%        | 5.2  |
| WETLAND       | 20           | 54                | 0%        | 2.7  |
| TRANSITION    | 61           | 74330             | 47%       | 1218.5                                       |
| LO_INT_DEV    | 2,173        | 98239             | 47%       | 45.2   |
| HI_INT_DEV    | 370          | 12982             | 47%       | 35.1   |
| Stream Bank   |              | 180,174*          | 47%       |  |
| <b>Totals</b> | <b>2,950</b> | <b>400,502</b>    |           |  |

\* Stream bank WLA = 339,950 \* (1 - 0.47) = 180,174 lbs; this is the 47% reduction to the Center Township existing stream bank load called for in the TMDL.

- Calculate the revised MS4 existing loads based on the Planning Area (Table 4). The Planning Area would need to be delineated into land use areas. For example, although the TMDL reported 25 acres of hay/pasture (HAY/PAST), the MS4 in this example determined that only 3 acres of hay/pasture lands exist in the Planning Area. Revised stream bank erosion loads are calculated separately in the next step.

**Table 4: Recalculated MS4 Existing Load for Center Township Based on Planning Area**

| Source        | Area (ac)    | Sediment (lbs/yr) | Unit Area Load (lbs/ac/yr) |
|---------------|--------------|-------------------|----------------------------|
| HAY/PAST      | 3            | 186               | 61.9                       |
| CROPLAND      | 20           | 25,128            | 1,256.4                    |
| FOREST        | 85           | 442               | 5.2                        |
| WETLAND       | 15           | 41                | 2.7                        |
| TRANSITION    | 57           | 131,049           | 2,299.1                    |
| LO_INT_DEV    | 2,000        | 170,600           | 85.3                       |
| HI_INT_DEV    | 300          | 19,860            | 66.2                       |
| Stream Bank   |              | 303,645*          |                            |
| <b>Totals</b> | <b>2,480</b> | <b>650,950</b>    |                            |

\* See below, Step 4 and Table 5.

- Calculate the existing stream bank erosion attributed to the Planning Area (Table 5). The total existing stream bank load for Center Township is 339,950 lbs (see Table 2). The portion of this load attributable to the Planning Area can be estimated by multiplying the proportion of impervious surface area in the Planning Area by the total existing stream bank load (Table 6). This calculation requires knowledge of the percent impervious surface that is assumed for urban land uses: 50% impervious for transitional, 70% for high intensity development and 34% for low intensity development.

**Table 5: Calculation of Impervious Area within Planning Area for Stream Bank Load**

| Source                       | Area – Entire Municipality (ac) | Planning Area (ac) (A) | Outside Planning Area (ac) (B) | Percent Impervious (C) | Impervious Area in Planning Area (A x C) | Impervious Area Outside Planning Area (B x C) |
|------------------------------|---------------------------------|------------------------|--------------------------------|------------------------|--|---|
| HAY/PAST                     | 25                              | 3                      | 22                             | 0%                     | 0  | 0   |
| CROPLAND                     | 39                              | 20                     | 19                             | 0%                     | 0  | 0   |
| FOREST                       | 262                             | 85                     | 177                            | 0%                     | 0  | 0   |
| WETLAND                      | 20                              | 15                     | 5                              | 0%                     | 0  | 0   |
| TRANSITION                   | 61                              | 57                     | 4                              | 50%                    | 29                                       | 2   |
| LO_INT_DEV                   | 2,173                           | 2,000                  | 173                            | 34%                    | 680                                      | 59  |
| HI_INT_DEV                   | 370                             | 300                    | 70                             | 70%                    | 210                                      | 49  |
| <b>Totals</b>                | <b>2,950</b>                    | <b>2,480</b>           | <b>470</b>                     | <b>-</b>               | <b>919</b>                               | <b>110</b>                                    |
| <b>Percent of Impervious</b> |                                 |                        |                                |                        | <b>89.3</b>                              | <b>10.7</b>                                   |

Recalculated MS4 Existing Load for Center Township Based on Planning Area = Total Existing Stream Bank Load for Center Township \* Impervious Area within Planning Area = 339,950 lbs \* 89.3% = 303,645 lbs.

- Calculate the revised WLA based on the planning area (Table 6). **The unit area loads (highlighted blue in Table 3) and % reductions (highlighted gray in Table 3) for each land use type must remain the same when calculating the revised WLA.**

**Table 6: Recalculated MS4 WLA for Center Township Based on Planning Area**

| Source       | Area (ac)    | Sediment (lbs/yr) | Unit Area Load (lbs/ac/yr) | Reduction |
|--------------|--------------|-------------------|----------------------------|-----------|
| HAY/PAST     | 3            | 123               | 40.9                       | 34%       |
| CROPLAND     | 20           | 16,584            | 829.2                      | 34%       |
| FOREST       | 85           | 442               | 5.2                        | 0%        |
| WETLAND      | 15           | 41                | 2.7                        | 0%        |
| TRANSITION   | 57           | 69,456            | 1218.5                     | 47%       |
| LO_INT_DEV   | 2,000        | 90,418            | 45.2                       | 47%       |
| HI_INT_DEV   | 300          | 10,526            | 35.1                       | 47%       |
| Stream Bank  |              | 160,932*          |                            | 47%       |
| <b>Total</b> | <b>2,480</b> | <b>348,521</b>    |                            |           |

\*Recalculated Stream Bank WLA = Allowable Load for Center Township Stream Bank \* Percent Impervious Within Planning Area = 180,174 \* 89.3% = 160,932 lbs.

The Center Township Planning Area contains 89.3% of the total impervious surface contained in the original unparsed Center Township loading calculations; therefore, the original stream bank load in the WLA in Table 3 is reduced from 180,174 to 160,932.

As a result of the weighted land use/imperviousness parsing approach in this example, Center Township's WLA for sediment was reduced from 400,502 lbs (Table 3) to 348,521 lbs (Table 6).