Lower Fox River TMDL Technical Team Meeting Notes

Date: November 12, 2008
Location: WDNR Green Bay - Lake Michigan Room/Conference Call

"MS4" Subcommittee (9am - 12pm)

Attendees: John Kennedy (Green Bay Metropolitan Sewerage District), Michael Finney (Oneida Tribe), Nick Vande Hey (McMahon), Matthew Heckenlaible (City of Green Bay), Kelly Mattfield (AECOM), Bud Harris (UW-Green Bay), Ed Wilusz (WI Paper Council), Paul Baumgart (UW-Green Bay), Rob McLennan (WDNR), Melanie Leet (Winnebago County Land & Water Conservation District)
Others: Jill Fermanich (UW-Green Bay), Dan Cibulka (UW-Green Bay), Tony Kappell (McMahon)

1. Presentation on the SLAMM model (Kelly Mattfield - EarthTech AECOM)

- SLAMM model can calculate BMP costs and model a variety of pollutants.
- MS4 permit modeling includes only urban areas prior to October 1, 2004. Areas zoned agricultural were removed. The entire volume of water from the watershed is included regardless of zoning. Anything developed after 10/1/04 is excluded because it has to meet 80% reduction in TSS required by NR 151. City ordinances may require redeveloped areas to meet higher standards than the 40% required by DNR – for example Appleton & Green Bay require 80% reduction in newly redeveloped areas.
- SLAMM inputs include soil type (set permeability characteristics), land use (from 2004, can make adjustments for 2008), rainfall, development characteristics, and control practices.
- SLAMM does not account for construction sites and does not consider growth.
- Land use categories are based upon typical characteristics of each category. Specific modeling projects could in theory: account for Low Impact Development (LID) areas by creating their own land use category, add up impervious surfaces to incorporate into the model, address soil permeability on a neighborhood scale, – however these are beyond the scope of the MS4 permit models.
- SLAMM calculates runoff volume based on "small storm hydrology". Very small events (1/10" in 24 hours) generate runoff.
- Concern that if we limit TMDL model to SLAMM we limit the potential solutions. SLAMM might be used to look at LID in specific areas and address the savings to the community by showing reductions in BMPs needed to meet MS4 permit reductions.
- For MS4 permit models – base loading condition with BMPs in place pre-10/1/04.
- Currently SLAMM doesn't account for adjustments that reduce phosphorus inputs. It uses an average mg/l of phosphorus for a given land use type no matter how much it rains.
- Site specific BMPs can be put into SLAMM, city-wide BMPs (such as homeowner rain gardens) are more difficult to model. The City of Green Bay model showed that directing ¼ of roof top runoff to rain gardens did not provide a significant reduction in TSS. Most loading in residential areas comes from streets, in commercial areas most loading is from parking lots (though street cleaning here is not shown to be a big

advantage because of the large area, concentrated sweeping in the spring could provide excellent removal).

- MS4s can't take advantage of natural wetlands in urban areas when determining 40% reduction. SWAT does take natural wetlands into account.
- Loading is measured at the end of the subwatershed unit, where it hits the water of the state. Output summary from SLAMM can give you estimates of costs.
- Mike Finney suggested that a policy driver could be to give credits to communities when they do a better job at removing phosphorus: better designed detention ponds, snow management (sweeping snow storage areas), turf management, leaf collections etc.
- SLAMM models phosphorus removal by removing sediment and assuming a certain percentage of phosphorus is attached to the soil – though not a 1:1 relationship. SLAMM can be run 'backwards' by specifying the % reduction needed and seeing which BMPs are produced.
- Efficiency of BMPs can be user-defined.
- How will TMDL account for urban areas that are not MS4s (eg. Wrightstown, Greenleaf, Freedom)? One could compare urban loading simulated by SWAT to SLAMM urban results to see how closely models agree.
- The full amount of data that SLAMM can provide may not be available based on what the communities have submitted to the DNR.
- SLAMM only considers spring-summer-fall period when BMPs are functional (not winter) using rainfall from one average representative year. It is a simplified hydrologic model – antecedent moisture conditions are held constant. Seasonal differences are not accounted for.
- In urban areas the small storms are moving more pollutants. This is opposite of rural areas where the large storms are more important.
- Communities with progressive stormwater management plans don't do it for the DNR 'credits'. Even though leaf collection on a terrace would be a benefit, a city that would have to change equipment would not get a reduction credit for this practice and is more likely to spend their limited money on practices that are counted by the DNR.
- An optimization chart showing various practices costs/pound of phosphorus reduction could quantify other practices that are beneficial but not included in MS4 modeling.

2. "Case Study" of three different MS4 SLAMM Reports

Matt Heckenlaible – City of Green Bay

- The city has 2 MS4 permits – one for Green Bay, one for Oneida reservation lands. Approximately 5% of lands within municipal boundary were excluded including many private detention ponds that were built after 10/1/04.
- City stormwater ordinance began in 2001.
- Areas of the city that do not show reductions after applying existing BMPs will be targeted for retrofits, available land may be limiting in densely populated areas. Partnerships with private industries may be useful as these are some of the areas with highest loadings.
- Green Bay selected an enhanced street sweeping process (6 sweeps of entire city in six weeks, April 15 through June 1) to meet the 20% reduction goal (had to reduce additional 196 ton/year). This year was test run and managed to sweep entire city

(excluding areas served by ditches, detention ponds, or engineered BMPS) in 8 days compared to 4 weeks in previous years. By doing so they reduced 222 additional tons/year which resulted in more than 20%. Cost is $50,000/year for manpower/overtime and does not include material costs. Costs approximately $175,000 to purchase a high efficiency sweeper.

