Wet Weather Benchmarking Report

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ABBREVATIONS & ACRONYMS

The following is a list of all acronyms used in the pages of this report. For the benefit of the reader, they have been divided into two separate alphabetical groups: individual environmental agencies (Agency Acronyms) and all other acronyms used (Non-Agency Acronyms).

Agency Acronyms

AK DEC	Alaska Department of Environmental Conservation
AL DEM	Alabama Department of Environmental Management
AR DEQ	Arkansas Department of Environmental Quality
AR DHHS	Arkansas Department of Health and Human Services
AZ DEQ	Arizona Department of Environmental Quality
Cal/EPA	California Environmental Protection Agency
CDPHE	Colorado Department of Public Health and Environment
CSWRCB	California State Water Resources Control Board
CT DEP	Connecticut Department of Environmental Protection
DNREC	Delaware Department of Natural Resources & Environmental Control
DRBC	Delaware River Basin Commission
FL DEP	Florida Department of Environmental Protection
FL DOH	Florida Department of Health
HI DoH	Hawaii Department of Health
IA DNR	Iowa Department of Natural Resources
ID DEQ	Idaho Department of Environmental Quality
IDEM	Indiana Department of Environmental Management
IEC	Interstate Environmental Commission
IL EPA	Illinois Environmental Protection Agency
KDHE	Kansas Department of Health and Environment
KY DEP	Kentucky Department of Environmental Protection
LA DEQ	Louisiana Department of Environmental Quality

MA DEP	Massachusetts Department of Environmental Protection
MDAR	Massachusetts Department of Agricultural Resources
MDE	Maryland Department of Environment
ME DEP	Maine Department of Environmental Protection
MI DEQ	Michigan Department of Environmental Quality
MO DNR	Missouri Department of Natural Resources
MPCA	Minnesota Pollution Control Agency
MS DEQ	Mississippi Department of Environmental Quality
MT DEQ	Montana Department of Environmental Quality
NC DENR	North Carolina Department of Environment and Natural Resources
ND DoH	North Dakota Department of Health
NEBRA	North East Biosolids and Residuals Association
NE DEQ	Nebraska Department of Environmental Quality
NEIWPCC	New England Interstate Water Pollution Control Commission
NH DES	New Hampshire Department of Environmental Services
NJ DEP	New Jersey Department of Environmental Protection
NMED	New Mexico Environment Department
NV DEP	Nevada Department of Environmental Protection
NYSDEC	New York State Department of Environmental Conservation
OH EPA	Ohio Environmental Protection Agency
OK DEQ	Oklahoma Department of Environmental Quality
OR DEQ	Oregon Department of Environmental Quality
ORSANCO	Ohio River Valley Water Sanitation Commission
PA DEP	Pennsylvania Department of Environmental Protection
RI DEM	Rhode Island Department of Environmental Management
SC DHEC	South Carolina Department of Health & Environmental Control

SD DENR	South Dakota Department of Environment and Natural Resources
SRBC	Susquehanna River Basin Commission
TCEQ	Texas Commission on Environmental Quality
TDEC	Tennessee Department of Environment & Conservation
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UT DEQ	Utah Department of Environmental Quality
UF/IFAS	University of Florida, Institute of Food and Agricultural Sciences
VA DCR	Virginia Department of Conservation and Recreation
VA DEQ	Virginia Department of Environmental Quality
VT DEC	Vermont Department of Environmental Conservation
WA DOE	Washington Department of Ecology
WI DNR	Wisconsin Department of Natural Resources
WV DEP	West Virginia Department of Environmental Protection
WY DEQ	Wyoming Department of Environmental Quality

Non-Agency Acronyms

40 CFR part 503	U.S. EPA federal regulation: Title 40 Protection of Environment
AKART	All Known, Available and Reasonable Methods of Prevention and Treatment Technology
AFO	Animal Feeding Operation
AWM	Animal Waste Management
BAT	Best Available Technology
BCT	Best Conventional Pollution Control Technology
BETX	Benzene + Ethylbenzene + Toluene + Xylene
BMP	Best Management Practice
BMPS	Best Management Plan Section

BPT	Best Practicable Control Technology
BOD	Biochemical Oxygen Demand
BOD_5	5 day Biochemical Oxygen Demand
CAFO	Concentrated Animal Feedlot Operation
CAWP	Certified Animal Waste Management Plans
CBOD	Carbonaceous Biochemical Oxygen Demand
CDBG	Community Development Block Grant
CEC	Cation Exchange Capacity
CFU	Colony Forming Units
CNMP	Comprehensive Nutrient Management Plan
COD	Chemical Oxygen Demand
CSO	Combined Sewer Overflow
CWP	Clean Water Partnership
DM	Dry Matter
DO	Dissolved Oxygen
ELG	Effluent Limit Guidelines
EPCRA	Emergency Planning & Community Right to Know Act
EQ	Exceptional Quality (septage class used by NH)
EQC	Environmental Quality Commission
ESD	Environmental Site Design
FAV	Final Acute Value
FOG	Fats, Oils and Grease
FTE	Full Time Equivalent
GAAMP	Generally Accepted Agricultural and Management Practices
GIS	Geographic Information System
HQ	High Quality Water

HQR	High Quality Resource Water
HUC	Hydrologic Unit Code
I/I	Inflow and Infiltration
ICIS	Integrated Compliance Information System
ICP	Inductively Coupled Plasma
IDDE	Illicit Discharge Detection & Elimination
IDEP	Illicit Discharge Elimination Program
IWM	Intensive Watershed Monitoring Effort
KAR	Kansas Administrative Regulation
LA	Load Allocation
LAC	Local Advisory Committee
LI	Leaching Index
LID	Low Impact Development
LMU	Land Management Unit
LOEL	Lowest Observed Effect Level
LTCP	Long Term Control Plan
MARI	Manure Application Risk Index
MBAS	Methylene Blue Active Substances
MCES	Metropolitan Council of Environmental Services (Minneapolis-St. Paul)
MGD	Million Gallons per Day
MPDES	Montana Pollutant Discharge Elimination System
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
MSGP	Multi-Sector General Permit
MSI	Manure Spreading Index
MTBE	Methyl Tertiary Butyl Ether

MWLMN	Major Watershed Load Monitoring Network
NBOD	Nitrogenous Biochemical Oxygen Demand
NMP	Nutrient Management Plan
NO3-N	Nitrate Nitrogen
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NSPS	New Source Performance Standards
NSW	Nutrient Sensitive Waters
NTU	Nephelometric Turbidity Unit
NURP	National Urban Runoff Plan
ORAWM	Oregon Animal Waste Management
P-Index	Phosphorus Risk Index
PAHs	Polycyclic Aromatic Hydrocarbons
PAN	Plant Available Nitrogen
PBDEs	Polybrominated Diphenyl Ethers
PCBs	Polychlorinated Biphenyl Ethers
PCS	Permit Compliance System
PFCs	Perfluorocarbons
PPCPs	Pharmaceuticals and Personal Care Products
POTW	Publicly Owned Treatment Work
PSNS	Pretreatment Standards for New Sources
PWA	Protected Water Area
QAPP	Quality Assurance Project Plan
RWQCB	Regional Water Quality Control Board
RYE	Realistic Yield Expectation
SARA	Superfund Amendments & Reauthorization Act

SMC	Stormwater Monitoring Coalition (of Southern California)
SNC	Significant Non-Compliance
SOD	Sediment Oxygen Demand
SPAW	Soil Plant Air Water Hydrology Tool
SSO	Sanitary Sewer Overflow
SRF	State Revolving Fund
SU	Standard Units
SUSWMP	Standard Urban Storm Water Management Plan
SWMM	Storm Water Management Manual
SWMP	Storm Water Management Plan
SWPPP	Storm Water Pollution Prevention Plan
SWQMP	Storm Water Quality Management Plan
TDS	Total Dissolved Solids
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TOC	Total Organic Carbon
TP	Total Phosphorus
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTO	Total Toxic Organics
TVS	Total Volatile Solids
TWTDS	Treatment Works Treating Domestic Sewage
UV	Ultraviolet
VOC	Volatile Organic Compounds
VSS	Volatile Suspended Solids
WDRs	Water Discharge Requirements

WET	Whole Effluent Toxicity
WLA	Waste Load Allocation
WPDES	Wisconsin Pollutant Discharge Elimination System
WUP	Waste Utilization Plan
WWTP	Wastewater Treatment Plant

Introduction

In the fall of 2008, the Michigan Department of Environmental Quality (MI DEQ) Water Bureau Director established a wet weather program designed to improve the understanding of rules, policies and regulations related to the monitoring, control and permitting of wet weather events and wet weather discharges. The program created five Water Bureau staff work groups, tasked with identifying and benchmarking more appropriate ways and means to control and reduce adverse surface water quality impacts of wet weather discharge flows.

The five groups and their individual focus areas are as follows:

1. Wastes to Land **-** including programs dealing with septage, biosolids, and animal feeding operations of all sizes.
2. Earth Change **-** including programs dealing with soil erosion and sedimentation, forestry, construction, storm water, and farming other than animal feeding operations.
3. Urban Living **-** including programs dealing with municipal and industrial storm water, and combined and sanitary sewer overflows.
4. Wet Weather Monitoring **-** including ambient and discharge monitoring practices of state agencies, permit holders, and external organizations.
5. Water Quality Based Effluent Limits (WQBEL) and Water Quality Standards Applicability.

