# Section X: Load Reduction Calculations

The Best Management Practices (BMPs) needed to reach the goals and their long term targets presented in Section VIII were found by modeling the watershed study area. The Watershed Treatment Model (WTM) Version 3.1 produced by the United States Environmental Protection Agency's (EPA) Office of Wetlands, Oceans and Watershed for Region V was used to find the calculated yearly loading rates before and after the implementation of BMPs.

The WTM is comprised of a series of worksheets with data inputs for primary sources, secondary sources, existing management practices, future management practices, and future land use. Other worksheets are included in the model but these were the primary input sheets used for the calculated load reductions.

The primary input data source was the current land use information contained in this plan with a 20 year planning horizon. The only secondary source considered was stream erosion. Existing management included the acreage of wetlands currently in the watershed being considered as natural riparian areas. The future management practices included a variety of structural BMPs as well as some soft practices that would reduce sediment and nutrient loads entering the water body. The future land use consisted of changing undeveloped areas into the wetlands as needed for structural BMPs. Also changed in future land use was the acreage that will be developed into medium density urban in the southern portion of the watershed study area located in Porter County. Appendix 19: Load Reductions contains a detailed breakdown of the data used to find the calculated load reductions in the watershed study area.

The structural BMPs needed to accomplish the long term targets for the seven watershed management goals are presented in Table 10.1. The future management practices are grouped according to their 14-digit HUC watershed with the combined acreage for each BMP being listed at the bottom of the table. The acreage of each BMP type represents the acreage used for the future management practices and is independent from the acreage of the other structural BMPs.

While the structural BMPs are the major source of calculated load reductions to the Little Calumet River and its tributaries, there are also "soft" practices that are to be implemented by the local communities in the watershed study area. However, the WTM could not calculate the load reductions for all of the BMPs in this plan. A list of the practices that should be implemented where appropriate but that could not be included as part of the WTM is shown in Table 10.2.

The resulting load reductions for each HUC 14-digit watershed and the combined total reduction is listed in Table 10.3. Appendix 19: Load Reductions contains the detailed listing of the existing and future loads with the reduction and percentages shown. The only parameters calculated for the WTM are Total Phosphorus, Total Nitrogen, Total Suspended Solids, and Fecal Coliform. The

reduction percentage found for the fecal coliform was used to find the new *E.coli* concentrations during dry weather. The new reduced concentrations are listed in Table 10.4 for each of the 42 sampling locations, which tested for *E.coli* alone. This percentage reduction was used because the relationship between fecal coliform concentrations and *E.coli* concentrations is a factor of 80%, with the *E.coli* concentrations being less.

| | BMP Type | Acreage |
|---|---|---|
| E-W Split Watershed | Infiltration Strip | 17 |
| | Wet Pond | 200 |
| | Dry Extended Detention Pond | 100 |
| | Wetlands | 1857 |
| LC & DR Watershed | Infiltration Strip | 21 |
| | Wet Pond | 200 |
| | Dry Extended Detention Pond | 151 |
| | Wetlands | 970 |
| WC & BD Watershed | Infiltration Strip | 54 |
| | Wet Pond | 200 |
| | Dry Extended Detention Pond | 256 |
| | Wetlands | 1954 |
| COMBINED | Infiltration Strip | 92 |
| | Wet Pond | 600 |
| | Dry Extended Detention Pond | 506 |
| | Wetlands | 4780 |

Table 10.1: Future management practices used for WTM.

