Watershed-Based NPDES Permitting Case Studies

December 2003 Update

Watershed-Based NPDES Permitting Case Studies

What is Watershed-Based NPDES Permitting?

Watershed-based NPDES permitting is a process that emphasizes addressing all stressors within a hydrologically-defined drainage basin or other geographic area, rather than addressing individual pollutant sources on a discharge-by-discharge basis. Watershed-based permitting can encompass a variety of activities ranging from synchronizing permits within a basin to developing water-quality based effluent limits using a multiple discharger modeling analysis. The type of permitting activity will vary from watershed-to-watershed, depending on the unique circumstances in the watershed and the sources impacting watershed conditions. The ultimate goal of watershed-based NPDES permitting, however, is to develop and issue NPDES permits that consider the entire watershed, not just an individual point source discharger.

What Does This Document Contain?

To promote this innovative permitting approach, EPA has generated a series of case study fact sheets highlighting existing watershed-based NPDES permitting efforts. These case studies generally fall into two categories: 1) Final Permit and 2) Permitting Approach. Case studies in the Final Permit category provide an overview of completed NPDES permits that have been developed and issued on a watershed basis. Case studies in the Permitting Approach category focus on projects related to one or more aspects of the watershed-based NPDES permitting process (i.e., an actual permit has not yet resulted from this process). This document contains fact sheets for the following case studies:

1. General Permit for Nitrogen Dischargers: Final Permit
2. The Selenium Stakeholder Group: Permitting Approach
3. Michigan General NPDES Storm Water Permit: Final Permit
4. Clean Water Services (Hillsboro, OR): Permitting Approach
5. Rahr Malting Company: Final Permit
6. Northern Kentucky Sanitation District No. 1: Permitting Approach
7. Discharges of Storm Water Runoff Associated with Industrial Activities and Maintenance Dredging at Marinas in the Lake Tahoe Hydrologic Unit (El Dorado and Placer Counties): Final Permit
8. Discharges of Storm Water Runoff Associated with Construction Activity Involving Land Disturbance in the Lake Tahoe Hydrologic Unit (El Dorado, Placer and Alpine Counties): Final Permit
9. Waste Discharge Requirements for the City of South Lake Tahoe, El Dorado County, and Placer County Storm Water/Urban Runoff Discharge: Final Permit
10. Louisville and Jefferson County Metropolitan Sewer District (MSD): Permitting Approach

Implementation of watershed-based permitting is relatively limited at this time. These case studies represent permitting activities that exemplify aspects of the watershed-based permitting process and help to illustrate how this approach can be applied in watersheds. EPA does not intend to imply that these case studies are “model” permits or permitting approaches. EPA first made these case studies available in April 2003. This version reflects updates to the original case studies made in December 2003. As more information is made available, EPA will update these fact sheets to reflect the current progress and results in these watershed-based permitting efforts. As states and EPA regions identify other examples, EPA will produce new case studies to add to the fact sheet series. The case study series, as well as other information on watershed-based NPDES permitting, is available on EPA’s Web site at http://cfpub.epa.gov/npdes/wqbasedpermitting/wspermitting.cfm.

Fact Sheet #1

Watershed-Based Permitting Case Study: Final Permit

General Permit for Nitrogen Discharges

Watershed
Long Island Sound

Permitting Authority
Connecticut Department of Environmental Protection (CTDEP)

Point of Contact
Gary Johnson
Planning & Standards, Water Bureau, CTDEP
(860)424-3754
Gary.Johnson@po.state.ct.us

Permit Information
www.dep.state.ct.us/pao/download.htm#watergp

Date Issued
January 1, 2002 (expires on December 31, 2006)

Background

- Excessive nitrogen loading causes low dissolved oxygen (DO) in bottom waters of western Long Island Sound in the summer.
- Publicly-owned treatment works (POTWs) in Connecticut (CT) and New York (NY) are a dominant source of nitrogen.
- Through the Long Island Sound Study, a 2014 goal of 58.5 percent nitrogen reduction from baseline has been established for CT and NY.
- CT and NY have formalized the nitrogen reduction program in a TMDL approved by EPA in April 2001.
- The entire State of Connecticut is within the Long Island Sound watershed.

Permit Type

- In CT, a nitrogen general permit has been issued for the 79 POTWs within the Long Island Sound watershed that discharge at least 20 pounds of total nitrogen (TN) per day.
- Individual permits continue to regulate non-nitrogen pollutants and protect against localized impacts.
- The general permit allows trading of TN loads.

Permitting Strategy

- CTDEP covered all 79 POTWs under one general permit.
- The permit contains annual statewide aggregate target for each year based on cumulative TN removal as new nitrogen treatment upgrades are brought online each year.
- The permit also sets annual end-of-pipe permit limits in pounds of TN per day for each POTW, apportioned by plant discharge volume to meet the aggregate state target.
- In addition, the permit includes the first five-year annual permit limits and final 2014 limit.
- Under the permit, facilities can purchase or sell nitrogen credits annually based on each facility's performance with respect to their annual limit.

Permit Overview

- The Permit became effective, with notification due process, on January 1, 2002.
- Requirements include scheduled effluent monitoring for flow and TN, reporting to the state on a monthly basis, and operating any installed nitrogen-removal equipment systems.

Permit Limits

- Permit limits pro-rated based on 1997-1999 average discharge volume, assuming equal TN removal needed to meet aggregate state target each year.
- Annual limits are reduced each year and are set well below TMDL requirements to ensure compliance with the TMDL.
- Permit limits are set with the objective of balancing credits sold and purchased to prevent a large deficit or surplus of credits in any year.
- The permit may be reopened and limits adjusted to reflect new information on annual performance and to better balance the credits.

Monitoring Requirements

- POTWs smaller than 10 million gallons per day (mgd) monitor on a weekly basis and larger POTWs monitor twice per week.
- All facilities required to take daily composite samples, flow proportioned over 24 hours.
- In addition, all facilities must monitor daily flow on a continuous basis to calculate average daily flow volume.
- The permit requires reporting on a monthly basis, with reports due by the 15th day of the following month.