This proactive approach recognized that the major surface water quality problems currently faced in the State of Michigan are derived from wet weather discharges. The work groups provide a coordinated approach within the Water Bureau that draws on the expertise of Bureau staff to meet the goals of the newly created wet weather program. Each work group was provided with specific research tasks that would yield information on the character of wet weather discharges arising from the various types of activities being considered in individual work groups. For instance, each work group prepared specific questions to be asked of other states and the U.S. EPA for the purpose of benchmarking wet weather policies. The responses to these questions from the states and U.S. EPA would contribute to a comprehensive understanding of wet weather regulatory policies and programs as practiced in this country.

The work on the questions for the states and U.S. EPA evolved to a final form of 16 pages from December 2008 through to mid May 2009. The set of final overall questions are shown in the attached Appendix A. Each work group listed questions in priority order.

To complement the detailed work of the five specified work groups and to gather information to respond to the prepared questions, a research team from the University of Michigan submitted a proposed work plan designed to solicit information from the Internet to document the states' and U.S. EPA's current wet weather practices. In addition to internet based research, the proposal included the design and implementation of appropriate survey instruments serving to obtain information not readily available from the Internet on current wet weather practice from states and the U.S. EPA. The Water Bureau approved this proposal and the research team commenced working in early May 2009.

The approved research plan called for the research team to complete its work and submit a final report by September 30, 2009. As a consequence of the magnitude of the undertaking, a no-cost extension to the research contract extended the due date of the final report to November 30, 2009.

Methods

The initial effort of this research team involved searching the Internet resources of the states and the U.S. EPA to find answers to as many of the questions from the five working groups as possible. While Internet research yielded useful results, many questions required further research. The remaining questions were compiled into a questionnaire for distribution to each state agency, U.S. EPA Regions, and the U.S. EPA Headquarters. In lieu of a more burdensome and costly paper format, Internet based survey instrument was used, which facilitated the final assembly of responses into a comprehensive report. After review of several different web based survey instruments (including Zoomerang, UM Lessons, SurveyMonkey), we identified SurveyMonkey as the most suitable tool for our purpose.

In order to ensure efficient and sensitive design of these questionnaires, all researchers obtained certification from the University of Michigan (UM) Program for Education and Evaluation in Responsible Research and Scholarship (PEERRS). Although the Institute for Social Research (ISR) informed us that the factual nature of our questionnaires does not require review by UM's Institutional Review Board, we did receive valuable information from ISR.

Because of the quantity and diverse nature of questions unaddressed on the Internet, the remaining questions were divided into twelve separate questionnaires, according to the following wet weather issues:

- Combined Sewer Overflows (CSOs)
- Sanitary Sewer Overflows (SSOs)
- Industrial Stormwater Permit Requirements
- Municipal Stormwater Permit Requirements
- Wet Weather Monitoring
- Industrial Stormwater WQBEL Requirements
- Municipal Stormwater WQBEL Requirements
- Construction Stormwater WQBEL Requirements
- Construction Nonpoint Source Pollution
- Construction Stormwater
- Land Application of Biosolids & Septage
- Land Application of Manure

Each questionnaire was distributed to the appropriate contact person who was identified as being knowledgeable about a given wet weather issue. In some cases, a contact person may have received more than one questionnaire, as some of the subject areas contain overlapping information. In most cases, the contact person for municipal stormwater received both the Urban Living Work Group's questions relating to municipal stormwater and the Water Quality Based Effluent Limitations (WQBEL) Work Group's questions relating to municipal stormwater.

The results received from the respondents as well as the Internet research are grouped and presented in Chapters 1-8. Overall, U.S. EPA Headquarters, 45 states, and nine EPA Regions responded to one or more of the survey instruments. In addition, two states opted out of survey participation for budgetary and standard policy reasons.

The version of this Wet Weather Benchmarking Report dated May 5, 2010 contains corrections and clarifications suggested by survey participants after the full version of the report was posted on December 11, 2009.

Chapter 1 : Industrial Stormwater Permit Requirements

1.1 Introduction & Trends

To benchmark wet weather regulations related to municipal stormwater permitting programs, U.S. Environmental Protection Agency (EPA) Headquarters (HQ) and Regional personnel, as well as State industrial stormwater personnel were surveyed on their industrial stormwater permitting programs, including sampling requirements.

The following 28 agencies responded to one or more questions in the Municipal Stormwater Permit Requirements survey: U.S. EPA Region 9, AK, AR, CA, CO, CT, FL, IN, KS, LA, MI, MN, MO, MS, MT, NE, NV, NJ, NC, ND, OH, OR, RI, TX, VT, VA, WA, WV. In all cases, the survey responses were supplemented with internet based research. Information for states not listed above is based solely on internet research and indicated with an asterisk. The 4 states that do not have National Pollutant Discharge Elimination System (NPDES) primacy are Idaho, Massachusetts, New Hampshire, and New Mexico; the District of Columbia also does not have NPDES primacy. Alaska has been approved for primacy, but the U.S. EPA issued permits have not yet been transferred to the Alaska Department of Environmental Conservation.

Most states use a multi-sector general permit to regulate industrial stormwater discharges and 83% of respondents (20 of 24 agencies) require industrial stormwater permit holders to sample their discharges. 52% of respondents (13 of 25 agencies) have established effluent limits and 74% of respondents (14 of 19 agencies) have established benchmarks for one or more industrial sector(s). 65% of respondents (13 of 20 agencies) require sample collection during the first flush and only 13% of respondents (3 of 23 agencies) are able to restrict the quantity of industrial stormwater discharged. The most common pollutants for which sampling is required include pH, total suspended solids (TSS), chemical oxygen demand (COD), total lead, total phosphorus, oil & grease, total copper, and total zinc. Arkansas and Colorado use both state staff and contractors to inspect industrial stormwater discharging facilities, and Florida uses only contractors; all other state environmental agencies rely solely on agency staff to inspect industrial stormwater. Among all of the responding states, Minnesota is the only state with different seasonal sampling requirements.

1.2 Permit Type

<u>U.S. EPA HQ</u>*
U.S. EPA uses a multi-sector general permit (MSGP) to regulate stormwater discharges from industrial facilities, which allows, under Sector AD, the Director to designate not otherwise classified facilities as needing a permit.[1]

<u>U.S. EPA Region 9</u>
Region 9 may designate non-regulated industrial facilities for permitting based on water quality concerns, but this practice is rare.[2]

<u>Alabama</u>*
Alabama Department of Environmental Management (AL DEM) uses 19 different general permits to regulate stormwater discharges, with each one tailored to a different industrial sector.[3] It is not clear whether AL DEM is able to permit additional, non-federally classified industrial sectors that discharge stormwater.

Alaska
In October 2008, the U.S. EPA approved Alaska Department of Environmental Conservation's (AK DEC) request for primacy over the NPDES program. Because of this recent approval, Alaska's stormwater program is in transition, with the transfer of stormwater permitting authority scheduled to be complete by October 2009. Stormwater discharging facilities previously regulated under U.S. EPA were to be transferred to the AK DEC, which plans to continue using U.S. EPA's MSGP, adding Alaska specific requirements upon the expiration of the MSGP in September 2013.[4]

Arizona*
Arizona Department of Environmental Quality (AZ DEQ) uses a MSGP to permit industrial stormwater discharges and is able to permit industries not classified under federal regulations under Sector AD, which allows the Director to designate any stormwater discharging facility as needing coverage.[5]

Arkansas
Arkansas Department of Environmental Quality (AR DEQ) uses a MSGP to regulate industrial stormwater discharges and is able to permit non-classified industrial facilities, by retaining authority to assign a stormwater discharging facility to Sector AD, which is solely for industrial facilities that are not otherwise classified.[6]

California
California State Water Resources Control Board (CSWRCB) uses a general multi-sector industrial stormwater permit and is not able to permit non-regulated industrial categories.[7]

Colorado
Colorado Department of Public Health & Environment (CDPHE) issues the following 7 types of general industrial stormwater permits: light industry, heavy industry, construction, metal mining, sand & gravel, coal mining, and recycling.[8] CDPHE is able to permit non-federally regulated industries; for example, they have issued an industrial stormwater permit to a baseball stadium.[9]

Connecticut
Connecticut Department of Environmental Protection (CT DEP) uses a MSGP to regulate industrial stormwater discharges and is not able to permit non-regulated industrial categories.[10]

Delaware*
Delaware Department of Natural Resources & Environmental Control (DNREC) uses a MSGP to regulate industrial stormwater discharges and is able to permit industries not classified under federal regulations under Sector AD, which allows the Director to designate any stormwater discharging facility as needing coverage.[11]

Florida
Florida Department of Environmental Protection (FL DEP) uses a generic multi-sector permit to regulate industrial stormwater and is not able to permit non-regulated industrial categories.[12]

Georgia*
Georgia Department of Natural Resources (GA DNR) uses a MSGP to regulate industrial stormwater discharges.[13]

