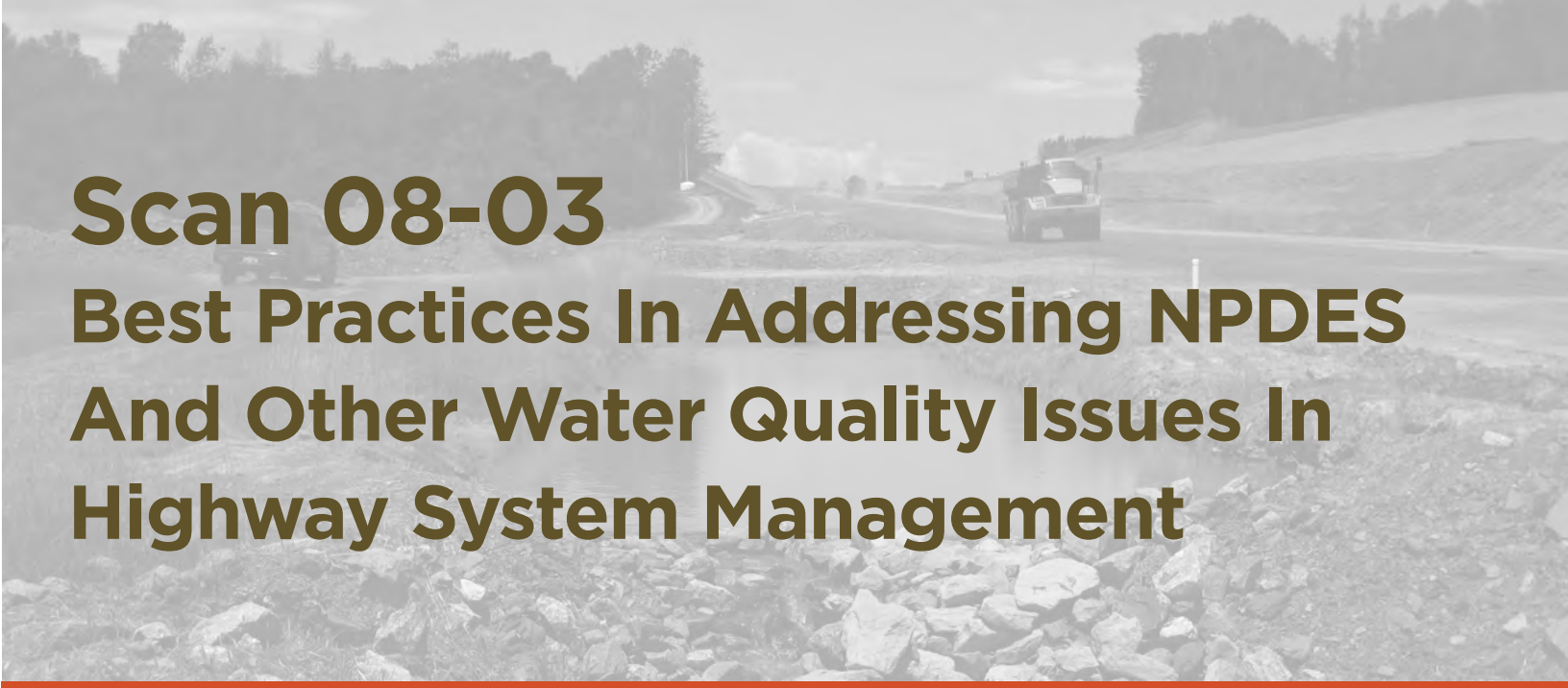

Scan 08-03

Best Practices In Addressing NPDES And Other Water Quality Issues In Highway System Management

REQUESTED BY THE

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Executive Summary

Introduction/Overview

The Domestic Scan program was developed by the Federal Highway Administration (FHWA) and the American Association of State Transportation Highway Officials (AASHTO) to facilitate technology transfer between state Departments of Transportation (DOTs) to improve domestic highway programs by increasing their efficiency and effectiveness. The Domestic Scan program is administered through the National Cooperative Highway Research Program (NCHRP) using consultant contracts to assist in completing the identified scans.