Special Conditions

- CTDEP equalized end-of-pipe TN loads to account for attenuation, based on watershed location and relative effect on DO in western Long Island Sound, to facilitate the Nitrogen Credit Exchange (i.e., trading).
- TN reductions in watersheds close to the low DO impact zone in the Long Island Sound are more "valuable" than TN reductions from more distant sources that are naturally attenuated.
- Disparity in credit value is the economic engine that makes it attractive for sources close to the problem to remove more nitrogen than the permit requires and sell credits.
- Adjustment also lowers the relative cost of purchasing credits by the more distant sources that may find it less expensive to buy credits rather than upgrade during the early years of implementation.
- Links cost of a TN credit to the statewide aggregate costs (capital and operation and maintenance) for nitrogen removal and will increase over time as more expensive projects are completed.
- Each facility must maintain and operate all nitrogen removal process equipment so as to reduce nitrogen discharges to the maximum extent practicable.

Measures of Success

- Progress measured based on monitored loads compared to the permit limit for each year.
- Compliance achieved by meeting the permit limit or by buying the equalized nitrogen credits if the limit is exceeded. The State will purchase all excess credits generated through the Nitrogen Credit Exchange.
- Ultimate measure of success is meeting, or exceeding, the wasteload allocation or nitrogen reduction schedule in the TMDL.

Progress Update

- Since 1993, CT's state revolving fund has awarded about $350 million in grants and loans for POTW upgrades that included nitrogen removal. The nitrogen removal portion of the construction cost about $90 million.

- POTW upgrades to include nitrogen removal have been implemented since 1993 in anticipation of the nitrogen permit with 27 projects completed from retrofits to full upgrades by the end of 2002. Projects are centered around western Long Island Sound where equalized nitrogen loads are more valuable, confirming the economic incentive for projects in the geographic area where they are most beneficial.
- The Nitrogen Credit Advisory Board published the second annual Nitrogen Credit Exchange Program on September 25, 2003 to document milestones achieved during the second full year of the program.
- Connecticut POTWs discharged an average of 15,840 equalized pounds of nitrogen per day during 2002, 13 percent less than the projected amount of 18,220 equalized pounds per day. The difference between expected and actual performance is largely due to favorable weather conditions (e.g., warm and dry conditions) and the efforts of POTW operators to maximize the nitrogen removal efficiency of existing treatment capacity.
- Projected performance for 2003 is 16,955 equalized pounds per day, as a result of improved nitrogen removal through additional nitrogen removal upgrade projects. Based on early data, there will be less difference between actual and projected nitrogen removal during 2003 due to unfavorable weather conditions (e.g., colder and wetter winter and spring).
- The cost per equalized pound of nitrogen in 2002 was $1.65. To remain in compliance with the general permit, 38 municipalities purchased credits at this price for a total cost of $1,317223. Nitrogen removal at levels greater than required to comply with the general permit resulted in 39 municipalities selling credits for a total value of $2,757,323. As stated in the permit, the State purchased all excess nitrogen credits generated during 2002 for $1,440,100.
- The cost per equalized pound of nitrogen in 2003 is likely to increase significantly due to unfavorable weather conditions. Therefore, municipalities that do not provide nitrogen treatment may face higher costs and municipalities that generate nitrogen credits may receive higher payments.
- To assist POTWs covered by the general permit, CTDEP provided technical assistance in the form of outreach and training for POTW operators on enhancing nitrogen removal efficiency.
- Each facility covered under the general permit participated in a comprehensive evaluation conducted by CTDEP staff. Evaluations included on-site inspections to examine monitoring and nitrogen removal equipment, documentation review, and split sampling.
- State of Connecticut explored the expansion of the program to other point and nonpoint sources in an EPA-funded project. Project results are due in late 2003.

Fact Sheet #2

Watershed-Based Permitting Case Study: Permitting Approach

The Selenium Stakeholder Group

Watershed
South Platte River and Sand Creek (Segments 15 and 16a)

Permitting Authority
Colorado Department of Public Health and Environment (CDPHE)

Point of Contact
Anthony R. Congram
Suncor Energy (U.S.A.) Inc.
(303) 286-5890
acongram@suncor.com

Additional Information
www.suncor.com

Project Timeframe
2000 - 2004

Background

- Through the triennial review process in 2000, CDPHE proposed lowering the chronic selenium standard from 12 ug/l total selenium to 4.6 ug/l dissolved selenium.
- Suncor Energy (U.S.A.) Inc., formerly Conoco Denver Refinery, convened a stakeholder group consisting of two refineries, a municipality, and a wastewater district in Denver, CO, to discuss the potential impacts of changing the selenium standards for point sources discharging to the South Platte River and its tributaries, specifically Sand Creek.
- The Selenium Stakeholder Group believed the standard change was unwarranted based on preliminary site-specific biological data and literature review.
- A change in the selenium standard could make compliance with NPDES water quality-based effluent limits (WQBELs) extremely challenging (considering current technological limitations for selenium removal from process wastewater discharges and nonpoint source contributors).

Strategy

- The Selenium Stakeholder Group presented data at the Triennial Review hearings demonstrating that suspected non-point sources of selenium in the upper Sand Creek watershed would cause a violation of the lower standard and require placement on the state's 303(d) list.
- Based on data presented by the Selenium Stakeholder Group, the Colorado Water Quality Control Commission (Commission) granted a three-year Temporary Modification for Segment 15 of the South Platte River and Sand Creek.
- The negotiation process with the Commission required the Selenium Stakeholder Group to develop and implement a Study Plan to collect more information to better understand the sources of selenium in the Sand Creek watershed and determine appropriate site-specific selenium criteria. The Study Plan is now in its third year of implementation.

Factors to Consider in Permitting

- Each member of the Selenium Stakeholder Group had different motivating factors for participating. These factors are described below.
  - For the upstream municipality on Sand Creek, concerns over elevated upstream selenium concentrations and potential impacts on NPDES permit limits motivated participation in the group.

- The two refineries involved in the group are concerned about future WQBELs and implementation of a TMDL for a stream in which background selenium concentrations exceed the proposed lower selenium standard. Permit renewals for these facilities were imminent at the time of the temporary modification.
- The wastewater reclamation district participates in the group due to the fact that it cannot control selenium concentrations entering the POTW and the economic and technical limitations of treating huge municipal flows.

Study Plan Objectives

The Selenium Stakeholder Group intends to:

- Identify sources of elevated selenium levels to Sand Creek.
- Develop site-specific chronic selenium criterion for Sand Creek and South Platte River (Segment 15).

Study Plan Overview

- Since March 2001 the group has collected monthly water column and outfall data to identify selenium hotspots and trace selenium hotspots up into storm water drainage systems to identify sources.
- To support development of site-specific criteria, the group collects a suite of biological and chemical data from South Platte River, Sand Creek, and on reference streams.