Hawaii*
Hawaii Department of Health (HI DoH) uses a MSGP to regulate industrial stormwater discharges.[14]

Illinois*
Illinois Environmental Protection Agency (IL EPA) uses a MSGP to regulate industrial stormwater discharges; however, the following facilities are subject to federal effluent guidelines and require an individual permit for stormwater discharges: cement manufacturing, feedlots, fertilizer manufacturing, petroleum refining, phosphate manufacturing, steam electric, coal mining, mineral mining & processing, ore mining & dressing, asphalt emulsion, hazardous waste treatment/storage/disposal.[15] IL EPA is able to permit industries not included in federal industrial categories on an as needed basis.[16]

Indiana
Indiana Department of Environmental Management (IDEM) uses a MSGP for all industrial sectors except the following, which require individual industrial stormwater discharge permits: Cement manufacturing (40 CFR 411), Feedlots (40 CFR 412), Fertilizer manufacturing (40 CFR 418), Petroleum refining (40 CFR 419), Phosphate manufacturing (40 CFR 422), Steam electric power generation (40 CFR 423), Coal mining (40 CFR 434), Mineral mining and processing (40 CFR 436), Ore mining and dressing (40 CFR 440), Asphalt (40 CFR 443).[17] IDEM does not have a provision for permitting non-regulated industrial categories.[18]

Iowa*
Iowa Department of Natural Resources (IA DNR) uses a MSGP to regulate industrial stormwater discharges.[19]

Kansas
Kansas Department of Health & Environment (KDHE) uses a MSGP to regulate industrial stormwater discharges. KDHE is able to permit non-regulated industrial categories using conventional authority to address significant contributors of pollutants when designated by the Department.[20]

Kentucky*
Kentucky Department of Environmental Protection (KY DEP) uses 6 different general permits to regulate industrial stormwater, with a separate permit for each of the following industrial categories: landfills, coal pile runoff, primary metal industries, oil & gas exploration/production, wood preserving, all other facilities. Under the latter permit, the KY DEP is able to permit industries not otherwise classified under federal regulations.[21]

Louisiana
Louisiana Department of Environmental Quality (LA DEQ) uses a MSGP to regulate most industrial sectors and is not able to permit non-regulated industrial categories.[22]

Maine*
Maine Department of Environmental Protection (ME DEP) uses a MSGP to regulate industrial stormwater discharges and is able to permit industries not classified under federal regulations under Sector AD, which allows the Director to designate any stormwater discharging facility as needing coverage.[23]

Maryland*
Maryland Department of Environment (MDE) uses a MSGP to regulate industrial stormwater discharges and is able to address significant contributors of pollutants when so designated by the Department.[24]

Michigan

Michigan Department of Environmental Quality (MI DEQ) uses a MSGP to regulate industrial stormwater discharges and is able to permit non-regulated industrial categories through designation as significant contributors. Under this designation, permits may be required for a discharge, or category of discharges within a geographic area, if the discharge is determined by the department to be a significant contributor of pollutants to waters of the state or to contribute to a violation of water quality standards.[25]

Minnesota

Minnesota Pollution Control Agency (MPCA) uses a MSGP to regulate industrial stormwater discharges and Minnesota law allows the MPCA Commissioner to designate permit coverage for any facility not currently regulated under the State Disposal System powers.[26]

Mississippi

Mississippi Department of Environmental Quality (MS DEQ) has a MSGP for all industrial facilities except hot mix asphalt and mining facilities, which both require a different general permit.[27] MS DEQ is able to permit non-regulated industrial facilities under Mississippi's Water Pollution Control Laws.[28]

Missouri

Missouri Department of Natural Resources (MO DNR) uses different general permits across industrial sectors.[29] MO DNR is able to permit non-regulated industrial categories according to Missouri State Regulation(s) 10-CSR 20-6.200(1) Storm Water Permits (A) & (B), which allows the Department to require a discharge permit for pollution discharged into state waters.[30]

Montana*

Montana Department of Environmental Quality (MT DEQ) uses a MSGP to regulate most industrial sectors. Mining and oil & gas exploration industries have a separate general permit, available at the following website: http://www.deq.state.mt.us/wqinfo/MPDES/StormwaterMining.asp.[31]

Nebraska

Nebraska Department of Environmental Quality (NE DEQ) uses a MSGP to regulate industrial stormwater and is not able to permit non-regulated industrial categories.[32]

Nevada

Nevada Division of Environmental Protection (NV DEP) has one multi-sector general permit (does not cover mineral facilities with SIC code 10) and is not able to permit non-regulated industrial categories.[33]

New Jersey

New Jersey has a basic industrial stormwater permit for facilities that do not have source materials exposed to stormwater and 5 other permits (one each for scrap metal and auto recycling, concrete, mining, asphalt, and CAFOs). Facility types ineligible for the Basic 5G2 Permit include: facilities subject to stormwater discharge effluent limitation guidelines (e.g., feedlots, fertilizer manufacturing, petroleum refining, coal pile runoff from steam electric power plants, asphalt emulsion); facilities with operating landfills ("sanitary landfills" or "hazardous waste landfills") and non-operating landfills (either type) unless closed in compliance with appropriate rules and not disrupted; and projects or activities that conflict with an adopted Water Quality Management Plan.[34] New Jersey Department of Environmental Protection (NJ DEP) is able to permit non-regulated industrial categories, as they are determined to be significant contributors of pollutants to state waters.[35]

New York*

New York Department of Environmental Conservation (NYSDEC) uses a MSGP to regulate industrial stormwater and is able to permit industries not classified under federal regulations under Sectors AD and AE, which allow the Director to designate any stormwater discharging facility as needing coverage.[36]

North Carolina

North Carolina Department of Environment & Natural Resources (NC DENR) has a general permit for each industrial sector. NC DENR does not have a provision for permitting non-regulated industrial categories.[37] NC DENR supplemented their initial survey response by adding that they do have a provision for permitting non-regulated industrial categories, since they have authority to designate sources of significant pollutants or causes of water quality standards violations. This is an authority passed on by the Federal Regulations to the NC DENR Director, and NC DENR has adopted these regulations by reference.[38]

North Dakota

North Dakota Department of Health (ND DoH) uses a MSGP to regulate industrial stormwater. ND DoH does not have a provision for permitting non-regulated industrial categories.[39]

Ohio

Ohio EPA (OH EPA) has 2 general industrial stormwater permits, one covering general industry as described in CFR 122.26 and the other specific to marinas (SIC 4493). Facilities in the following categories require an individual permit: landfills, petroleum bulk terminals (SIC 5171), mining and quarrying of non-metallic minerals (SIC 14xx).[40]

OH EPA retains the ability to permit non-regulated industrial categories not included in CFR 122.26. State law allows OH EPA to regulate any point source stormwater discharger not prohibited from regulation by the U.S. EPA, so they retain the ability to designate a facility as requiring a permit. Also, prior to the development of U.S. EPA's 1990 stormwater regulations, OH EPA regulated stormwater discharging facilities that were not included in the U.S. EPA's regulations. OH EPA continues to permit those facilities.[41]

Oregon

Oregon Department of Environmental Quality (OR DEQ) has created three different types of general permit:

- 1200-A: required for primary Standard Industrial Classification Code (SIC) 14, Mining and Quarrying of Nonmetallic Minerals, Except Fuels and asphalt mix batch plants and concrete batch plants, including mobile operations. This permit may cover multiple non-metallic mining and quarrying sites under single ownership, each of less than 10 disturbed acres where only mining activities are conducted.[42]
- 1200-COLS: required for general industrial facility that discharges into Columbia Slough or conveyance systems that discharge into Columbia Slough Watershed.[43]
- 1200-Z: multi-sector general permit for all industrial categories except those required to obtain coverage under a 1200-A or 1200-COLS permit.[44]

OR DEQ is able to permit and regulate industrial facilities not specified in EPA's federal regulations with the 1200-COLS permit, which was developed based on a TMDL and specifies additional industrial facilities to be permitted.[45]

Pennsylvania*
Pennsylvania Department of Environmental Protection (PA DEP) uses a MSGP to regulate industrial stormwater.[46]

Rhode Island
Rhode Island Department of Environmental Management (RI DEM) uses a MSGP to regulate industrial stormwater and is able to permit industries not classified under federal regulations using Sector AD, which allows the Director to designate any stormwater discharging facility not covered under Sectors A-AC as needing coverage.[47]

South Carolina*
South Carolina Department of Health & Environmental Control (SC DHEC) uses a MSGP to regulate industrial stormwater and is able to permit industries not classified under federal regulations under state regulations, which allow SC DHEC to designate a stormwater discharge as needing a permit.[48]

South Dakota*
South Dakota Department of Environment & Natural Resources (SD DENR) uses a MSGP to regulate industrial stormwater.[49]

Tennessee*
Tennessee Department of Environment & Conservation (TDEC) uses a MSGP to regulate stormwater from industrial facilities and is able to permit industries not classified under federal regulations under Sector AD, which allows the Director to designate any stormwater discharging facility not covered under Sectors A-AC as needing coverage.[50]

Texas
Texas Commission on Environmental Quality (TCEQ) uses a MSGP to regulate stormwater from industrial facilities. TCEQ is able to permit non-regulated industrial categories by including an additional industrial category in its MSGP that is used to provide permit coverage for facilities "designated by the executive director as needing a permit to control pollution related to storm water discharges and that do not meet the description of an industrial activity covered by Sectors A-AC."[51] A facility may not apply for coverage under this sector unless directed by the executive director.