- SLAMM BMP costs are broken out by drainage areas and depend on land costs. City's initial analysis looked at city owned properties. Approx costs/ton TSS for ponds - $20,000 to $55,000, biofilters - $80,000 to $124,000, high efficiency sweeper - $50,000 - $100,000/ton removed.
- 30 additional structural BMPs were identified – even with enhanced street sweeping and implementing all 30 the City can only get to approx 32% reduction. It is likely that over time some of the 30 will be found not to be viable options. Initial cost estimates of 30 were over $13.1 Million ($3.4 million in land acquisition and $9.7 million in construction costs, costs have since increased).
- Other controls considered:
  - Rain Gardens (100% Residential Parcels) resulted in 9.4 Tons TSS Reduction
  - Bio-Filters resulted in 192 Ton Reduction, 1,132 Additional Acres of Land Required & $15,843,000 Cost (Land Not Included)
  - Converting Ditches to Engineered Infiltration Swales resulted in 192 Ton Reduction Potentially Feasible IF 100% of existing ditches converted at a cost of $8,666,000
- Pollutant trading for MS4s may be difficult since mainly developed for phosphorus trading and there's no criteria for measuring TSS reductions. May take some code changes to make this viable option for MS4s. Urban sediment has potential to carry other pollutants with it (eg. Heavy metals) and is a surrogate standard for other parameters. Currently there is no conversion factor (which could include safety factor) that accounts for differences between agricultural and urban sediments.

Nick Vande Hey - McMahon & Associates – Village of Little Chute

- MS4 does require tracking of phosphorus reduction
- With existing BMPs the Village has 10.1% reduction in TSS. To get to 20% used street sweeping, converted 2 dry ponds to wet ones ($480,000 + O&M costs, $0.74/lb reduction), and pursuing legal agreements with private ponds.
- Provided 3 alternatives to reach 40% reduction that included enacting a parking ordinance that would increase street sweeping performance (Alternatives 2&3)..

-	Total Capital Cost	Total O&M Cost (Over 20 yrs)	Annual Total Cost ($/lbs)
20% TSS Reduction	$480,000	$2,311,025	$0.74
Alt. #1 - 40% TSS Reduction	$2,036,000	$3,816,157	$0.76
Alt. #2 - 40% TSS Reduction	$1,542,000	$3,308,752	$0.65
Alt. #3 - 40% TSS Reduction	$1,930,000	$3,757,263	$0.74

- Village also identified load reductions in subwatersheds that drain to impaired waters.

Kelly did not present City of Appleton SLAMM results due to time. Sorry Kelly!

"Ag" Subcommittee (1pm - 3pm)

Attendees: Eugene McLeod (Claumet County Land & Water Conservation Department), Eric Cooley (UW Discovery Farms), John Kennedy (Green Bay Metropolitan Sewerage District), Michael Finney (Oneida Tribe), Nick Vande Hey (McMahon), Matthew Heckenlaible (City of Green Bay), Bill Hafs (Brown County Land & Water Conservation Department), Greg Baneck (Outagamie County Land & Water Conservation Department), Bud Harris (UW-Green Bay), Ed Wilusz (WI Paper Council), Paul Baumgart (UW-Green Bay), Kevin Fermanich (UW-Green Bay), Rob McLennan (WDNR), Melanie Leet (Winnebago County Land & Water Conservation Department), Kevin Urb (UW-Extension), Erin Hanson (WDNR)
By phone: Nicole Richmond (WDNR), Corrine Billings (WDNR), Laura Blake (Cadmus)
Others: John Katers (UW- Green Bay), Brent Peterson (Brown County Land & Water Conservation Department), Jim Jolly (Brown County Land & Water Conservation Department), Tony Kappell (McMahon)

Agricultural BMPs - Addition of BMPs for consideration in optimization model

Discussion centered on the list of Agricultural BMPs circulated to the technical team titled "Agricultural Management Scenarios 11-10-08.xls".

Agricultural Management Scenario

1. *Nutrient Management (reduce phosphorus in dairy cow feed ration by 25%)*
   - When phosphorus is overfed in the ration more phosphorus is in soluble form in the manure.
   - CAFOs will be more likely than smaller farms to reduce their feed phosphorus levels (1/3 of cows are on CAFOs). Some small farms deliberately over feed phosphorus to increase calving.
   - Reducing phosphorus in rations will depend on market forces and costs to farm.
   - Kevin Urb showed a graph showing phosphorus in rations over time, larger farms had more samples, trending downwards.
   - This is the only option that actually reduces phosphorus inputs to the basin so it would be best to keep the maximum implementation rate high (beyond the estimated 25-50% current implementation rate).
2. *Manure Incorporation (increase proportion of applied manure that is incorporated within 72 hours)*
   - This will require adequate manure storage, and storage costing should be included with this BMP.
   - Incorporation reduces soluble phosphorus in soil. It will also be important to include BMPs that restrict soil loss since with incorporation phosphorus is attached to the soil.
   - Increased manure incorporation will also increase soil phosphorus levels.
3. *Nutrient Management (stabilize soil-test phosphorus averages at current average of 40 ppm [Bray P1])*
   - With high soil phosphorus expect increasing levels of soluble phosphorus.