Expected Outcomes

- The Selenium Stakeholder Group anticipates development of final site-specific selenium criteria for Sand Creek and Segment 15 of the South Platte River based on analyzed data.
- In addition to the site-specific criteria, the group will draft recommendations and a report that presents the data and data analysis during the next South Platte River Triennial Review in summer 2004.

Project Funding

- Cost of the project is estimated to be approximately $0.5 million, incorporating costs for consultants, sampling and legal assistance. The coordination of all billing is handled by the primary consultant, who divides the charges and invoices among the individual stakeholders based on a negotiated arrangement for splitting the charges.

Benefits to Date

- Through collaboration, the group produced successful negotiation of a temporary modification of the selenium stream standard.
- Members of the group collected comprehensive data with significant cost savings due to shared burden of both physical sampling and financial resources over the duration of the Study Plan.
- The relationship established among neighboring dischargers expanded to other issues; in one particular case, a wasteload re-allocation (water quality based trade) between two refineries was uncontested during the permit renewal process.
- The process promoted a broad watershed approach to issues of mutual concern, and provided an effective catalyst to bring dischargers and regulators around the same table.

- The Study Plan facilitated the collection of a large amount of quality data, which can be used in implementing better science-driven TMDLs in the future, not to mention important ecological data shared with state and federal agencies.
- This approach provided a medium for adaptive implementation—the desire to work cooperatively and pro-actively to solve problems outside of the regulatory realm, furthering efforts toward sustainability.

Fact Sheet #3

Watershed-Based Permitting Case Study: Final Permit

Michigan General NPDES Storm Water Permit

General Wastewater Discharge Permit Storm Water Discharges from Separate Storm Water Drainage Systems NPDES General Permit No. MIG610000

Watershed
All watersheds within the State of Michigan

Permitting Authority
Michigan Department of Environmental Quality (MDEQ)

Point of Contact
David Drullinger
Water Division, Permits Section, MDEQ
(517) 335-4117
drullind@michigan.gov

Permit Information
www.deq.state.mi.us/documents/deq-swq-stormwater-G610000.pdf

Date Issued
July 31, 1997

Revoked and Reissued
September 18, 1998

Background

- Initially developed to address water quality problems within the Rouge River watershed, including regular exceedances of dissolved oxygen (DO) and bacteria standards.
- Federal District Court overseeing the cleanup of the Rouge River promoted idea of an independent institutional structure to fund and manage water quality for the entire watershed *(United States, et al. v. City of Detroit, et al)*.
- The communities proposed a watershed-based NPDES general storm water permit as an alternative to Court's idea. Application for the permit was voluntary.
- Endorsed for use under the Phase II Municipal Separate Storm Sewer System (MS4) Stormwater Program by an Environmental Council of the States (ECOS) agreement.

Permit Type

- Voluntary general permit for MS4 discharges within a watershed that do not have Phase I MS4 permit coverage.

Permitting Strategy

- MDEQ conducted multiple workshops in the Rouge River watershed to educate the communities on the permit and compliance options.
- The Rouge Project Steering Committee formed to address the issues that cross subwatershed boundaries.
- Information obtained through this process is used by the state for the TMDL program, the Clean Michigan Initiative and a water quality trading program.
- MDEQ made the permit available beyond the Rouge River watershed to watersheds throughout the State of Michigan. Currently 50 MS4s have coverage under this permit, six of which are located outside of the Rouge River watershed.
- This permit is available as an alternative to the traditional six minimum measures permitting option under the Phase II MS4 Storm Water Program.
- Once reissued, this permit will also be available to MS4s currently covered under a Phase I MS4 Storm Water permit.

- Under Phase II, this permit will require storm water pollution control throughout the watershed, both inside and outside of urbanized areas.

Permit Overview

- Voluntary coverage for public agencies that own, operate or control storm water within the watershed that have not previously been required to obtain a Phase I MS4 NPDES permit.
- Dischargers within a subwatershed are encouraged to join together and submit applications as watershed partners, with a single Watershed Management Plan.
- Each permittee must also submit a Public Participation Process, Illicit Discharge Elimination Plan, Storm Water Pollution Prevention Initiative, and a Monitoring and Reporting Plan.
- Watershed partners establish the appropriate subwatershed size during the application process.

Permit Limits

- The permit has prescriptive requirements for illicit discharge elimination and public education.
- Permittees must develop and implement a watershed plan that includes short- and long-term goals with a method for assessing progress.
- During watershed plan development and goal setting, permittees must involve the public through a defined public participation process.
- This permit does not contain effluent limits.

Monitoring Requirements

- Dischargers must submit and implement a Monitoring and Reporting Plan for their subwatershed.

Special Conditions

- None.

Measures of Success

- Through the Rouge River Project, this permit has demonstrated the following successes:
  - Over 95 percent of the watershed is now covered under this voluntary permit.
  - Twenty-five different communities throughout the watershed are implementing more than 100 pilot projects.
  - The percent of DO readings that have indicated non-attainment has dropped from 61 percent to 4 percent.
  - Frog and toad surveys have demonstrated ecological improvements.

- A reissued watershed permit has demonstrated the following successes for 2003:
  - Coverage is provided watershed-wide, including many non-urbanized areas. Genessee County has applied for coverage county-wide, approximately doubling the coverage of the Flint urbanized area.
  - Waters of the State which are designated county drains received added attention for illicit discharge inspections.
  - Approximately three-quarters of Michigan's communities are expected to take the watershed permit option.

Watershed-Based Permitting Case Study: Permitting Approach

Clean Water Services (Hillsboro, OR)

Fact Sheet #4

Watershed
Tualatin River

Permitting Authority
Oregon Department of Environmental Quality (OR DEQ)

Point of Contact
Charles Logue, PE, Technical Services Department Director
Clean Water Services
(503) 846-3539
loguec@cleanwaterservices.org

Additional Information
www.cleanwaterservices.org

Project Timeframe
June 2002 - August 2003

Background

- The Tualatin River watershed, encompassing Washington County and small portions of Multnomah and Clackamas Counties, drains approximately 710 square miles of northwestern Oregon, just west of the City of Portland.
- Both Total Maximum Daily Loads (TMDLs) and endangered species are primary concerns within the Tualatin River watershed.
- One water withdrawal facility and two water storage reservoirs are also located within the Tualatin River watershed.
- Clean Water Services is a County Special Service District responsible for wastewater and surface water management in urban Washington County.