Utah*
Utah Department of Environmental Quality (UT DEQ) uses a MSGP to regulate industrial stormwater and is able to permit industries not included in federal industrial categories on an as needed basis.[52]

Vermont
Vermont Department of Environmental Conservation (VT DEC) uses a MSGP to regulate industrial stormwater and does not permit non-regulated industrial categories.[53]

Virginia
Virginia Department of Environmental Quality (VA DEQ) closely follows the U.S. EPA's 2008 MSGP, using an individual permit, as needed, for facilities with special needs.[54] Virginia is able to permit non-regulated

industrial categories when those facilities are determined to be significant contributors of pollutants or are contributing to a violation of water quality standards.[55]

<u>Washington</u>

Washington Department of Ecology (WA DOE) has a multi-sector general permit, which contains a provision to require permit coverage for significant contributors of pollutants. Significant contributors are determined on a case by case basis, and can include facilities that are significant contributors of pollutants to groundwater even if no discharge to surface water or storm sewer system exists.[56]

<u>West Virginia</u>

West Virginia Department of Environmental Protection (WV DEP) uses a MSGP to regulate industrial stormwater, with different monitoring requirements for each industrial sector.[57] The MSGP contains a sector W, under which any industrial activities not specifically covered under the multi-sector permit can be regulated.[58]

<u>Wisconsin</u>*

Wisconsin Department of Natural Resources (WI DNR) regulates industrial stormwater with a two-tiered general permit system. Tier 1 permits cover heavy industries, such as paper manufacturing, chemical manufacturing, petroleum refining, ship building/repair, and bulk storage of coal, minerals and ores. Tier 2 permits cover light industries, such as furniture manufacturing, printing, warehousing and textiles. In addition to Tier 1 and 2 permits, there are separate general permits for auto dismantling & scrap recycling and non-metallic mining.[59] WI DNR does retain the ability to permit industries not included in federal industrial categories on an as needed basis.[60]

<u>Wyoming</u>*

Wyoming Department of Environmental Quality (WY DEQ) regulates industrial stormwater using a MSGP and a separate general permit for stormwater associated with mineral mining & processing (excluding coal or metals).[61, 62] Local agencies also retain the ability to control and/or permit stormwater discharges on an individual basis.[63]

1.3 Discharge Quantity Reduction

<u>Alaska</u>

AK DEC is not empowered to limit industrial stormwater discharge quantity.[64]

<u>Arkansas</u>

AR DEQ is not empowered to limit industrial stormwater discharge quantity.[65]

<u>California</u>

CSWRCB is not empowered to limit industrial stormwater discharge quantity, but Water Quality Control Boards in Regions 2, 4, 9 have incorporated language addressing low impact development (LID) into their Standard Urban Storm Water Management Plan (SUSWMP) requirements.[66]

<u>Colorado</u>

CDPHE is not able to limit industrial stormwater discharge quantity.

<u>Connecticut</u>

CT DEP is not empowered to limit industrial stormwater discharge quantity.

Florida
No response.

Indiana
IDEM is not empowered to limit industrial stormwater discharge quantity.

Kansas
KDHE is not empowered to limit industrial stormwater discharge quantity.

Louisiana
LA DEQ is not empowered to require that industries reduce the quantity of stormwater discharges.

Maine
ME DEP is able to require that industries reduce the quantity of industrial stormwater discharge if a facility has a large area of impervious surface.[67]

Maryland*
Through the Stormwater Management Act of 2007, MDE requires the implementation of environmental site design (ESD) to the maximum extent practicable in order to control the volume of stormwater discharged. ESD includes reducing impervious surfaces, reducing stormwater velocity, and green infrastructure.[68]

Michigan
MI DEQ is not empowered to limit industrial stormwater discharge quantity.

Minnesota
MPCA is able to limit industrial stormwater discharge quantity, but the techniques used to do so were not identified in the survey.

Mississippi
MS DEQ is not empowered to limit industrial stormwater discharge quantity.

Missouri
MO DNR is not empowered to limit industrial stormwater discharge quantity.

Montana
No response.

Nebraska
NE DEQ is not empowered to limit industrial stormwater discharge quantity.

Nevada
NV DEP is not empowered to limit industrial stormwater discharge quantity.

New Jersey
In some cases, NJ DEP requires reuse of stormwater in industrial applications as well as separation and infiltration of nearby runoff before it is commingled with stormwater associated with industrial activity. Also, NJ DEP implements additional stormwater management requirements (including best management practices, or BMPs) with increased impervious cover.[69]

North Carolina
NC DENR is not empowered to limit industrial stormwater discharge quantity.

North Dakota
ND DoH is not empowered to limit industrial stormwater discharge quantity.

Ohio
OH EPA is not empowered to limit industrial stormwater discharge quantity.

Oregon
OR DEQ is not specifically able to limit industrial stormwater discharge quantity, but is in the process of revising the permit, using EPA's 2008 MSGP for guidance. EPA's 2008 MSGP directs facilities to evaluate control measures, including those that minimize impervious areas and infiltrate runoff, but it does not require the installation of specific BMPs.[70]

Vermont
VT DEC is not empowered to limit industrial stormwater discharge quantity.

Texas
TCEQ is not empowered to limit industrial stormwater discharge quantity.[71]

Virginia
VA DEQ is not empowered to limit industrial stormwater discharge quantity.

Washington
WA DOE requires industrial facilities to determine if flow control BMPs are required in order for their stormwater discharges to "satisfy All Known, Available and Reasonable Methods of Prevention and Treatment Technology (AKART) requirements, prevent pollution of state waters, or comply with state water quality standards." The facilities' Storm Water Pollution Prevention Plan (SWPPP) must describe the methods used to determine if flow control BMPs are required. If necessary, the SWPPP shall also include appropriate BMPs from Volumes I and III of WA DOE's Storm Water Management Manual (SWMM) or equivalent manuals, or a description of the technical basis for their chosen BMPs. Flow control BMPs that are required to reduce industrial stormwater quantity include infiltration BMPs such as swales, ponds, and trenches. [72] SWMMs describing these BMPs for Western Washington and Eastern Washington are available at the following agency websites, respectively: http://www.ecy.wa.gov/pubs/0510031.pdf and http://www.ecy.wa.gov/pubs/0410076.pdf.

West Virginia
WV DEP is not empowered to limit industrial stormwater discharge quantity.

1.4 Monitoring requirements

U.S. EPA HQ*

Sampling frequency:

U.S. EPA requires samples to be collected during a storm event that results in actual discharge from stormwater outfalls; the storm event must be at least 72 hours from the preceding storm event, unless it can be documented that the frequency of storm events for a particular region is less than one storm event every 72 hours.[73] The MSGP requires most sectors to conduct quarterly benchmark sampling and annual effluent limit sampling.[74] The industrial sectors that do not have either benchmarks or effluent limits include: oil & gas extraction; land transportation & warehousing; ship & boat building & repair yards; treatment works; textile mills; printing & publishing; furniture & fixtures; leather tanning; transportation equipment; and electronic equipment & components.

Sample collection:

U.S. EPA requires grab samples during the first flush.[75]

Pollutants monitored:

Benchmarks and effluent limitations vary by sector. See pages 43-136 of Reference 1 for sector descriptions. Only the following six sectors have effluent limits: timber products; chemical and allied products manufacturing & refining-phosphate fertilizer manufacturing; asphalt paving and roofing materials and lubricant manufacturing; cement manufacturing facilities; non-metallic mineral mining & dressing; hazardous waste treatment, storage, or disposal facilities; landfills & open dumps; discharges from coal storage piles at steam electric generating facilities.[76]

Benchmarks:

- pH - 6.0-9.0 S.U. ; Sector S
- COD - 120.0 mg/L; Sectors A, B, G, K, N, S, U
- TSS - 100.0 mg/L; Sectors A, D, E, F, G, H, J, L, M, N, U
- Total arsenic - .016854 mg/L; Sectors A, K
- Total zinc - .117 mg/L; Sectors A, C, F, N, Q, Y, AA
- Total copper - .0636 mg/L; Sectors A, F, N
- Total lead - .0816 mg/L; Sectors C, K, M, N, Q
- Total iron - 1.0 mg/L; Sectors C, E, F, H, L, M, N, O, Q, AA
- Total aluminum - .75 mg/L; Sectors C, E, F, H, M, N, Q, AA
- Ammonia as nitrogen - 19.0 mg/L; Sectors K, S
- Nitrate and nitrite as nitrogen - .68 mg/L; Sectors C, G, J, U, AA
- Total phosphorus - 2.0 mg/L; Sector C
- BOD_5- 30 mg/L; Sector S, U
- Mercury- .0024 mg/L; Sector K
- Selenium- .2385 mg/L; Sector K
- Silver- .0318 mg/L; Sector K
- Magnesium- .0636 mg/L: Sector K

Effluent limitations:

- pH - 6.0-9.0 S.U.; Sectors A, D, E, and any facility with coal pile runoff
- TSS - 50.0 mg/L; Sectors D, E and any facility with coal pile runoff
- Total phosphorus - 105.0 mg/L daily max; Sector C
- Fluoride - 75.0 mg/L daily max; Sector C
- No debris- Sector A facilities with wet deck storage.