| NEW CAMPAIGNS/PROGRAMS TO BE IMPLEMENTED | EXISTING CAMPAIGNS/PROGRAMS TO BE UTILIZED | ORDINANCES TO BE CREATED | STRUCTURAL BMPs TO BE IMPLEMENTED |
|---|---|---|---|
| Develop a pet waste educational campaign | Develop a conservation program to follow the Farm Bill cost-share guidelines that are specific to land uses in the watershed | Develop on-site sewage disposal system (OSDS) inventory | Identify, prioritize and schedule retrofit opportunities to reduce CSO impacts |
| Create a septic maintenance awareness program | Implement an Adopt-A-Stream Program | Create ordinance to prevent septic system failures in watershed study area | Using a program model the effects that will be felt through proposed channel modifications. Implement BMPs to reduce these impacts on the watershed study area |
| Develop a residential car washing campaign to encourage residents to use car washes or pervious surfaces | Using current zoning restrictions to better control post-construction water quality | Create ordinance to enforce conservation measures to reduce E.coli loads to the river | Wetlands planting via public involvement |
| Implement a pond/lake management campaign to reduce nuisance wildlife | Develop a conservation management system (CMS) for pasture components through Farm Bill cost-share program | Develop ordinance to require an 80% TSS reduction standard governing new developments | After construction of BMPs require an inspection and maintenance |
| Review existing land use plans and verify the implementation of "Smart Growth" or LID practices being used | Post the IN Stormwater Manual and supporting documents on municipal websites for easy access by developers and landowners | Develop and adopt a riparian setback ordinance | Conduct fluvial geomorphic assessment to gather more baseline data and utilize practices consistent with NRCS Stream Restoration Design Guidebook |
| Develop a stream and riparian area restoration work plan | Encourage participation in Indiana Clean Marina Program for new and existing marinas | Use ordinances to control post-construction runoff | To increase filtration implement bioretention and rain gardens, catch basin inserts, sand and organic filters, and vegetated filter strips. |
| Create a reforestation program for natural areas in the study area | Use a post-construction plan review process to ensure all ordinances are being met or exceeded | Determine key players to the success of an alliance group for the Little Calumet River and its tributaries and gain buy-in | Begin implementing bioengineering practices that were found to be feasible when assessing eroding stream banks and marine shorelines |
| Develop a LID presentation that can travel and is targeted at specific audiences | Coordinate and train municipalities on good housekeeping strategies and regional Rule 5 enforcement | Create an erosion and sediment control plan to be regulated by building permits | Riparian area restoration/mitigation that will result in the greatest benefit to water quality and habitat connectivity |
| Find and develop a partnership with the fertilizer industry to make P-free fertilizer available to residents | Develop a nutrient management plan as outlined in the IN NRCS Field Office Technical Guide | Monthly street sweeping and parking lot cleaning requirements in the local communities | To increase infiltration implement grassed swales, infiltration basin, infiltration trench, and porous pavement |
| Develop a homeowner outreach strategy that will educate the public on yard maintenance activities | Promote NIRPC guidance document for land managers/owners | Regulate building permits to require preservation of natural vegetation | Restore native plant communities in wetlands and riparian areas that are targeted at specific soil types for restoration/mitigation |
| Outreach material to be developed on the importance and function of wetlands and riparian areas to help protect from adverse impacts | Assimilate an economic study to determine functional value as well as feasibility of existing wetlands | Require storm drain system cleaning | Identify areas along waterway that create the greatest obstructions and hamper navigability |
| Create a public service announcement (PSA) relating to E.coli and recreational activities to be put in utility bills | Incorporate Coastal Program findings about gaps in public access sites and develop a map showing access points | | To reach retention/detention standards implement dry detention ponds, in-line storage, on-lot treatment, stormwater wetlands, or wet ponds. |
| Map future population trends for each community and compare to those of neighboring communities to find where development ordinances will be needed | Increase awareness of on-going watershed projects and home owner BMPs | | Use check dams to control runoff |
| | Coordinate available resources including those provided by NIRPC, IDEM and the EPA | | Implement grass-lined channels to better control runoff and filter out sediments |
| | | | Control sediment loads reaching the river through the implementation of brush barriers, sediment traps, and vegetated buffers |
| | | | Use innovative BMPs for new site plans including conservation easements, eliminating curb and gutters, green parking, green roofs, LID strategies, narrower residential streets, protection of natural features, redevelopment, riparian/forested buffer, street design and patterns, and urban forestry |