- Kevin Urb noted that soil phosphorus levels in Lower Fox basin have peaked and are now declining and stabilizing.
- Smaller farms are now coming into nutrient management. To see a trend in soil phosphorus we will have to look at weighted average of soil phosphorus for individual farms over time.
- When questioned why 40 ppm was selected for this BMP it was noted that this was a number representative of land in Lower Fox Basin. The state allows up to 50 ppm even though 30 ppm is what's needed for crops to grow. 40 ppm is an intermediate step when the ideal soil phosphorus is really lower (see #7).
- Last bullet in description of this BMP lists redistributing manure to fields manages as cash crops & the best way to do this will be to look at concentrating the manure (dewatering) though the costs of dewatering may not be included in estimates for this BMP.

4. *Conservation Tillage (mulch and zone tillage)*
   - Increased manure incorporation and Conservation Tillage could be working against each other.
5. *Cover Crops (on low residue fields)*
   - Will need incentives, cost $50-70/acre.
   - Barriers – additional expense (seed costs & if don't harvest crop then have to spray in spring), delayed spring planting
   - More effective on corn silage fields than in dairy rich areas because there is enough time to get crop growing if done immediately after corn. We are further north than other areas that use these successfully. If there isn't enough time to get the crop growing after the last manure application in the fall these aren't effective.
6. *Vegetative Buffer strips*
7. *Decrease Soil Phosphorus Levels from 40 ppm to 25 ppm (Bray P1)*
   - In Dane County even 30 ppm is considered excessive. Ideal would be 25-30 ppm.
   - This BMP option has much lower maximum implementation rate (35%) since this will be difficult to achieve and will take a long time to reach these soil levels.
   - This BMP assumes that runoff will be managed appropriately.
   - Eric Cooley mentioned that Discovery Farms see some of the highest phosphorus losses from soils with low phosphorus concentrations.
8. *Biofuel Crops*
   - These were originally added to the list of BMPs for the demonstration project to show that innovative and forward thinking practices need to be considered. Agreed that these should still be included in optimization since maximum implementation rate is set low.
9. *Sediment Basin*
   - WASCB (soil catchment basin)
   - To model these could use generic implementation rate. For example could take 5% of high sediment yield acres. Would also get phosphorus reduction, similar to urban areas.
   - Could be doable given the right incentives.
10. *Innovative Manure Management (IMM)*
    - Bill Hafs circulated a map of Brown County Animal Waste Management Ordinance Permits and Agricultural fields. Brown County doesn't have enough

land to accommodate the current number of cows and wants to increase numbers as it's good for business (has 115,000 acres of crop land, need 2-3 acres per cow to land apply waste).

Adobe Acrobat Document

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- John Katers, UWGB & Feco/Encap, listed the disadvantages of several of the manure management options in Dane County's list that was circulated to the technical team. He discussed Feco & Encap's current use of waste from paper mills and their patented polymer technology. They are located in Town of Scott and are currently exploring use of animal wastes to generate fertilizers for sale and for other markets. They could make a custom blend fertilizer with movement control included to reduce phosphorus losses. The smallest scale operation could handle 17,500 dry tons/year or approximately the waste from 12,000 cows. Two meat packers could go in together and supply enough waste for a plant. Research and development trials of this new technology are scheduled to occur in the next year and data should be available in spring 2009.
- Difficulty for cost optimization model will be to quantify costs and account for this in model. Paul Baumgart's table of preliminary results from test simulation of removing applied manure in SWAT model was distributed to technical team.
- IMM will not be a solution to all problems, but can be considered as technology becomes available.

Additional Discussion:

- Although soil phosphorus levels are decreasing it is not expected that results would be immediately seen in Green Bay waters. Recent phosphorus data from Green Bay show that the noise around the mean phosphorus level is increasing (more variable results). There is enough phosphorus in stream sediments to obscure any measureable decreases in phosphorus inputs for a very long time.
- There isn't a long term data set that measures soluble phosphorus runoff from fields.
- Should an additional crop in rotation be included in modeling exercise? Dairy already uses alfalfa. Won't be able to get a 3rd crop into the rotation if it's not economically feasible.
- Dewatering of manure is included in #3 and #7, the technology is available
- Improvements to small farm barn yards are not included in this list of BMPs. Although these types of improvements can be very beneficial on a case-case basis, overall they are very expensive for a small portion of the load. These BMPs can be listed as one of many ways of decreasing sediment and phosphorus loads, but will not be considered in the cost optimization model.
- All BMPs on list should remain in consideration for the cost optimization model.