Factors to Consider in Permitting

- Clean Water Services performs the following functions:
  - Manages over 800 miles of sanitary sewer lines and 41 pump stations, as well as four wastewater treatment plants.
  - Operates a comprehensive surface water management utility to protect watershed health, manage flooding and maintain a regional storm water system.
  - Administers four NPDES permits for the wastewater treatment plants that expired in 1997 and have been administratively extended while new permits are negotiated.
  - Serves as co-permittee with Washington County for a Phase I municipal separate storm sewer system (MS4) storm water permit that covers the urbanized portion of Washington County within the Urban Growth Boundary. This permit expired in 2001.
  - Works with OR DEQ to cooperatively administer 79 general NPDES storm water permits through a Memorandum of Agreement.
- The second set of TMDLs for the Tualatin River were established in 2001. These TMDLs address temperature, bacteria, phosphorus, ammonia, and settleable volatile solids (i.e., storm water contribution to sediment oxygen demand).

Pilot Project Goals

- This is a multi-year project that will ultimately result in a documentable process and regulatory framework analysis that will demonstrate the feasibility of transitioning from a conventional NPDES permitting approach to a watershed-based NPDES permit.

- The goal is to evaluate the technical, stakeholder, regulatory, and legal issues involved in developing a watershed-based permit.

Pilot Project Overview

- The plan is divided into the following four elements:
  - Conducting stakeholder outreach;
  - Establishing a regulatory framework;
  - Assessing the watershed; and
  - Developing water quality trading and watershed management tools.

Stakeholder Outreach

- Under this element, Clean Water Services will perform the following:
  - Develop and implement a stakeholder process that provides meaningful input and develops support for the project.
  - Develop broad public support and regulatory Agency support for the watershed plan outcome.

Watershed Assessment

- Under this element, Clean Water Services will perform the following:
  - Implement strong scientific process developed for supporting good watershed-based decisions.
  - Identify prioritized actions that are consistent with TMDL and Endangered Species Act response.

Permitting and Regulatory Requirements

- Under this element, Clean Water Services will perform the following:
  - Develop interim permit that will allow development of a watershed-based permitting framework.
  - Develop a regulatory framework that will allow efficient means to attain the highest ecosystem benefit and comply with regulatory requirements.
  - Develop a detailed 5-year project workplan to coordinate requirements under the Clean Water Act, the Endangered Species Act and the Safe Drinking Water Act.

Water Quality Trading and Other Watershed Management Tools

- Under this element, Clean Water Services will perform the following:
  - Identify relevant tools to use in watershed improvement to exceed the improvements achievable through the traditional permitting processes.

Expected Outcomes

- The goal for the first year of this project is to develop a draft interim watershed permitting framework, or other appropriate regulatory agreement, as a transitional mechanism to move to a watershed-based permit that covers multiple point source discharges.

Pilot Project Funding

EPA is funding this project through a Clean Water Act 104(b)(3) Cooperative Agreement.

Pilot Project Update

- Clean Water Services participated in a collaborative process that resulted in a draft watershed-based integrated permit covering the four wastewater treatment

plants, the Phase I MS4, and industrial stormwater general permits (1200-Z) for the two wastewater treatment plants required to have coverage.

- The draft watershed-based integrated permit contains water quality trading elements for trading (1) carbonaceous BOD and ammonia both within a facility and among the four wastewater treatment facilities and (2) temperature with shading (i.e., tree planting in upstream agriculture areas) and release of cool water from a reservoir. The trading elements are in conformance with the waste load allocations from the 2001 Tualatin TMDL.
- OR DEQ made the draft watershed-based integrated permit available for public review and comment on November 14, 2003, for a 45 day period. The draft permit is available at www.deq.state.or.us/news/publicnotices. Permit issuance is anticipated in early 2004.
- Clean Water Services has developed the public involvement and outreach process on an ongoing basis.

Watershed-Based Permitting Case Study: Final Permit

Rahr Malting Company

Fact Sheet #5

National Pollutant Discharge Elimination System and State Disposal System Permit No. MN0031917

Watershed
Minnesota River

Permitting Authority
Minnesota Pollution Control Agency (MPCA)

Point of Contact
Bruce Henningsgaard, PE
Senior Engineer
Majors Water and Land Section, MPCA
(651) 296-9289
bruce.henningsgaard@pca.state.mn.us

Permit Information
www.pca.state.mn.us/water/pubs/rahrtrad.pdf

Date Issued
January 8, 1997

Background

- The Rahr Malting Company processes approximately 2.5 million pounds of barley per day for various industries and discharges its waste into the 16,770 square-mile Minnesota River watershed.
- The receiving segment has a TMDL for biochemical oxygen demand (BOD).
- In 1996, Rahr Malting decided to expand operations and applied for a permit to build a wastewater treatment plant to treat the additional effluent.
- No waste load allocation was available for the proposed new discharge of 150 lb/five day carbonaceous BOD (CBOD5) and the best available technology proposed could not achieve zero discharge.

Permit Type

- Individual NPDES permit.

Permitting Strategy

- The Rahr Malting Company proposed to offset the proposed new discharge through a point-nonpoint source trading program.
- The Rahr Malting Company works with the Coalition for Clean Minnesota River and American Rivers to identify potential trades.

Permit Overview

- The permit expired in January 2002. Rahr Malting has applied for a new permit, but continues to operate under the requirements of the expired permit.
- The trading program allows point-to-nonpoint trades. Specific reductions to be purchased became part of the permit, and therefore could not easily be changed during the permit term.

Permit Limits

- Permit contains first effluent limit for phosphorous ever assigned to Rahr Malting, and the first effluent limit for a phosphorous discharge to the Minnesota River. It contains a CBOD5 effluent limit of 12-mg/l year round and a phosphorous monthly average limit of 2 mg/l.

- The Rahr Malting Company was required to install and maintain limits-of-technology controls at the wastewater treatment facility, in addition to the trading requirements.

Monitoring Requirements

- The permit requires monitoring and compliance at two separate outfalls for the following parameters: flow, temperature, pH, CBOD5, ammonia, phosphorus, and dissolved oxygen.

Special Conditions

- None.

Measures of Success

- As of January 2002, Rahr Malting exceeded its goal of offsetting 150 lbs. of CBOD per day.
- BMP implementation is ahead of schedule.
- The company has completed four trade sites and have achieved 204 lbs. of offsite CBOD credits per day.