Additional controls based on sampling results:
If the average of four consecutive samples does not exceed the benchmark for a given parameter, the permit holder is not required to sample for that parameter for the remainder of the permit term. If the average of the four samples does exceed a benchmark, the permit holder must review the control measures and take corrective action. See page 36 of U.S. EPA's 2008 MSGP (reference 1). If a numeric effluent limit is exceeded, follow up sampling must be done within 30 days after the corrective action is implemented.[77]

<u>Alabama</u>*
Sampling frequency:
AL DEM requires most industrial sectors to collect grab samples at least once every 6 months. Actual sampling frequency varies widely among the industrial sectors and a given general permit may contain semi-annual, annual, and quarterly sampling requirements. Concrete batch plants are required to collect grab samples during every 7.5 inch or greater storm event. Certain metal finishing facilities are required to sample monthly, while others are required to sample quarterly.[78] Commercial ship building/repair facilities are required to sample semi-annually and recreational ship building/repair facilities are required to sample annually. Concrete facilities with runoff associated with petroleum handling must sample quarterly.

Different seasonal sampling requirements: None.

Pollutants monitored:
Sampling parameters vary by sector. Numeric effluent limits exist for some sectors, while no benchmarks have been established. Effluent limits are specified below. Where no concentration is provided for a given parameter, effluent limits do not exist for that parameter. Copies of AL DEM's NPDES permits can be found at the following website: http://www.adem.state.al.us/genpermits.htm.

<u>Naphthalene - 620 µg/L daily maximum:</u> all facilities with runoff from petroleum storage and fueling areas; groundwater and/or storm water incidental to groundwater cleanup operations which has been contaminated with automotive gasoline, aviation fuel, jet fuel, or diesel fuel; hydrostatic test water from petroleum & natural gas industries.

<u>Total chlorides - 860 mg/L daily maximum:</u> discharges associated with non-contact cooling water and cooling tower blowdown, uncontaminated condensate, and boiler blowdown & demineralizer wastewater; concrete facilities.

<u>Temperature - 90° F:</u> discharges associated with non-contact cooling water and cooling tower blowdown, uncontaminated condensate, and boiler blowdown & demineralizer wastewater; concrete facilities.

Benzene, ethylbenzene, toluene, xylene (BETX) - 154.7 µg/L daily maximum: concrete manufacturing; runoff from petroleum storage and fueling areas; groundwater and/or storm water incidental to groundwater cleanup operations which has been contaminated with automotive gasoline, aviation fuel, jet fuel, or diesel fuel; hydrostatic test water from petroleum & natural gas industries.

Oil & grease - 15 mg/L daily maximum: commercial & recreational boat & ship building & repair activities; All facilities with storm water runoff from petroleum storage and fueling areas; asphalt facility discharges (containing chlorine) associated with non-contact cooling water and cooling tower blowdown, uncontaminated condensate, and boiler blowdown & demineralizer wastewater; concrete facilities; vehicle and equipment exterior washing operations that do not use solvents; food production & kindred industries; warm blooded animal slaughterhouses; landfill discharges that do not contain leachate from active or inactive landfills; paper products; paint & allied product manufacturing; auto recycling & salvage; salvage and recycling of metal scrap; non-metal scrap salvage & recycling; plastic industries; rubber industries; groundwater and/or storm water incidental to groundwater cleanup operations which has been contaminated with automotive gasoline, aviation fuel, jet fuel, or diesel fuel; hydrostatic test water from petroleum & natural gas industries; textile manufacturing.

Oil & grease - 10 mg/L daily maximum: runoff from coal/wood chip storage areas.

pH 6.0-8.5 standard units (SU): most facilities for which sampling is required.

Total phosphorus - 1.0 mg/L daily maximum: asphalt facility discharges (containing chlorine) associated with non-contact cooling water and cooling tower blowdown, uncontaminated condensate, and boiler blowdown & demineralizer wastewater; concrete facilities; vehicle and equipment exterior washing operations that do not use solvents.

TSS - 50 mg/L daily maximum: discharges associated with non-contact cooling water and cooling tower blowdown, uncontaminated condensate, and boiler blowdown & demineralizer wastewater; concrete facilities; vehicle and equipment exterior washing operations that do not use solvents.

Total residual chlorine - 0.019 mg/L daily maximum, 0.011 mg/L monthly average: asphalt facility discharges (containing Chlorine) associated with non-contact cooling water and cooling tower blowdown, uncontaminated condensate, and boiler blowdown & demineralizer wastewater; concrete facilities; hydrostatic test water from petroleum & natural gas industries.

Total recoverable lead - 2.5 µg/L: Groundwater and/or storm water incidental to groundwater cleanup operations which has been contaminated with automotive gasoline, aviation fuel, jet fuel, or diesel fuel; hydrostatic test water from petroleum & natural gas industries.

Parameters for which sampling is required, but limits do not exist:

- Rainfall amount: all facilities.
- Total nnitrogen: primary metal facilities & foundries; storage of stormwater exposed air transportation goods; salvage and recycling of metal and non-metal scrap
- Total phosphorus: food production & kindred industries

- TSS: food production & kindred industries; warm blooded animal slaughterhouses; landfill discharges that do not contain leachate from active or inactive landfills; paint & allied product manufacturing; commercial & recreational boat & ship building/repair activities; auto salvage & recycling; metal and non-metal scrap salvage & recycling; plastic industries; rubber industries; stone, glass, clay product manufacturing; textile manufacturing; runoff from coal/wood chip storage areas
- Total dissolved solids (TDS): discharges associated with non-contact cooling water and cooling tower blowdown, uncontaminated condensate, and boiler blowdown & demineralizer wastewater; concrete facilities; landfill discharges that do not contain leachate from active or inactive landfills
- BETX: auto recycling & salvage
- Methyl tertiary butyl ether (MTBE): concrete manufacturing; runoff from petroleum storage and fueling areas; groundwater and/or storm water incidental to groundwater cleanup operations which has been contaminated with automotive gasoline, aviation fuel, jet fuel, or diesel fuel; hydrostatic test water from petroleum & natural gas industries
- Biochemical oxygen demand (BOD): paper products; food production & kindred industries; warm blooded animal slaughterhouses; landfill discharges that do not contain leachate from active or inactive landfills; paint & allied product manufacturing; plastic industries; textile manufacturing
- Naphthalene: auto recycling & salvage
- Nitrate and nitrite as nitrogen: food production & kindred industries; warm blooded animal slaughterhouses
- Total Kjeldahl nitrogen (TKN): food production & kindred industries; warm blooded animal slaughterhouses
- Fecal coliform: warm blooded animal slaughterhouses
- Total recoverable cadmium: primary metal facilities & foundries; auto salvage & recycling; landfill discharges that do not contain leachate from active or inactive landfills; salvage and recycling of metal scrap
- Total recoverable copper: commercial & recreational boat & ship building/repair; auto salvage & recycling; landfill discharges that do not contain leachate from active or inactive landfills; salvage and recycling of metal scrap; textile manufacturing
- Total recoverable lead: commercial & recreational boat & ship building/repair; auto salvage & recycling; salvage and recycling of metal scrap; plastic industries; rubber industries
- Total recoverable silver: primary metal facilities & foundries; auto salvage & recycling; salvage and recycling of metal scrap
- Total recoverable chromium: plastic industries; primary metal facilities & foundries; rubber industries
- Total recoverable zinc: commercial & recreational boat & ship building & repair activities; paint & allied product manufacturing; auto salvage & recycling; textile manufacturing
- Total zinc: salvage and recycling of metal scrap; rubber industries
- Total cyanide: salvage and recycling of metal scrap; primary metal facilities & foundries
- Total mercury: salvage and recycling of metal scrap; primary metal facilities & foundries
- Total zinc: salvage and recycling of metal scrap; rubber industries
- COD: landfill discharges that do not contain leachate from active or inactive landfills; paper products; paint & allied product manufacturing; commercial & recreational boat & ship building & repair activities; auto salvage & recycling; metal and non-metal scrap salvage & recycling; plastic industries.
- Sulfide: textile manufacturing
- Total recoverable iron, aluminum; total tin: commercial (semi-annual sampling) & recreational (annual sampling) boat & ship building & repair activities[79]

- All of the ship building parameters, with the addition of total recoverable arsenic, nickel; total toxic organics; total organic carbon (TOC): primary metal facilities & foundries[80]
- Total chromium; settleable solids; upstream and downstream turbidity (quarterly): landfill discharges that do not contain leachate from active or inactive landfills

Arizona*
AZ DEQ's industrial stormwater permit is currently in draft form; however, the current draft contains sector specific sampling requirements similar to U.S. EPA's 2008 MSGP, including the benchmarks and effluent limitations.[81]

Arkansas
Sampling frequency:
AR DEQ requires all industrial stormwater permit holders to sample semi-annually, once during January through June and once during July through December, with paper submittal of sampling results required annually.