Table 10.2: List of BMPs for possible implementation

| LOAD REDUCTIONS RESULTING FROM BMP IMPLEMENTATION | | | | | |
|---|---|---|---|---|---|
| | | TN lb/year | TP lb/year | TSS lb/year | Bacteria billion/year |
| 07120003030050 | Total | 14526 | 2344 | 4093108 | 1164171 |
| | Percentage | 18.63% | 24.15% | 84.61% | 39.94% |
| 04040001040020 | Total | 11538 | 1627 | 4353019 | 870303 |
| | Percentage | 12.44% | 13.86% | 69.45% | 25.69% |
| 04040001040030 | Total | 14653 | 2543 | 5552534 | 1420717 |
| | Percentage | 18.10% | 24.24% | 88.70% | 54.63% |
| COMBINED | Total | 40717 | 6513 | 13998660 | 3455191 |
| | Percentage | 16.18% | 20.40% | 80.61% | 38.81% |

Table 10.3: Load reduction totals and percentage for 14-digit watersheds.

| Sampling Location | E. coli (cfu/100ml) | | | |
|---|---|---|---|---|
| | Dry Weather (7/24/2007) | | Dry Weather (10/30/2007) | |
| | Sampling Results | 38.81% Reduction | Sampling Results | 38.81% Reduction |
| 1 | | 0 | 225 | 138 |
| 2 | 1804 | *1104 | 341 | 209 |
| 3 | 448 | *274 | 190 | 116 |
| 4 | 25 | 15 | 218 | 133 |
| 5 | 396 | *242 | 174 | 106 |
| 6 | 94 | 58 | 52 | 32 |
| 7 | 2 | 1 | 3 | 2 |
| 8 | 3 | 2 | 5 | 3 |
| 9 | 1 | 1 | 32 | 20 |
| 10 | 228 | 140 | 15 | 9 |
| 11 | 207 | 127 | 144 | 88 |
| 12 | 108 | 66 | 15 | 9 |
| 13 | 56 | 34 | 1 | 1 |
| 14 | 353 | 216 | 20 | 12 |
| 15 | 270 | 165 | 46 | 28 |
| 16 | 692 | *423 | 75 | 46 |
| 17 | 119 | 73 | 78 | 48 |
| 18 | 345 | 211 | 58 | 35 |
| 19 | 1 | 1 | 428 | *262 |
| 20 | 88 | 54 | 113 | 69 |
| 21 | 51 | 31 | 79 | 48 |
| 22 | 111 | 68 | 7 | 4 |
| 23 | 374 | 229 | 40 | 24 |
| 24 | 505 | *309 | 77 | 47 |
| 25 | 275 | 168 | 48 | 29 |
| 26 | 68 | 42 | 16 | 10 |
| 27 | 937 | **573 | 445 | **272 |
| 28 | 375 | 229 | 260 | 159 |
| 29 | 158 | 97 | 5 | 3 |
| 30 | 168 | 103 | 18 | 11 |
| 31 | 5 | 3 | 72 | 44 |
| 32 | 72 | 44 | 102 | 62 |
| 33 | 50 | 31 | 8 | 5 |
| 34 | 71 | 43 | 19 | 12 |
| 35 | 129 | 79 | 27 | 17 |
| 36 | 51 | 31 | 2 | 1 |
| 37 | 4 | 2 | 92 | 56 |
| 38 | 3 | 2 | 79 | 48 |
| 39 | 36 | 22 | 67 | 41 |
| 40 | 9 | 6 | 2 | 1 |
| 41 | 86 | 53 | 44 | 27 |
| 42 | 913 | **559 | 586 | **359 |

* Single sample measured load reduction exceeding the 235 cfu/100mL standard.
** Both dry weather measured sample load reduction percentages will be exceeding the 235 cfu/100mL standard.

Table 10.4: Sampling locations dry weather E. coli loads resulting from percentage load reduction.