Fact Sheet #6

Watershed-Based Permitting Case Study: Permitting Approach

Northern Kentucky, Sanitation District No. 1

Watershed
Ohio River

Permitting Authority
Kentucky Division of Water (KY DOW)

Point of Contact
John Lyons
Northern Kentucky, Sanitation District No. 1
(859) 578-7450
JLYONS@sd1.org

Additional Information
www.sd1.org/index.html

Project Timeframe
August 2002 - January 2004

Background

- Boone, Campbell, and Kenton Counties comprise an area referred to as Northern Kentucky located along the southern border of the Ohio River.
- Prior to 1995, operation and maintenance of the wastewater collection system in Northern Kentucky were the responsibility of respective municipal jurisdictions.
- State legislation authorized the transfer of ownership of most wastewater collection systems in Northern Kentucky to Sanitation District No. 1.
- Three county region has potential for water quality impacts from sanitary sewage, urban storm water runoff, rural storm water runoff, and failing septic systems.
- A recent evaluation revealed that existing storm water management programs in the 33 cities and three counties subject to the Phase II MS4 regulations vary administratively and structurally. These programs are not conducive to incorporating watershed-based planning into the storm water management decision making process.

Factors to Consider in Permitting

- Sanitation District No. 1 is responsible for managing 1,400 miles of combined and separate sewers, one major wastewater treatment plant, nine small wastewater treatment plants, 135 pump stations, and 15 flood pump stations.
- The District recently developed a regional facilities plan that includes a program to construct two new regional wastewater treatment plants over the next five years.
- The Combined Sewer Overflow Control Plan implemented by the District considers an integrated watershed approach to planning.
- The District also implements a Sanitary Sewer Overflow Plan requested by the KY DOW to reduce the number of unpermitted discharges from overflow points.
- A single regional storm water permit, under the direction of Sanitation District No. 1, has been issued to thirty cities and three counties. This permit will help the District facilitate its watershed management activities.

Pilot Project Goals

- Through this project, the District intends to:
  - Develop a broad conceptual model of how a watershed-based permitting approach would function in this three county area.
  - Identify the challenges to, and benefits of, implementing a watershed approach to water quality permitting and management.

Pilot Project Overview

- The project is divided into three major components:
  - Review of the consolidation of the sanitary sewer system already conducted by Sanitation District No. 1 and the storm water management program which is underway
  - Development of a conceptual model for a watershed-based approach
  - Evaluation of the feasibility of future implementation of the conceptual model.

Review of Consolidation

- Under this component, Sanitation District No. 1 will perform the following activities:
  - Examine the approach used by the District to consolidate several disparate sanitary sewer and storm water agencies under one management structure.
  - Document any identified legislative, legal, regulatory, and political obstacles that arose during the consolidation process and the techniques used to overcome these challenges.

Development of a Conceptual Model

- Under this component, Sanitation District No. 1 will perform the following activities:
  - Review programmatic support for the proposed approach to watershed-based permitting.
  - Develop a program framework for watershed-based permitting.

Review Feasibility of the Conceptual Model

- Under this component, Sanitation District No. 1 will perform the following activities:
  - Identify benefits and obstacles that would result from implementing the conceptual model as a watershed-based permit.

Expected Outcomes

- Through this pilot project, Sanitation District No. 1 made a determination that it is feasible to further pursue development of a watershed-based permit.
- Based on results of this study, the District will continue dialog with state and federal agencies related to the development of a watershed-based permit.

Pilot Project Funding

- EPA is funding this project through a Clean Water Act 104(b)(3) Cooperative Agreement. Sanitation District No. 1 is providing a local matching contribution.

Fact Sheet #7

Watershed-Based Permitting Case Study: Final Permit

Discharges of Storm Water Runoff Associated with Industrial Activities and Maintenance Dredging at Marinas in the Lake Tahoe Hydrologic Unit El Dorado and Placer Counties

NPDES General Permit No. CAG616003 Board Order No. 6-00-36

Watershed
Lake Tahoe Hydrologic Unit

Permitting Authority
State Water Resources Control Board (SWRCB), Lahontan Regional Water Quality Control Board (Region 6a)

Point of Contact
Mary Fiore-Wagner
Environmental Scientist, SWRCB, Region 6a
(530) 542-542
mfwagner@rb6s.swrcb.ca.gov

Permit Information
www.swrcb.ca.gov/rwqcb6/files/00-03.pdf

Date Issued
May 10, 2000

Background

- Several of the marinas in the Lake Tahoe Basin were regulated by both the NPDES General Industrial Activities Storm Water Permit and individual Waste Discharge Requirements (WDRs)[1] issued by the Regional Board.
- Complying with two separate but similar permits and their respective monitoring and reporting requirements had been complicated and costly for most marina operators.

Permit Type

General Permit for Discharges of Storm Water Runoff Associated with Industrial Activities and Maintenance Dredging at Marinas in the Lake Tahoe Basin Hydrologic Unit.

Permitting Strategy

- This permit combines the requirements and monitoring needs of each of the previous existing permits into one permit that should be more manageable for Regional Board staff and the regulated marina operators.
- The Permit regulates potential pollutant discharges at the marina including storm water runoff, waste from maintenance activities, vessel sewage, bilge water wastes, and pollutants associated with maintenance dredging.

Permit Overview

- Marina operators must submit a Notice of Intent (NOI) and an annual fee to the Lahonton Regional Board.
- Marina operators are required to comply with the water quality standards outlined in the Lake Tahoe Basin Plan and amendments[2].

---

[1] As per the state's Porter-Cologne Water Quality Control Act, any person discharging or proposing discharge within a region is required to apply for and obtain Waste Discharge Requirements. They can be adopted for individual or general permits. These requirements can be waived by the Regional Board. WDRs are in addition to NPDES requirements where applicable.

[2] Water Quality Control Plan for the Lahonton Region, North and South Basins. Lahonton Regional Control Board. 10/94.

Permit Limits

- The Basin Plan contains numeric effluent limitations for pollutants in storm water (e.g., total nitrogen, total phosphorus, turbidity, grease/oil, total iron) and requires a storm water pollution prevention plan (SWPPP) as well.