Program oversight:
AR DEQ uses both state staff and contractors to inspect permitted industrial stormwater discharges.

Different seasonal sampling requirements: None.

Sample collection:
Grab samples are required during the first flush.

Pollutants monitored:
All facilities are required to sample for pH, COD, TSS, oil & grease, with the following benchmark values for maximum concentration: 6.0-9.0 SU pH, 120 mg/L COD, 100 mg/L TSS, 15 mg/L oil & grease. Specific industrial sectors are required to sample for additional parameters, for which benchmarks and effluent limits exist. Sector specific requirements can be found in pages 12 through 16 of AR DEQ's Industrial Stormwater General Permit, reference 6.

Additional controls based on sampling results:
Sampling data is used to establish permit controls and follow up sampling is required based on sampling results.

California
Sampling frequency:
Sampling of two storms per wet season is required, with results to be submitted annually on paper. Sampling for specific pollutants is required, but this varies by sector, and no benchmarks or effluent limits exist.

Program oversight:
CSWRCB uses state staff to inspect permitted industrial stormwater discharges.

Different seasonal sampling requirements:
No sampling is required from June to September.

Sample collection:
Grab samples are required during the first hour of stormwater discharge.

Pollutants monitored:
pH, TSS, electroconductivity, oil & grease.

Additional controls based on sampling results:
Frequent occurrences of high pollutant concentrations in sampling results may require follow-up inspections or enforcement, but the permit holder is not required to conduct follow up sampling or implement additional controls based on sampling results.

<u>Colorado</u>
Sampling frequency:
CDPHE requires industrial stormwater permit holders within certain industrial sectors to sample annually. Paper submittal of results is also required annually. For facilities with holding ponds or other impoundments, sampling shall be performed at the outlet from the pond; no sampling is necessary if discharge from the pond does not reach surface water.

Program oversight:
CDPHE uses both state staff and contractors to inspect permitted industrial stormwater discharges.

Different seasonal sampling requirements: None.

Sample collection:
Grab samples are required during the first flush.

Pollutants monitored:
No benchmarks exist. For light industry, routine sampling of stormwater is not required.[82] For heavy industry, annual sampling is required.[83] See below for required effluent limits.

Phosphate manufacturing (defluorinated phosphate rock and defluorinated phosphoric acid manufacturers only) and fertilizer manufacturing (phosphate manufacturers only): total phosphorus 35 mg/L 30 day average, 105 mg/L daily maximum; fluoride 25 mg/L 30 day average, 75 mg/L daily maximum; pH 6-9.5 SU.[84]

Petroleum refining: oil & grease 15 mg/L daily maximum, TOC 110 mg/L.[85]

Paving and roofing materials - asphalt emulsion manufacturers only (SIC Code 295, 40 CFR 443, subpart A): pH 6-9 SU; TSS 0.125 lb/1000 gal runoff 30 day average, 0.188 lb/1000 gal runoff daily maximum; oil & grease 0.083 lb/1000 gal runoff 30 day average, 0.125 lb/1000 gal runoff daily maximum.[86]
Cement manufacturing (SIC Code 3241, 40 CFR 411) and coal pile runoff: pH 6-9 SU; TSS 50 mg/L daily maximum.[87]

Parameters for which sampling is required, but for which limits do not exist[88]:
- Oil & grease, pH, TSS: primary metal industries, land disposal units/incinerators, wood treatment (chlorophenolic/creosote formulations or arsenic or chromium preservatives), coal pile runoff, airports with deicing, animal handling/meat packing, asphalt emulsion, chemicals and allied products (SIC code

30), rubber and plastic products manufacturing (SIC code 28), cement manufacturing (SIC Code 3241), lime storage piles (SIC Code 3274), oil fired electric power generating facilities
- COD: rubber and plastic products manufacturing (SIC code 28), cement manufacturing (SIC Code 3241), lime storage piles (SIC Code 3274), oil fired electric power generating facilities, animal handling/meat packing, airports with deicing, wood treatment, land disposal units/incinerators, primary metal industries
- Total lead, copper, cadmium, chromium, arsenic: primary metal industries
- Total copper, zinc: coal pile runoff
- BOD_5 (5 day Biochemical Oxygen Demand) - airports with deicing, animal handling/meat packing
- Oil & grease, TOC, pH: petroleum refining
- Total phosphorus, fluoride, pH, oil & grease: phosphate manufacturing, fertilizer manufacturing
- TKN, total phosphorus, fecal coliform: animal handling/meat packing

Basis of limits:
The limits are based on federal effluent limit guidelines.

Additional controls based on sampling results:
No additional controls or sampling is required based on sampling results, but sampling data is used to determine compliance with effluent limits and BMP effectiveness.

Connecticut
Sampling frequency:
Industrial stormwater permit holders are required to sample annually, with paper submittal also required annually. The storm event from which the sample is collected must be a storm event that results in the accumulation of 0.1 inches or more of precipitation and that occurs at least 72 hours after any previous storm event of 0.1 inch or greater.[89]

Program oversight:
CT DEP uses state staff to inspect permitted industrial stormwater discharges.

Different seasonal sampling requirements: None.

Sample collection:
Grab samples are required during the first flush.

Pollutants monitored:
If concentrations are less than the following for 2 consecutive years, sampling may be suspended for the following 2 years.[90]

- Total oil & grease: 2.5 mg/L
- COD: 45 mg/L
- TSS: 30 mg/L
- Total phosphorus: 0.2 mg/L
- TKN: 1.25 mg/L
- Nitrate as nitrogen: 0.75 mg/L
- Total copper: 0.060 mg/L
- Total lead: 0.030 mg/L

- Total zinc: 0.200 mg/L
- Aquatic toxicity: 50% lethal concentration (LC50) = 100%. A minimum of twenty neonatal *Daphnia pulex* must be used for the aquatic toxicity tests and toxicity tests must be started within 36 hours of stormwater sample collection

Basis of limits:
Connecticut uses monitoring results to determine concentrations which, if not exceeded by a facility for two years, waive sampling requirements for that facility for the two following years. These limits, detailed above, are based upon the 50th percentiles of cumulative relative frequency graphs of industrial facilities' stormwater monitoring results, as reported to CT DEP.[91]

<u>Delaware</u>*
Sampling frequency:
DNREC requires certain sectors of industry to collect stormwater samples semi-annually.[92]

Sample collection:
Grab samples required during the first flush.[93]

Pollutants monitored:
All information below, regarding benchmarks and effluent limitations, was obtained from the State of Delaware's Water Pollution Control Regulations (reference 92).

Benchmarks:
- pH - 6.0-9.0 S.U. all sectors
- Total arsenic - 0.16854 for SIC code 2491
- Total recoverable aluminum - 0.75 mg/L for SIC codes 2812-2819, 3245-3259, 3261-3259, 3312-3317, 3321-3325, 3411-3471, 3482-3499, 3911-3915, 4412-4499, 5015, 5093
- Total recoverable copper - .0636 mg/L for SIC codes 2491, 3321-3325, 3351-3357, 3363-3369
- Total recoverable iron - 1.0 mg/L for SIC codes 2812-2819, 2873-2879, 3271-3275, 3321-3325, 3411-3471, 3482-3499, 3911-3915, 4412-4499, 5015, 5093, SE
- Total recoverable lead - .0816 mg/L for SIC codes 2873-2879, 4412-4499, 5015, 5093
- Total recoverable zinc - 0.117 mg/L for SIC codes 2821-2824, 2873-2879, 2841-2844, 3011-3069, 3312-3317, 3321-3325, 3351-3357, 3363-3369, 3411-3471, 3482-3499, 3911-3915, 4412-4499, 5093
- Nitrate and nitrite as nitrogen - 0.68 mg/L for SIC codes 1442, 1446, 2074-2079, 2812-2819, 2841-2844, 2873-2879, 3411-3471, 3482-3499, 3911-3915
- TKN - 1.5 mg/L for SIC code 3111
- COD - 120 mg/L for SIC codes 2074-2079, 2421, 2426, 2429, 2431-2439 except 2434, 2448, 2449, 2593, 2951, 2952, 3271-3275, 3321-3325, 4011-4013, 4111-4173, 4212-4273, 4311, 5015, 5093, 5171, 2631, 45xx, 5093
- TSS - 100 mg/L for SIC codes 1411, 1422-1429, 1442, 1446, 1481, 1499, 2041-2048, 2074-2079, 2411, 2421, 2426, 2429, 2431-2439 except 2434, 2448, 2449, 2593, 2951, 2952, 3271-3275, 3321-3325, 4011-4013, 4111-4173, 4212-4273, 4311, 5015, 5093, 5171
- BOD_5 - 30 mg/L for SIC codes 2074-2079, 45xx
- Ammonia - 19 mg/L for SIC code 45xx

- Oil & grease - 15 mg/L for SIC codes 3271-3275, 4011-4013, 4111-4173, 4212-4273, 4311, 5015, 5093, 5171
- Total surfactants - 1 mg/L for SIC codes 4011-4013, 4111-4173, 4212-4273, 4311, 5171
- Total phosphorus - 2 mg/L for SIC codes 2873-2879

Effluent limitations:
- pH - 6.0-9.0 for SIC codes 1422-1429, 1442, 1446, 2411, 2874, 2951, 2952, coal pile runoff
- Total phosphorus as P - 105 mg/L daily maximum, 35.0 mg/L 30 day average for SIC code 2874
- Fluoride - 75.0 mg/L daily maximum, 25.0 mg/L 30 day average for SIC codes 2874
- TSS - 23.0 mg/L daily maximum, 15.0 mg/L 30 day average for SIC codes 2951, 2952
- TSS - 45.0 mg/L daily maximum, 25.0 mg/L 30 day average for SIC codes 1422-1429, 1442, 1446
- TSS - 50 mg/L daily maximum for any cement manufacturing facility, coal pile runoff
- Oil & grease - 15.0 mg/L daily maximum, 10.0 mg/L 30 day average for SIC codes 2951, 2952

Florida

Sampling frequency:

Analytical monitoring is only required for regulated industrial stormwater permit holders that have a high potential to discharge pollutants at concentrations of concern, with a smaller subset of those facilities required to annually monitor for effluent limits. Permit holders are required to visually monitor quarterly at all facilities. Where applicable, analytical monitoring for benchmarks is required quarterly during the second and fourth year of the permit term, and year 4 monitoring is waived if benchmarks are not exceeded during year 2.