Domestic scans are conducted by a team of specialists consisting of members of the FHWA and DOTs, with representatives from other agencies and consultants as appropriate. The scan team includes a chairman or chairwoman who guides the process and a subject matter expert (SME) who is responsible for completing most of the project deliverables. The scan format begins with a research phase where a desk scan is drafted, investigating the study questions and suggesting potential scan field locations. The scan continues through personal visits by the scan team to the selected field locations. Final scan documentation includes a summary report, a presentation file, and a final program report.

Scan Purpose and Scope

The purpose of this scan was to investigate issues surrounding the implementation of a DOT stormwater program. Compliance with state and federal stormwater regulations is complex, and DOTs must continually examine their approach to compliance with the goals of improving water quality and reducing implementation costs. DOT infrastructure improvements can be delayed if stormwater requirements are not well integrated early into the planning and project delivery process.

The scan team participated in an initial coordination meeting to discuss and refine the scan topics. The team concluded that it would investigate these four topic areas, each consisting of two subtopics:

- **Total Maximum Daily Load** (TMDL) implementation is an emerging issue for DOT stormwater programs, including how waste load allocations (WLAs) will be implemented in NPDES permits and what methods will be used to develop WLAs and compliance strategies. The scan team wanted to investigate water quality credit trading as a secondary topic to determine if this approach will be an important tool for DOT TMDL compliance.
- Traditional and innovative **Best Management Practices** (BMPs) are the cornerstone of a DOT stormwater program. BMPs also represent the single most resource-intensive portion of a DOT stormwater program. The scan team was especially interested in new BMP technologies that could operate passively in a highway environment and those that performed well for

the constituents of concern (COC) from highways, such as metals. Both construction and post-construction BMPs were of interest. Source control BMPs are the secondary element under this topic. The scan team recognized that source control approaches can be the most environmentally effective and least costly BMPs. Applied research in this area would also most likely be easily transferable to other agencies.

- **DOT Practices/Procedures**. DOT operation and maintenance (O&M) practices are an important element of the agency's stormwater program. The scan team was interested in how DOTs track the maintenance requirements of treatment BMPs, as well as the O&M BMPs being used to improve stormwater quality (such as reduction of DOT herbicide use). Overall, stormwater program reporting and compliance tracking are also important but consume staff time. The scan team investigated tools DOTs use to streamline agency reporting requirements as a secondary topic. The scan team members were interested in approaches to stormwater program effectiveness assessment (PEA), along with the performance measures that were being used. PEA is a required element under most NPDES permits; however, there is a lack of guidance to assist program managers, and existing assessment methods tend to be resource intensive.
- **Regulatory**. The relationship of the DOT with the regulatory agency charged with implementing the Clean Water Act (CWA) is complex. Typically, authority to implement the CWA is delegated to the state, so the DOT is regulated by a sister state agency, with federal oversight. The scan team believed that methods to improve communication with state and federal regulators would be highly valuable both in improving the effectiveness and proactively addressing issues of the DOT stormwater program, as well as in assisting the DOT to introduce more certainty into its stormwater budgeting process. The team was especially interested in the characteristics of DOTs that had a partnership-level relationship with their regulatory agency. There is a potential for overlap in the Act's stormwater regulation between Sections 401 (water quality certification) and 402 (regulation of discharge from the storm drain system). A secondary topic was to understand if this potential conflict was occurring in practice at the implementation level.