Parameter	Effluent Limits for Discharge to:	
	Land Treatment Systems	Collection Systems and Surface Waters
Total Nitrogen	5 mg/L (as N)	0.5 mg/L (as N)
Total Phosphorus	1 mg/L (as P)	0.1 mg/L (as P)
Total Iron	4 mg/L	0.5 mg/L
Turbidity	200 NTU	20 NTU
Suspended Solids	—	50 mg/L
Grease and Oil	40 mg/L	2 mg/L

- Must comply with existing WDRs that require marinas to regulate point sources, maintain a vessel pumpout facility, and install best management practices (BMPs) to treat runoff from a 20-year, 1-hour design storm from all impervious surfaces.

Monitoring Requirements

- Facilities were required to develop a Monitoring and Reporting Program by June 15, 2000, under Section 13267 of the California Water Code.
- Permittees are required to monitor the runoff discharging from the facility and inspect BMPs installed.

Special Conditions

- None.

Measures of Success

- All 12 Lake Tahoe, California-side marinas are permitted and have installed fixed or portable sewage pump-outs, depending on marina size.
- Monitoring and reporting requirements provide data about the presence and magnitude of gasoline constituents at marinas and sediment and nutrient in stormwater runoff.
- This permit allows a streamlined permitting process for dredging projects.
- Annual Reports provide Regional Board with information regarding fueling practices, sewage pump-out volumes, fertilizer application, irrigation practices, and motorized watercraft usage.
- Transition from two permits to one has reduced the time and resources Regional Board staff and dischargers must commit to the program.

Fact Sheet #8

Watershed-Based Permitting Case Study: Final Permit

Discharges of Storm Water Runoff Associated with Construction Activity Involving Land Disturbance in the Lake Tahoe Hydrologic Unit El Dorado, Placer and Alpine Counties

NPDES General Permit No. CAG616002 Board Order No. 6-00-03

Watershed
Lake Tahoe Hydrologic Unit

Permitting Authority
State Water Resources Control Board (SWRCB), Lahontan Regional Water Quality Control Board (Region 6a)

Point of Contact
Mary Fiore-Wagner
Environmental Scientist, SWRCB, Region 6a
(530) 542-5425
mfwagner@rb6s.swrcb.ca.gov

Permit Information
www.swrcb.ca.gov/rwqcb6/files/00-03.pdf

Date Issued
January 12, 2000

Background

- Water quality problems related to storm water discharges, erosion and sedimentation are most frequent and widespread due to significant amount of precipitation in this region.
- Significant resources had been allocated for implementation of the Environmental Improvement Program (EIP). Most EIP projects are large construction projects for purposes of restoration and improvement of water quality and wildlife habitat.

Permit Type

General permit that covers all storm water discharges to the Lake Tahoe hydrologic unit associated with any construction activity, which includes grading, clearing and excavation (***except*** activities that result in total land disturbance of less than five acres or beginning December 8, 2002 less than one acre and are not part of a common plan of development) or other storm water discharges determined eligible for coverage by the Regional Board and State Water Resources Control Board (SWRCB).

Permitting Strategy

- The permit was updated to include specific monitoring and reporting requirements for EIP projects to gauge success and identify strengths and weaknesses of these projects.

Permit Overview

- The permit requires co-permittees to comply with the water quality standards established in the Basin Plan[1] and any amendments.
- All dischargers must develop a SWPPP which outlines all of the pollution prevention measures necessary to reduce pollutants being discharged from the construction site to levels that are in compliance with the effluent limits and receiving water objectives.

[1]Water Quality Control Plan for the Lahonton Region, North and South Basins. Lahonton Regional Control Board. 10/94.

Permit Limits

- Effluent limitations for total nitrogen, total phosphorus, total iron, turbidity, suspended solids and grease/oil.

Parameter	Effluent Limits for Discharge to:	
	Land Treatment Systems	Collection Systems and Surface Waters
Total Nitrogen	5 mg/L (as N)	0.5 mg/L (as N)
Total Phosphorus	1 mg/L (as P)	0.1 mg/L (as P)
Total Iron	4 mg/L	0.5 mg/L
Turbidity	200 NTU	20 NTU
Suspended Solids	—	50 mg/L
Grease and Oil	40 mg/L	2 mg/L

Monitoring Requirements

- All dischargers are required to adhere to the Monitoring and Reporting Program which is included in the general permit. This program details the inspections and reporting required for each permitted site.
- No effluent or ambient monitoring is required by this permit.
- Additional monitoring requirements are included for restoration projects (Attachment C of the permit).
- The permit states that the Regional Board suggests monitoring for amount and type of vegetative cover, stability of stream banks, groundwater levels, success of erosion control measures used on-site and water quality parameters to include total suspended solids, total nitrogen, total phosphorus, conductivity and turbidity.

Special Conditions

- None.

Measures of Success

- The permit requires additional monitoring to track the success of restoration projects.
- Storm water effluent limitations developed for the Lake Tahoe Hydrologic Unit are reflected in the permit.
- Information gained by monitoring of restoration projects identify strengths and weaknesses of projects; this information provides feedback to improve the restoration project and enhance the success of future projects
- Since adoption of the permit, 11 projects have been enrolled.

Fact Sheet #9

Watershed-Based Permitting Case Study: Final Permit

Waste Discharge Requirements for the City of South Lake Tahoe, El Dorado County, and Placer County Storm Water/Urban Runoff Discharge

NPDES Permit No. CAG616001 Board Order No. 6-00-82

Watershed
Lake Tahoe Hydrologic Unit

Permitting Authority
State Water Resources Control Board (SWRCB), Lahontan Regional Water Quality Control Board (Region 6a)

Point of Contact
Kara Thiel
Water Resources Control Engineer, SWRCB Region 6a
(530) 542-5570
kthiel@rb6s.swrcb.ca.gov

Permit Information
www.swrcb.ca.gov/rwqcb6/files/00-82.pdf

Date Issued
October 12, 2000

Background

- Storm water discharges contribute a significant amount of the sediment and nutrients responsible for the decline in Lake Tahoe's water quality.

Permit Type

- General permit covering all storm water discharges from residential, commercial, industrial, municipal, and construction areas within the City of South Lake Tahoe, El Dorado County, and Placer County (the co-permittees).

Permitting Strategy

- The permit area includes all of the Lake Tahoe Basin (the Basin)[1] that is included in the State of California. This incorporates all of South Lake Tahoe, but only the Basin portions of Placer and El Dorado counties.
- This approach eliminated the need for multiple Board Orders and Waste Discharge Requirements (WDR)[2] within the Project Area.
- Each permittee is only responsible for the discharges originating within its jurisdiction boundaries, within the Basin.
- The permit excludes discharges from federal lands or other jurisdictions including state lands. The permit states that the Regional Board has the discretion and the authority to require other entities within the Project Area to obtain their own individual permits.
- Caltrans is covered separately under a state-wide NPDES permit.