Program oversight:

FL DEP uses contractors to inspect industrial stormwater facilities, with state oversight of the contractors.

Different seasonal sampling requirements: None.

Sample collection:

Grab samples are required during the first flush (first 30 minutes of discharge).

Pollutants monitored:

Benchmarks:

Same as EPA's 2008 MSGP.

Effluent limitations:

Same as EPA's 2008 MSGP.

Basis of limits:

Benchmarks and effluent limits for each sector are based on EPA's 2008 MSGP.

Additional controls based on sampling results:

Analytical sampling data is used to evaluate the effectiveness of SWPPPs, and follow up sampling is required based on sampling results.

<u>Georgia</u>*

Sampling frequency:

GA DNR requires industrial stormwater permit holders within certain industrial sectors to sample annually.[94]

Sample collection:

Grab samples are required during the first flush.[95]

Pollutants monitored:

The following is a list of industries and the pollutants for which sampling is required, according to Georgia's 2006 industrial stormwater permit (reference 94).

- *Primary metal industries:* oil & grease, COD, TSS, pH, dissolved lead, dissolved cadmium, dissolved copper, dissolved arsenic, dissolved chromium
- *Landfills 40 CFR Part 445 Subpart A:* BOD_5, TSS, ammonia, alpha terpineol, aniline, benzoic acid, naphthalene, pCresol, phenol, pyridine, total recoverable arsenic, total recoverable chromium, total recoverable zinc, pH
- *Landfills 40 CFR Part 445 Subpart B:* BOD_5, TSS, total recoverable zinc, ammonia, alpha terpineol, benzoic acid, pCresol, phenol, pH
- *Incinerators, boilers, industrial furnaces:* total recoverable Magnesium, dissolved Magnesium, TKN, BOD5, COD, TSS, Total dissolved Solids (TDS), TOC, Oil & Grease, pH; dissolved arsenic, total recoverable barium, dissolved cadmium, ddissolved chromium, total cyanide, dissolved lead, mercury, dissolved selenium, silver
- *Wood waste & wood waste landfills:* COD, TSS
- *Wood treatment:* oil & grease, COD, TSS
- *Coal pile runoff:* oil & grease, pH, TSS, dissolved copper, dissolved nickel, dissolved zinc
- *Battery reclaimers:* oil & grease, COD, TSS, pH, dissolved copper, dissolved lead
- *Airports* (with over 50,000 flights annually): BOD_5, COD, TSS, pH, primary deicing ingredient used
- Coal fired steam electric facilities: oil & grease, pH, TSS, dissolved copper, dissolved nickel, dissolved zinc
- *Animal handling/meat packing:* oil & grease, BOD_5, TSS, TKN, Total phosphorus, fecal coliform, pH
- Rubber & miscellaneous plastics (SIC major group 30) or Chemicals & allied products (SIC major group 28): oil & grease, COD, TSS, pH
- *Automobile salvage yards, cement manufacturing, ship building/repairing facilities, oil fired steam electric power generating facilities, lime manufacturing facilities:* oil & grease, COD, TSS, pH
- *Asphalt emulsion:* oil & grease, TSS, pH
- *Scrap metal recycling facilities:* COD, TSS, aluminum, dissolved copper, dissolved lead, dissolved zinc

There are no specific numeric effluent limitations in GA DNR's 2006 MSGP, and the only benchmark appears to be 100 mg/L TSS, which applies to animal processing facilities. Animal processing facilities also have a list of recommended BMPs intended to control fecal coliform (p. 53-57 of Reference 94).

<u>Hawaii</u>

Sampling frequency:

HI DoH requires all industrial stormwater permit holders to sample annually and submit the results in an annual report.[96]

Sample collection:
Composite (flow or time-weighted) samples are required for all parameters except toxic volatile organic compounds, cyanide, oil & grease, pH, which require grab samples.[97]

Pollutants monitored:
No benchmarks or effluent limits exist for the following parameters: discharge quantity, BOD_5, COD, TSS, total phosphorus, total nitrogen, nitrate and nitrite as nitrogen. The following numeric effluent limits exist for all sectors: 15 mg/L oil & grease, pH (range depends on classification of the receiving water). Permit holders must also measure additional pollutants, as specified in Appendix D of 40 CFR Part 122.[98]

<u>Illinois</u>*
IL EPA enforces requirements included in CFR 40 Subchapter N, as they pertain to stormwater discharges.[99]

<u>Indiana</u>
Sampling frequency:
IDEM requires general permit holders to sample annually, and individual permits may require more frequent sampling of stormwater runoff based on the industrial sector. A measurable storm event is defined as a storm event which results in the accumulation of 0.1 inches or more of precipitation.[100] Sampling results must be submitted on paper annually.

Program oversight:
IDEM uses state inspection to ensure compliance among permitted industrial stormwater discharges.

Different seasonal sampling requirements: None.

Sample collection:
Grab samples are required during the first flush.

Pollutants monitored:
Permit holders are required to monitor the following, but no benchmarks or effluent limits exist: pH, COD, TSS, nitrate and nitrite as nitrogen, total phosphorus**.**

Additional controls based on sampling results:
Sampling data is being used to establish permit controls. Follow up sampling is not required based on sampling results.

<u>Iowa</u>*
Sampling frequency:
IA DNR requires industrial stormwater permit holders to sample annually.[101]

Different seasonal sampling requirements: Not specified.

Sample collection:
Grab samples during the first flush and flow or time weighted samples are required for each parameter.

Pollutants monitored:
The following numeric effluent limits exist only for facilities with coal pile runoff: 50 mg/L daily maximum TSS, 6.0-9.0 SU pH. No benchmarks have been established and specific monitoring requirement parameters vary by industrial sector. All facilities specified below must record the amount of precipitation (in inches), as well as the concentration of the specified parameters.

- *Facilities subject to Section 313 of SARA Title III*: oil & grease, pH, BOD_5, COD, TKN, TSS, total phosphorus, any Section 313 water priority chemical which facility is subject to report
- *Primary metal industries*: oil & grease; pH; BOD_5; COD; TKN; TSS; total phosphorus; total lead, copper, arsenic, cadmium, chromium
- *Land disposal units/incinerators*: ammonia; bicarbonate; calcium; chloride; total iron, magnesium; dissolved magnesium; nitrate and nitrite as nitrogen; potassium; sodium; sulfate; COD; TDS; TOC; oil & grease; pH; total arsenic, barium, cadmium, chromium, cyanide, lead, mercury, selenium, silver
- *Wood treatment (Chlorophenolic/Creosote Formulations)***:** oil & grease; pH; BOD_5; COD; TKN; nitrate and nitrite as nitrogen; TSS; total phosphorus; pentachlorophenol
- *Wood treatment (arsenic or chromium Preservatives):* oil & grease; pH; BOD_5; COD; TKN; TSS; total phosphorus; nitrate and nitrite as nitrogen; total arsenic, total copper, total chromium
- *Coal pile runoff*: oil and grease; pH; TSS; total copper, nickel, zinc
- *Airports* (with over 50,000 flights per year): oil & grease; pH; BOD_5; COD; TKN; TSS; total phosphorus; ethylene glycol
- *Animal handling/meat packing*: oil & grease; pH; BOD_5; COD; TKN; TSS; total phosphorus; fecal coliform
- *Battery reclaimers*: oil & grease; pH; BOD_5; COD; TKN; TSS; total phosphorus; lead
- *Coal fired steam electric facilities*: oil & grease; TSS; copper; zinc; nickel; pH
- *Other facilities not mentioned above*: oil & grease, pH, BOD_5, COD, TKN, TSS, total phosphorus

<u>Kansas</u>
Sampling frequency:
Industrial facilities are not required to sample their stormwater discharges under the current multi-sector general permit.

Program oversight:
KDHE uses state inspection to insure compliance among permitted industrial stormwater discharges.

<u>Kentucky</u>
Sampling frequency:
KY DEP requires all industrial facilities to monitor twice per year.