The scan team discussed potential scan field visit sites at its initial team meeting and reviewed a short list of sites based on findings from the desk scan report. The main consideration for selecting the field visit sites was each site's assessed compatibility with the final topics. The team determined that the best field visit candidate locations would be those DOTs with well-developed programs, including experience in several of the topic areas. Ultimately, the team selected six sites to visit based on Internet research and discussions with experts in the field of highway stormwater quality and with the NPDES coordinator at the candidate DOTs. The team visited the following sites for this scan (in order of the trip itinerary):

- **New York State DOT** (NYSDOT). NYSDOT has an established stormwater program that includes an advanced treatment system application for construction sites. The DOT also has experience with TMDLs, BMP research, and ultra-urban BMPs. The team was interested in viewing the database created by the DOT's Environmental Science Bureau to track

maintenance requirements and other data associated with treatment controls.

- **Washington D.C. DOT** (DDOT). DDOT is a leader in low-impact development (LID) BMP installation, particularly retrofits. DDOT has a unique structure in that it reports both to the City Council for the District of Columbia (DC) and to the other DC resource agencies. Many of the receiving waters within the District are on the 303(d) list for a variety of pollutants, and portions of the DDOT system are on a combined sewer outfall (CSO).
- **Maryland State Highway Authority** (MSHA). The scan team's literature review and personal communications with national experts indicated that MSHA is one of the leaders in beginning LID implementation and is a key state within the Chesapeake Bay watershed. MSHA faces many stormwater management challenges at the regional, state, and local levels and has a state-of-the-art tracking system for post-construction BMPs, maintenance, and operation. The scan team was also interested in its construction site stormwater compliance program and its design, build, operate, and maintain (DBOM) model for stormwater management BMPs. MSHA holds both Phase I and Phase II Municipal Separate Storm Sewer System (MS4) permits and has addressed individual permit requirements for impervious treatment accounting that will be integrated into the Chesapeake Bay modeling for the future Bay TMDL development.
- **North Carolina DOT** (NCDOT). NCDOT is actively involved in TMDL planning and participates on state workgroups for TMDLs. NCDOT partners with state universities to conduct water quality research, such as the use of soil binders for erosion control and BMP performance studies. NCDOT is also conducting a bridge stormwater project to assess the quality of runoff from bridge decks and the impact of runoff from bridge decks on receiving waters and aquatic life and to evaluate the cost of implementing effective bridge BMPs statewide. The DOT has improved stormwater compliance by basing a portion of employee performance reviews on metrics related to stormwater program performance.
- **Texas DOT** (TxDOT). TxDOT partners with public universities in Texas to implement an ongoing research program for highway BMPs and pioneered the use of sand filters in the Edwards Aquifer watershed. Texas Agricultural and Mechanical (A&M) University's erosion control laboratory tests erosion and sediment controls (ESCs) for use in the highway environment. The scan team was interested in the BMP research studies that TxDOT has funded and the results of those studies for potential technology transfer.
- **Florida DOT** (FDOT). The scan team was interested in Florida as a field visit site for several reasons. First, responsibility for the stormwater program resides with each of the DOT districts, rather than with a central office. NPDES permits are held by the DOT districts as a co-permittee with other MS4's, rather than through a single statewide DOT permit. FDOT also operates the Florida Turnpike Enterprise (FTE), which is a system of toll roads, and funds a BMP research program through the University of Central Florida (UCF).

Summary of Initial Findings

The scan team found a wide array of innovative practices at the field sites and was impressed with the dedication of the DOT staff at each location and their resolve to improve the effectiveness of their stormwater programs. The scan team developed some overall findings that are provided here as a basis for formulating improvements to DOT stormwater programs and for guiding future stormwater quality research.

- **DOTs are unique NPDES permittees.** DOTs have unique aspects that make them different from traditional municipalities for NPDES permitting. In some states, the unique attributes have been recognized at the regulatory level to the benefit of the highway stormwater program (HSP). The scan team isolated the unique characteristics of DOTs as NDPES permittees:
  - DOT facilities are passive and uniform.
  - DOT facilities are diffuse.
  - Safety is a primary objective.
  - DOTs have requirements to manage off-site stormwater runoff.

These unique characteristics offer an opportunity to craft DOT NPDES regulation and DOT approaches to stormwater programs to provide the maximum environmental benefit.

