Non-tidal Passaic River Basin Water Quality Trading Project

Summary of Existing Tier A/ Tier B Municipal Separate Storm Sewer System (MS4) Permit Requirements

Background

The Clean Water Act (CWA) regulates pollution from point sources discharging to waters in the United States. Municipal separate storm sewer systems (MS4s) are considered point sources even though they collect runoff from diffuse areas. Congress amended the Clean Water Act in 1987 to require regulation of discharges from MS4s. In 2004, New Jersey approved the Phase II process of the MS4 permit program. As a result, almost all New Jersey municipalities are now subject to MS4 permitting requirements.

The following paragraphs cite the New Jersey Department of Environmental Protection (NJDEP) 2005 proposed Phase I Passaic River Study Total Maximum Daily Load for Phosphorus in Wanaque Reservoir Northeast Water Region:

"On February 2, 2004 [NJDEP] promulgated two sets of stormwater rules: The Phase II New Jersey Pollutant Discharge Elimination System (NJPDES) Stormwater Rules, N.J.A.C. 7:14A and the Stormwater Management Rules, N.J.A.C. 7:8

The Phase II NJPDES rules for the Municipal Stormwater Regulation Program require municipalities, highway agencies, and regulated "public complexes" to develop stormwater management programs…Tier A municipalities are required to implement various control measures that should substantially reduce phosphorus loadings in the impaired watersheds. These control measures include adoption and enforcement of a pet waste disposal ordinance, prohibiting the feeding of unconfined wildlife on public property, cleaning catch basins, performing good housekeeping at maintenance yards,

and providing related public education and employee training. These basic requirements will provide for a measure of load reduction from existing development."

[Additional measures] "All municipalities within the contributory drainage area of the Wanaque Reservoir will be required to adopt an ordinance as an additional measure that prohibits the outdoor application of fertilizer other than low phosphorus fertilizer, consistent with a model ordinance provided by the Department."

"The Stormwater Management Rules have been updated for the first time since their original adoption in 1983. These rules establish statewide minimum standards for stormwater management in new development, and the ability to analyze and establish region-specific performance standards… through regional stormwater management plans."

"Furthermore, the New Jersey Stormwater Management Rules establish a 300-foot special water resource protection area (SWRPA) around Category One (C1) waterbodies and their intermittent and perennial tributaries, within the HUC 14 subwatershed. In the SWRPA, new development is typically limited to existing disturbed areas to maintain the integrity of the C1 waterbody."

The non-tidal Passaic River watershed intersects 84 municipalities. Almost all are designated as Tier A municipalities. A summary table of statewide basic requirements (SBRs) for Tier A and Tier B municipal stormwater permits is available at http://www.state.nj.us/dep/dwq/pdf/tier_a_matrix.pdf and http://www.state.nj.us/dep/dwq/pdf/tier_b_matrix.pdf

Discussion of requirements that are relevant to MS4 trading:

Municipalities can generate credits by controlling discharge from MS4s beyond the MS4 permit requirement. Certain MS4 requirements are conducive to a trading program in that control beyond the requirement can be clearly determined. Three such requirements are discussed.

Tier A MS4 permit requirements only require best management practices (BMPs) for new development or redevelopment. BMPs are not required for existing development. A potential source of credits would therefore be to implement BMPs for existing development.

A second source of credits would be to implement BMPs and/or structural measures that are outlined in the stormwater management plan to a level of performance beyond permit requirements.

A third source of credits pertains to the Solids and Floatable Controls section of the permit. Several of these activities could be executed to a level beyond permit requirements, namely improving stormwater facilities such as swales, and restoring streamed banks scoured by stormwater.

Preliminary Feasibility Analysis of MS4 – WWTP Trading Opportunities

See Appendix 1.

Conclusion

Certain MS4 permit requirements are conducive to generating phosphorus credits for water quality trading. Determination of the exact quantity of phosphorus pounds reduced by any BMP is uncertain. A trading ratio would need to be incorporated to account for uncertainty. A preliminary feasibility analysis shows that trade opportunities exist

between small WWTPs discharging less than 1 MGD at high phosphorus effluent and proximate MS4s.

REFERENCES

"Municipal Stormwater Regulation Program," *NJDEP, Division of Water Quality*. Available at http://www.state.nj.us/dep/dwq/municstw.html. Accessed in March 2006.

New Jersey Department of Environmental Protection (NJDEP). 2005. Amendment to the Northeast, Upper Raritan, Sussex County, and Upper Delaware Water Quality Management Plans: Phase I Passaic River Study Total Maximum Daily Load for Phosphorus in Wanaque Reservoir Northeast Water Region (*proposed*).