---

[1]Water Quality Control Plan for the Lahonton Region, North and South Basins. Lahonton Regional Control Board. 10/94.

[2]As per the state's Porter-Cologne Water Quality Control Act, any person discharging or proposing discharge within a region is required to apply for and obtain Waste Discharge Requirements. They can be adopted for individual or general permits. These requirements can be waived by the Regional Board. WDRs are in addition to NPDES requirements where applicable.

Permit Overview

- The permit requires co-permittees to comply with the water quality standards established for the Basin contained in the Basin Plan and any amendments.

Permit Limits

- Effluent limitations for total nitrogen, total phosphorus, total iron, turbidity, and grease/oil.
- The effluent limitations for all storm water/urban runoff flows generated within the permit area (except those construction projects subject to a separate permit) must be met by November 30, 2008 (not within the current permit term).

Parameter	Effluent Limits for Discharge to:	
	Land Treatment Systems	Collection Systems and Surface Waters
Total Nitrogen	5 mg/L (as N)	0.5 mg/L (as N)
Total Phosphorus	1 mg/L (as P)	0.1 mg/L (as P)
Total Iron	4 mg/L	0.5 mg/L
Turbidity	200 NTU	20 NTU
Suspended Solids	—	50 mg/L
Grease and Oil	40 mg/L	2 mg/L

Monitoring Requirements

- Each permittee must submit and comply with a Storm Water/Urban Runoff Monitoring Program Plan, developed in accordance with the Monitoring and Reporting Program requirements included in the general permit.
- The Monitoring and Reporting Program outlines the inspections, California Toxics Rule water quality monitoring, special monitoring projects and reporting requirements for all co-permittees.
- Each permittee is required to submit a list of "storm water/erosion control projects" scheduled for the permit term. Each permittee must submit a plan for a special monitoring project each permit year.

Special Conditions

- None.

Measures of Success

- Annual Reports provide information regarding sand application and recovery; this data will be used to develop a Lake Tahoe basin-wide sand specification for low phosphorus material.
- The permit incorporates storm water effluent limitations developed for the Lake Tahoe Hydrologic Unit.
- Permittees must provide annual workplan of erosion control and stormwater treatment projects to treat runoff from existing roads and subdivisions.
- Comprehensive monitoring projects will determine the effectiveness of stormwater treatment projects; data from monitoring are used to improve future projects.

Watershed-Based Permitting Case Study: Permitting Approach

Louisville and Jefferson County Metropolitan Sewer District (MSD)

Fact Sheet #10

Watershed
Mill Creek, Ohio River, Pond Creek, Cedar Creek, Pennsylvania Run, Floyds Fork, South Fork Beargrass Creek, Middle Fork Beargrass Creek, Muddy Fork Beargrass Creek, Goose Creek, Harrods Creek

Permitting Authority
Kentucky Division of Water (KY DOW)

Point of Contact
Patti Grace-Jarrett, Water Quality/Quantity Administrator
MSD
(502) 540-6145
grace@msdlouky.org

Permit Information
www.msdlouky.org

Project Performance
1995 - present

Background

- Jefferson County borders the Ohio River in north central Kentucky and contains the City of Louisville, the state's largest city, as well as 93 smaller municipalities.
- MSD's existing service area consists of Jefferson County, approximately 375 square miles, which encompasses portions of eleven watersheds.
- MSD builds, maintains and operates wastewater and stormwater facilities for Jefferson County, serving nearly 200,000 businesses and households.

Factors to Consider in Permitting

- MSD manages 3,000 miles of sanitary sewer lines, 680 miles of which are combined sewers.
- Infrastructure operated by MSD includes one major publicly-owned treatment works (POTW), five regional POTWs, 22 small treatment plants, and 12 major pump stations.
- MSD's responsibilities include flood protection, management of all floodwall and levee facilities, as well as drainage, management of floodplains, and implementation of the floodplain ordinance.
- Management of the industrial pretreatment program, the combined sewer overflow (CSO) program, and the sanitary sewer abatement and elimination program fall within MSD's jurisdiction.
- The Phase I NPDES Municipal Separate Storm Sewer System (MS4) permit is also the responsibility of MSD as the lead agency on the permit.
- MSD also manages and implements the local erosion protection and sediment control ordinance.

Pilot Project Goals

- MSD will evaluate its monitoring activities and oversight strategies for implementation of Clean Water Act (CWA) requirements, with emphasis on improving and streamlining NPDES permits and related programs.
- Through this project, MSD intends to develop two alternative watershed-based permit models (i.e., unified permits) and explore application of these model permits in two different watersheds within Jefferson County.

Pilot Project Overview

This project took a phased approach and resulted in a mid-term report and a final report. Tasks performed under this project during the first phase included:

- Establishing internal and external advisory groups
- Reviewing literature on other NPDES integration efforts
- Interviewing other NPDES program managers around the country
- Evaluating MSD monitoring programs
- Evaluating data collection, management, and analysis procedures related to NPDES programs
- Sharing information at national conferences.

The second phase of the project focused on implementation of earlier recommendations defined in the Mid-Term Report. Activities included:

- Appointing a Chief Information Officer
- Developing an enterprise data structure
- Reorganizing departments and divisions to better manage NPDES permits and related programs, including integration of wet weather related programs and permits.

Phase three of the project focused on exploring the concept of a unified permit approach to managing NPDES regulatory programs. MSD developed two unified permit models: the regulatory flexibility permit model and the co-permittee model.

Regulatory Flexibility Permit Model

- This model represents a single permit combining MSD's existing point source permits and other NPDES-related programs.
- Under this model, MSD's programmatic constraints relaxed to allow MSD to pursue the "best" solution for water quality improvement rather than prescriptive program requirements.

Co-Permittee Permit Model

- This model combines existing MSD NPDES permits and NPDES-related programs with other point source permits under the authority of a local management group.
- It maximizes involvement and individual efforts of partner organizations, but balances independent efforts of these organizations with the direction of a watershed planning agency.

Expected Outcomes

Through this project, MSD expects to:

- Improve annual reporting based on watersheds.
- Improve management of water quality resources.
- Facilitate TMDL implementation.
- Increase involvement of the MS4 co-permittees and the community.

Pilot Project Funding

EPA funded the pilot project through a Clean Water Act 104(b)(3) Cooperative Agreement. Current activities are funded solely by MSD.