- **DOTs must develop new approaches to stormwater programs.** The scan team found that there are some aspects of stormwater program implementation that DOTs can perform exceptionally well and others that, due primarily to external factors, have high costs and fewer benefits. The scan team finds that it is logical for DOTs to focus on the areas of the stormwater program where they can expend public resources to achieve the highest beneficial outcome. Program areas that DOTs should invest in are:
  - Hydromodification
  - Particulate pollutant and metal removal
  - Sources of pollutants under DOT control (e.g., deicers)

  Program areas where traditional approaches should be reevaluated are:
  - Public education
  - Runoff characterization
  - Illicit discharge detection
- **DOTs should continue applied research.** Since DOTs have unique infrastructures and document stormwater discharge quality from their facilities, focused research will help to

achieve next-generation program improvements. The scan team found that research is needed in the following areas:

- Source control
- Pavement systems
- Trash control
- BMP effectiveness measurement

- **DOTs have a need for program changes.** The implementation of stormwater programs will continue to be an adaptive process. Regulations and technology have undergone continuous evolution since the inception of the NPDES program in the early 1990s. The scan team found a variety of areas that could strengthen DOT stormwater programs:
  - Investigate the benefits of a specific MS4 permit for transportation agencies (the concept of a Transportation Separate Storm Sewer System [TS4] permit) to optimize agency stormwater programs.
  - Investigate a TMDL credit-trading program for DOTs.
  - Strengthen the pooled-fund research program.
  - Invest in source control research.
  - Streamline and improve communication with regulatory agencies
  - Improve integration of the stormwater program into the DOT organization.

The scan team also found that a culture of environmental stewardship at the DOT is one of the single most important characteristics to support a successful stormwater program. DOTs need to create an agency culture that demonstrates a strong commitment to enhancing and preserving the environment. This requires strong upper management support and buy-in—words and actions that demonstrate commitment—and a similar high standard applied to all of the external partners, (e.g., consultants, contractors, and vendors) doing business with the DOT.

Recommendations

The scan team has developed a set of recommendations based on the field visits, team findings, and team discussions at the conclusion of the scan travel. Some of the recommendations can be implemented locally by DOTs; however, some will require a national discussion.

Create the Framework of a TS4 Permit

A TS4 permit can help focus DOTs on stormwater activities that will provide the most environmental benefit. The scan team recommends developing a model permit that state regulatory agencies can use as a guide for permitting their DOTs. The model permit would apply

to DOTs as an individual Phase I or Phase II permit, intended to cover all of the DOT's CWA activities, including construction. The model permit framework could initially be fashioned around the United States Environmental Protection Agency's (U.S. EPA's) six minimum measures:

- **Public Education and Outreach.** Focus this element on antilitter campaigns and integrate the program nationally.
- **Public Participation and Involvement**. Refocus this portion of the program on areas of specific interest to the public and benefit for DOT programs.
- **Illicit Discharge Detection and Elimination (IDDE).** This portion of the program should be centered on staff (i.e., maintenance personnel) training and enforcement (i.e., highway police departments).
- **Construction Site Runoff Control.** This program should be enhanced to promote both DOT-specific training for engineers and contractors and research into BMPs that are effective in the highway right-of-way (ROW). Sharing this information with the regulatory community will also be important.
- **Post-Construction Runoff Control.** Focus research and mitigation on controlling sources of pollutants from the existing highway system as well as on controlling hydromodification.
- **Pollution Prevention and Good Housekeeping.** This program element should be emphasized to reduce potential pollution from highway-specific maintenance activities (e.g., pavement rehabilitation) and to optimize current practices (e.g., sweeping). Pollution prevention techniques for maintenance yards, rest stops, and other similar locations under the DOTs control should also be examined.

Create National Guidance on TMDL Application for DOTs

303(d) listing of water bodies and TMDL development is increasing nationally as states collect more receiving water data. There is tremendous pressure on states (primarily from the threat of third-party litigation) to complete TMDLs and assign WLAs to stakeholders. DOTs may be overwhelmed by the volume of TMDLs they must track and implement.