Appendix 1: Preliminary Feasibility Analysis of MS4 – WWTP Trading Opportunities

A preliminary analysis to determine the feasibility of phosphorus trading between WWTPs and MS4s on a sub-watershed scale was conducted. It is based on methodology developed by Dr. Christopher Obropta and Greg Rusciano of Rutgers University (article in press).

To minimize the potential for creating hot spots, potential trading opportunities were examined on a sub-watershed basis. Study areas were delineated according to hydrologic unit code (HUC) 14 sub-watersheds (delineated from 1:24,000-scale USGS quadrangles) that include the WWTP and impaired water body of interest. Study areas that do not themselves contain impaired water bodies were considered if they drain directly into impaired reaches. Sixteen study areas were identified and mapped according to this methodology (See Figures 1 and 2).

The next step in the trading feasibility analysis was to calculate the WWTP and MS4 loading to the waterbodies in each of the sixteen study areas. The phosphorus loading from each WWTP was calculated based upon the current average flow rate and average effluent total phosphorus concentrations. Using NJDEP's GIS data on 1995/1997 land use/land cover, the land uses within the study areas were examined to determine MS4 phosphorus loads.

The following land uses/land covers contribute to MS4 loads:

- High/medium density residential
- Low density/rural residential
- Commercial

- Industrial
- Mixed Urban
- Barren land

Total phosphorus loadings from each land use within the study areas were determined based upon pollutant export coefficients obtained from NJDEP.

See attached spreadsheet 'MS4_analysis.xls' - The first column lists the study area and its size. The number for each study area corresponds to the attached map in Figure 1. The next few columns contain data on the WWTPs in each study area. MS4 loads are shown in a column near the middle. MS4 loads are based upon pollutant export coefficients obtained from NJDEP. If we assume that the TMDL will require MS4s to reduce their phosphorus loading by 40%, the resultant loads are in the column 'MS4 load post-40% reduction'. This represents a potential allocation for MS4 loads coming out of that study area.

Scenario A: Assume each WWTP has to treat TP to 0.5 mg/L effluent. Assume the load allocation is based on current average flow, not capacity flow. Therefore, the WWTP's target load will equal 0.5 mg/L * current average flow. Scenario A assumes the WWTP will not upgrade and will seek to meet their allocation entirely through trading. Scenario A shows the difference between current load and target load for each WWTP. *It represents the load the WWTP must acquire through trading if the WWTP does not upgrade.*

Scenario B: Assume each WWTP has to treat TP to 0.5 mg/L effluent. Assume the load allocation is based on current average flow, not capacity flow. Therefore, the WWTP's target load will equal 0.5 mg/L * current average flow. Scenario B assumes the WWTP

will upgrade to 1.0 mg/L and reduce the remainder of its load by trading. Scenario B shows the difference between load at 1.0 mg/L and target load for each WWTP. *It represents the load the WWTP must acquire through trading if the WWTP upgrades to 1.0 mg/L.*

If a plant is currently discharging less than 0.5 mg/L, it has no need to trade under these scenarios, and NA is marked in its scenario A column.

If a plant is currently discharging between 0.5 – 1.0 mg/L, Scenario A and Scenario B are the same. Scenario B is marked as NA.

Scenario ratios: If trading between WWTPs and MS4s is to be feasible, the MS4 must have sufficient load to trade after its 40% reduction. This is quantified as a ratio between MS4 post-40% reduction load and the load the WWTP must acquire. If the ratio is greater than 3:1, trading is feasible, and the ratios are highlighted in red. The ratio 3:1 is chosen as a threshold because it sufficiently accounts for uncertainty in any trades.

Results: Scenario B always gives a higher ratio than Scenario A. This is because in Scenario B, the WWTP needs to acquire less pounds than in Scenario A.

8 of the 24 plants have Scenario A or Scenario B ratios greater than 3:1, indicating potential for trading.

There are two categories of WWTPs that could benefit from trading with MS4s.

Category 1 – WWTPs that currently discharge less than 1 MGD, and have effluent greater than 0.5 mg/L. These plants are Warren Twp Stage I-II STP, Warren Twp SA Stage IV STP, Warren Twp Stg V STP, Chatham Twp / Chatham Glen STP, and Florham Park SA STP.

Category 2 – WWTPs that currently discharge between 0.5-1.0 mg/L effluent. Rather than upgrade all the way to 0.5 mg/L these plants may want to trade with MS4s. These plants are Morris Twp Woodland STP, Berkley Heights STP, and Morristown STP.

Comment: A key assumption is that target loads for WWTPs will be based on current average flow. If instead target loads are based on permitted flows, target loads will be higher and the WWTPs will need to acquire less load to comply. This would drive the scenario ratios higher and make trading with MS4s more favorable.