Pilot Project Update

Recent activities include:

- Refined the watershed permitting model that is a hybrid of two current EPA models—the "Watershed-Based Individual Permit" and "Integrated Municipal NPDES Permit models.
  - Bundled all point source requirements and mechanisms for all municipal point sources (CSO, SSO, MS4 Phase I Storm Water, and Pretreatment) under one permit.
  - Included MS4 co-permittees.
  - Based on watershed boundaries of the Beargrass Creek Watershed.
- Drafted a Beargrass Creek Watershed Permit Concept Paper and Presentation.
- Met with Kentucky Division of Water Regarding Watershed Permit (Summer, Fall 2003).
- Drafted a Beargrass Creek Watershed Permit and submitted to Kentucky Division of Water (Summer 2003) for review. Anticipate issuance in March 2004.

Benefits to Date

MSD cites the following benefits:

- Streamlined NPDES activities.
- Cross-trained staff.
- Better program integration.
- Better program management.

Watershed-Based Permitting Case Study: Final Permit

Neuse River Compliance Association

NPDES No. NCC000001

Fact Sheet #11

Watershed
Neuse River Basin

Permitting Authority
North Carolina Department of Environment and Natural Resources, Division of Water Quality (NCDWQ)

Point of Contact
Mike Templeton
North Carolina Division of Water Quality
(919) 733-5083
mike.templeton@ncmail.net

Additional Information
h2o.enr.state.nc.us/nps/neuse.htm

Date Issued
December 30, 2002

Background

- Neuse River Basin is classified as Nutrient Sensitive Waters (NSW) due to long-term over-enrichment of its estuary, leading to the development of the Neuse River Basin NSW Management Strategy (Strategy).
- The stated goal of the Strategy is to reduce Total Nitrogen (TN) loads to the estuary by 30 percent by 2003.
- Under the NSW Management Strategy, the Wastewater Discharge Requirements rule establishes specific nutrient control requirements for the point source dischargers in the basin. Dischargers with permitted flows of 0.5 million gallons per day (MGD) or greater (accounting for 95% of the point source TN load) receive TN limits in their individual NPDES permits.
- Nutrient impacts also led to listing on 303(d) list and the development of total maximum daily loads (TMDLs), which the U.S. Environmental Protection Agency (EPA) Region 4 has approved.

Permit Type

- Individual watershed-based permit with multiple co-permittees.

Permitting Strategy

- The Wastewater Discharge Requirements rule established under the NSW Management Strategy allows point source dischargers within the basin to form a compliance association to work collectively to meet their combined TN wasteload allocation of 1.64 million pounds TN per year (Phase I TMDL). Membership in an association is voluntary.
- The Neuse River Compliance Association (NRCA), a non-profit comprised of public and private entities in the basin that hold individual NPDES permits, functions as the compliance association described under the Wastewater Discharge Requirements rule.
- Dischargers participating in the NRCA are subject to TN limits in a group compliance NPDES permit, rather than those in their individual NPDES permits.
- The NRCA serves as the point of contact between NCDENR and its co-permittee members on issues related to the group permit.

Permit Overview

- Requirements in an association's permit supplement the requirements contained in each member's individual permit.

- An association permit governs only TN. The requirements under each individual permit remain in effect for all other parameters of concern. The compliance permit only replaces requirements of an individual permit where specifically stated.

Permit Limits

- Each co-permittee member has an estuary TN allocation and (due to transport effects) a corresponding discharge allocation. Similarly, actual loads can be specified as estuary or discharge loads.
- The Association's TN limit for a given calendar year is equal its estuary TN allocation. This overall TN allocation is the sum of all TN allocations for members of the NRCA (listed in Appendix A of the permit).
- TN allocations of co-permittee members may change due to purchases, sales, trades, leases and other transactions among NRCA members, impacting the Association's TN allocation. All TN transactions are expressed in terms of estuary allocations.
- Membership in the NRCA may change, impacting the Association's overall TN allocation.
- If a co-permittee member's membership in the NRCA is terminated, coverage under the group compliance permit terminates and the member is subject to the TN limitation in its individual NPDES permit.
- Changes in membership, and thus to the TN allocation, become effective at the beginning of the calendar year.

Compliance

- If the NRCA complies with its TN limit for the year, the Association and its co-permittee members are, by definition, in compliance with the TN limits in its permit.
- If the NRCA exceeds its TN limit, the Association is out of compliance and any co-permittee member that exceeds its individual TN limit in Appendix A of the permit is also out of compliance and subject to enforcement action.

Monitoring Requirement

- Members of the NRCA monitor discharges and report results to NCDWQ as specified in their individual permits.
- The NRCA compiles and submits co-permittee members' TN monitoring results for its own reporting purposes.
- The group compliance permit does not require instream monitoring. Each co-permittee member does have instream monitoring requirements in their individual NPDES permits, conducted for most by the Lower Neuse Basin Association, a coalition of dischargers established for this purpose.

Reporting Requirements

- The NRCA serves as the primary point of contact between the co-permittee members and NCDWQ, including preparation and submission of information such as reports and requests for modification or renewal of the group compliance permit.
- Under the permit, the NRCA must submit three types of reports: a mid-year report, a year-end report, and a five-year report.
  - The mid-year report contains a Discharge Monitoring Report (for informational purposes only) of each co-permittee member's discharge

and estuary TN loads and the overall Association's estuary TN load, and states planned changes in membership or TN allocations to become effective for the ensuing calendar year.

- The year-end report summarizes discharges for the NRCA and each co-permittee member, as well as transactions made during the previous calendar year that affect TN allocations.
- The five-year report provides a full accounting of membership and allocation changes for the previous five years. Its purpose is to ensure that the NRCA and NCDWQ agrees on the Association and individual allocations at the end of the permit term.

Special Conditions

– Any year in which the NRCA exceeds its TN allocation, the permit requires the NRCA to make payments to the Wetlands Restoration Fund in support of stream and wetlands restoration projects that will offset the excess nitrogen load to the estuary.

Measures of Success

NCDWQ may use the following as measures of success for the group compliance approach:

- Demonstrated feasibility of the group compliance concept and market-driven approach to TN reduction.
- Highlighted strengths and weaknesses of this approach, as well as possible improvements.
- Fostered cooperation of the members toward its environmental goal with the possibility of extending this cooperation to other endeavors and goals.
- Demonstrated cost-effective approach for reducing TN loads.