National guidelines could assist states and DOTs by ensuring that DOTs are aware of and ready to participate in pollutant/water body listings for which there is a scientific nexus with highway stormwater quality. Those listings for which there is no scientific basis for the DOT to participate should be eliminated from consideration. The development of case studies and guidance on how DOTs are dealing with TMDLs within their permits would help all DOTs learn from experience. Open communication with regulators is important at all stages of TMDL development; expanded partnerships will be important for the effective implementation of TMDLs. The scan team recommends a panel or national discussion on the topic of allocating TMDL load distributions based on science, contributors, and cost-effective ways to implement the program on a watershed basis.

Refine the Approach to Expending Public Resources on Stormwater Quality

The cost to remove pollutants from stormwater varies from discharger to discharger, with the point of greatest control (usually at the source) being the most effective and economical location to expend water quality resources. Stormwater programs are entering a defining period where treatment control retrofit may be emphasized to meet numeric limits and TMDL WLA. What has not been adequately investigated, however, is the life-cycle cost of a treatment-emphasis type of approach for compliance as compared to a true source control approach through reduction of the pollutant in commercial use.

A flaw in current stormwater programs is that all point sources must reduce their discharge of a pollutant, regardless of its source. This type of approach is not the most efficient expenditure of limited stormwater program resources. Point source dischargers should focus their efforts on removing pollutants for which they have the tools and technical potential to reduce, rather than all constituents that are present in their runoff. For constituents that have a high marginal cost for the discharger to reduce or eliminate, alternatives such as credit trading may be more effective. The scan team recommends further study into credit trading programs for stormwater dischargers, with the objective of optimizing constituent control at the location that can obtain the greatest effectiveness per unit cost. Credit trading could provide needed flexibility, identify reliable benefits on a watershed scale, and would contribute to the de-listing of impaired waters.

Promote Environmental Stewardship

Overall, the scan team was impressed by the exceptional technical, strategic and practical approaches the DOT field sites were employing to meet their stormwater program objectives. An organization that has environmental stewardship as a core value can optimize these resources. Other benefits of environmental stewardship may include a reduction in both regulatory agency oversight of and reporting requirements for the DOT.

The scan team recommends that DOTs consider the following practices in guiding and structuring their organizations:

- Management commitment to environmental protection
- Accountability at all levels in the organization, promoted through education
- Communication and transparency of operations and environmental performance

Other Recommendations

The scan team assembled a collection of additional recommendations drawn from observing the operations at the scan field locations and assessing factors that would facilitate DOT stormwater program improvement. These recommendations are to:

- Hold an annual AASHTO Stormwater DOT Conference
- Integrate stormwater program responsibility within the DOT

- Invest in pooled-fund highway stormwater research
- Collect accurate and detailed cost data for stormwater program elements
- Develop a Transportation Research Board (TRB) initiative for source control of highway pollutants
- Invest in BMPs for maintenance activities

Implementation Activities

The scan identified important programs, strategies, and recommendations that would be beneficial to other DOTs. The team plans to initiate implementation activities such as the following immediately upon completion of the scan report. The implementation activities were developed specifically to support the scan's recommendations and will use methods such as:

- Publishing articles in journals and other industry-related publications, such as *ASCE Magazine* (published by the American Society of Civil Engineers), Stormwater *Solutions, and APWA Reporter* (published by the American Public Works Association)
- Making presentations at AASHTO committees, TRB conferences, ASCE conferences, and other venues as appropriate
- Using the project presentation file that the scan team members developed for the scan trip for in-house DOT presentations and presentations to local transportation organizations (see Appendix A)
- Integrating the team's findings into other associations and industry groups, such as the AASHTO Center for Excellence.
- Performing outreach with the assistance of the FHWA and U.S. EPA

Details on the implementation strategy for each of the recommendations made in this report are discussed in Chapter 8