The second key assumption is that WWTPs will all have to upgrade to 0.5 mg/L. The results will change if the TMDL dictates a different effluent level.

REFERENCES

New Jersey Department of Environmental Protection (NJDEP). 2004. New Jersey Stormwater Best Management Practices Manual. NJDEP Division of Watershed Management: Trenton, NJ.

NJDEP, New Jersey 2004 Integrated Water Quality Monitoring and Assessment Report.

Obropta, C.C. and G. M. Rusciano. Addressing Total Phosphorus Impairments with Total Water Quality Trading. *Article in press*, Journal of American Water Resources Association.

Figure 1: Delineation of sixteen study areas for MS4 trading feasibility analysis

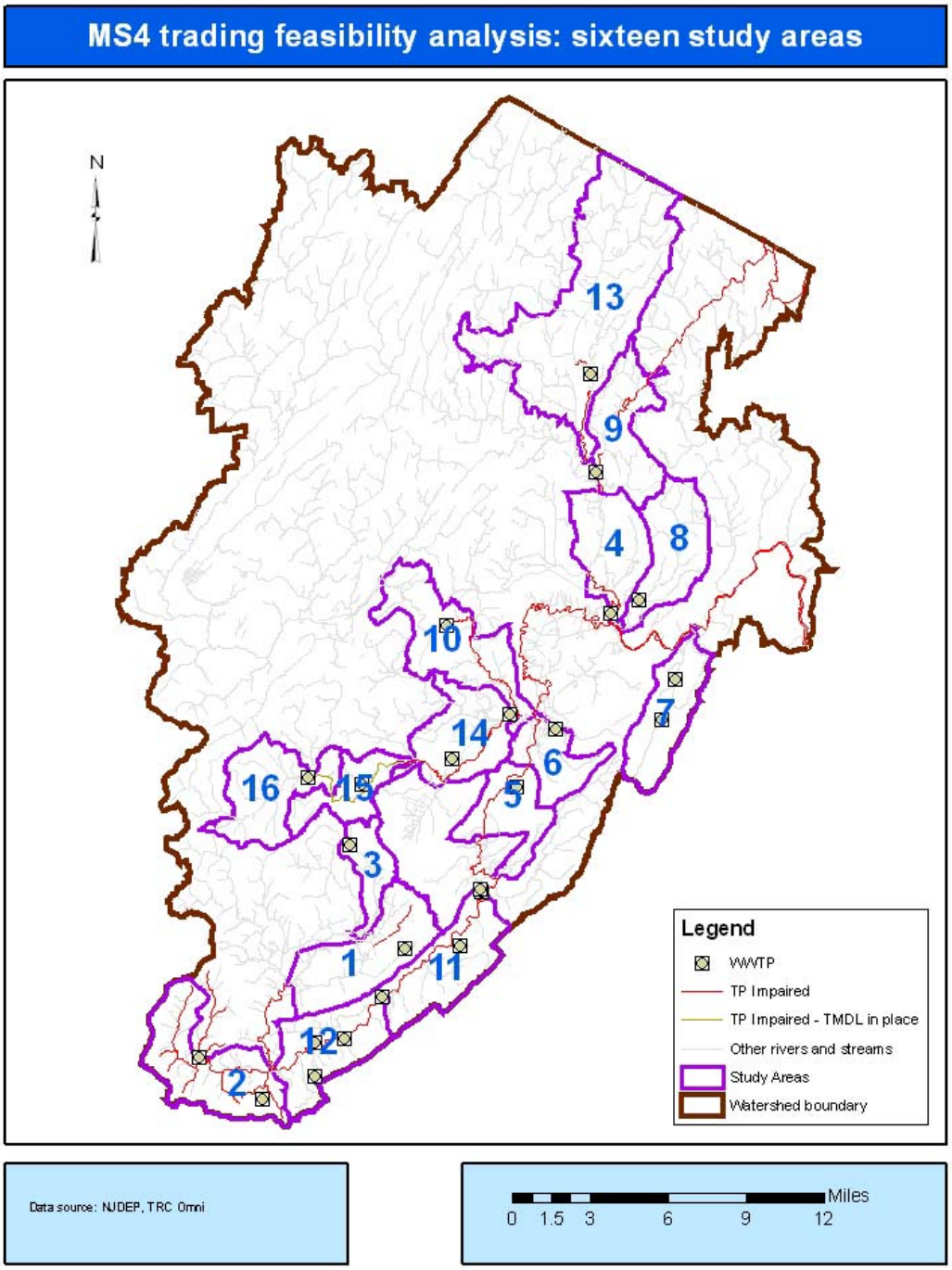

Figure 2: Example of study area – Dead River