Pollutants monitored:
No benchmark concentrations have been established; only coal facilities (with coal pile runoff) have numeric effluent limits for TSS (50 mg/L as a daily maximum) and pH (6-9).
Industrial facilities must monitor the following parameters:

- *Coal facilities:* flow, oil & grease, TSS, total arsenic, total copper, total iron, total manganese, total nickel, total selenium, total zinc, sulfate, hardness, pH
- *Landfills:* all of the above, TDS, COD, total barium, total cadmium, total mercury, total silver, hexavalent chromium, cyanide, chloride, TOC, ammonia

- *Metal facilities:* flow, COD, oil & grease, TSS, total arsenic, total cadmium, total copper, total lead, total nickel, total zinc, hexavalent chromium, hardness, other pollutants to which stormwater may be exposed
- *Wood preserving facilities:* flow, COD, oil & grease, TSS, total arsenic, total copper, hexavalent chromium, hardness, pentachlorophenol
- *Oil & gas exploration/production:* flow, COD, oil & grease, TSS, chloride, sulfate, pH
- *Other facilities:* flow, oil & grease, COD, TSS, pH, other pollutants to which stormwater may be exposed

<u>Louisiana</u>

Sampling frequency:
LA DEQ requires only certain industrial sectors to sample and submit the results annually on paper. For those sectors, LA DEQ requires quarterly sampling for benchmarks and annual sampling for effluent limitations during the 2nd and 4th year of the permit term.[102] A measurable storm event is one with at least 0.1 inches of precipitation, with a 72 hour or greater interval from the preceding measurable storm.[103]

Program oversight:
LA DEQ uses state staff to inspect permitted industrial stormwater discharges.

Different seasonal sampling requirements: None.

Sample collection:
Grab samples are required, during the first flush.

Pollutants monitored:
Benchmarks and effluent limits vary for each industrial sector. See pages 53 to 176 of Louisiana Pollutant Discharge Elimination System (LPDES) MSGP (Reference 103).

Basis of limits:
Numeric effluent limitation are generally based on U.S. EPA's 2008 MSGP, with some SIC types subject to more stringent limits.

Additional controls based on sampling results:
Sampling results are used to evaluate the level of success of facility controls. Follow up sampling is not required based on sampling results.

<u>Maine</u>

Sampling frequency:
ME DEP's MSGP requires certain industrial sectors to sample their stormwater annually.[104]

Program oversight:
ME DEP uses state staff inspectors to insure compliance among industrial stormwater facilities; inspectors are paid using industrial stormwater permit fees.[105]

Sample collection:
Grab samples are required during the first flush (up to 60 minutes of the storm event).

Pollutants monitored:
Monitoring requirements, including benchmarks and numeric effluent limitations, vary by industrial sector and are identical to those of U.S. EPA's 2008 MSGP.[106]

Michigan
Sampling frequency:
MI DEQ's MSGP does not contain specific sampling requirements. MI DEQ requires permit holders to sample discharges from secondary containment structures subject to such sampling requirements under State or Federal Law, from lands on Michigan's List of Sites of Environmental Contamination (Part 201), and from other activities which may contribute pollutants of concern to stormwater. Such sampling is completed as part of a Short Term Stormwater Characterization Study. Paper submittal of the results is required.

Program oversight:
MI DEQ uses state staff to inspect permitted industrial stormwater discharges.

Different seasonal sampling requirements: None.

Sample collection:
Both grab and either time or flow weighted composite samples are required.

Pollutants monitored:
Sampling requirements do not include analysis for specific pollutants.

Basis of limits:
Not applicable.

Additional controls based on sampling results:
No follow up sampling is required based on sampling results, but sampling results are being used to established permit controls.

Minnesota
Sampling frequency:
MPCA's draft MSGP (it is currently under public notice and available for comment until September) requires permit holders to sample for benchmarks once every 3 months and, for the 7 sectors subject to effluent limits, to sample annually for effluent limits.[107] Sampling results must be submitted electronically on an annual basis.

Program oversight:
MPCA uses state staff to inspect permitted industrial stormwater discharges.

Different seasonal sampling requirements:
Industrial stormwater permit holders will be required to collect samples during winter thaws, in addition to the quarterly sampling described above.

Sample collection:
Grab or composite (permit holder may decide whether to flow or time weight the composites) samples are required. If grab samples are collected, they must be during the first flush.

Pollutants monitored:
Based on the survey response, sampling is required for the following pollutants: pH, COD, TSS, total arsenic, total zinc, total copper, total lead, total iron, total chromium, chromium (III), total aluminum, ammonia as nitrogen, nitrate and nitrite as nitrogen, total phosphorus, BOD_5.

Benchmarks from MPCA's MSGP (in mg/L unless otherwise specified):

Sector A: *General sawmills/planing mills* - 120 COD, 100 TSS, 0.234 total zinc
Wood preserving - 0.680 total arsenic, 0.028 total copper, 3.5 total chromium, .011 pentachlorophenol, 100 TSS
Log storage & handling - 100 TSS
Log storage & handling with wet decking discharge areas - 100 TSS, 6.0-9.0 SU pH
Hardwood dimension & flooring mills - 120 COD, 100 TSS
Wood pallets, containers, miscellaneous wood products - 100 TSS

Sector B: *Pulp, paper, cardboard products* - 100 TSS, 120 COD

Sector C: *Phosphate agricultural chemicals* - 1.0 total phosphorus (as phosphorus), 100 TSS
Agricultural Chemicals - 0.164 total lead, 1.0 total iron, 0.234 total zinc, 1.0 total phosphorus (as phosphorus), 100 TSS
Industrial inorganic chemicals - 0.234 total zinc, 1.5 total aluminum, 1.0 total iron, 100 TSS
Soaps, detergents, cosmetics - 0.234 total zinc, 100 TSS
Plastics, synthetics, resins - 0.234 total zinc, 100 TSS, 25 BOD_5
Medicinal chemicals/botanical products - 100 TSS
Ethanol facilities - 100 TSS, 25 BOD_5

Sector D: *Asphalt paving & roofing* - 100 TSS
Discharges from asphalt emulsion production areas - 100 TSS, 6.0-9.0 SU pH
Miscellaneous coal & petroleum products - 100 TSS

Sector E: *Clay products manufacturers* - 1.5 total aluminum, 100 TSS
Concrete & gypsum manufacturers - 1.0 total iron, 100 TSS
Cement manufacturing - 100 TSS, 6.0-9.0 SU pH
Glass, stone, abrasive, asbestos manufacturing - 100 TSS

Sector F: *Steel works, blast furnaces* - 1.5 total aluminum, 100 TSS, 0.234 total zinc
iron & steel foundries - 1.5 total aluminum, 100 TSS, 0.028 total copper, 1.0 total iron, 0.234 total zinc
Rolling & extruding of non-ferrous metals/non-ferrous foundries - 0.028 total copper, 0.234 total zinc, 100 TSS
Smelting & refining of non-ferrous metals - 100 TSS

Sector G: *Active ccopper ore mining & dressing facilities* - 100 TSS, 0.68 nitrate and nitrite as nitrogen, 120 COD
Active metal mining facilities - 100 TSS, 6.0-9.0 SU pH, 0.18 total antimony, 0.680 total arsenic, .0078 total cadmium, 0.028 total copper, 1.0 total iron, 0.164 total lead, 0.938 total nickel, 0.040 total selenium, 0.0041 total silver, 0.234 total zinc

Sector H: *Coal mines & related areas* - 100 TSS, 0.75 total aluminum, 1.0 total iron, 6.0-9.0 SU pH

Sector I: *Oil & gas extraction* - 100 TSS, 6.0-9.0 SU pH

Oil refining - 0.234 total zinc, 2.8 total ammonia (as nitrogen)
Sector J: *Sand & gravel mining, non-metallic minerals, mineral mining* - 100 TSS
Sector K: *Hazardous waste landfills* - 100 TSS, 120 COD, 2.8 total ammonia (as N), 25 BOD_5, 0.164 total lead, 0.680 total arsenic, 0.0078 total cadmium, 0.234 total zinc, 3.5 total chromium, 6.0-9.0 SU pH, 0.045 total cyanide, 0.040 total selenium, .0041 total silver
Sector L: *All Landfills* - 100 TSS
All landfills except municipal solid waste landfills - 100 TSS, 1.0 total iron
All landfills subject to 40 CFR part 445 subpart B - 25 BOD_5, 100 TSS, 2.8 total ammonia (as nitrogen), 0.234 total zinc, 6.0-9.0 SU pH
Sector M: *Automobile salvage yards* - 100 TSS, 1.5 total aluminum, 1.0 total iron, 0.164 total lead, 9.0 benzene, 3.7 toluene, 2.7 ethylbenzene, 2.8 xylene
Sector N: *Scrap recycling facilities* - 100 TSS, 120 COD, 0.75 total aluminum, 1.0 total iron, 0.164 total lead, 0.028 total copper, 0.234 total zinc, 6.0-9.0 SU pH
Sector O: *Coal & oil fired steam electric generating facilities* - 100 TSS, 1.0 total iron
Nuclear & natural gas fired co-generation facilities - 100 TSS
Sector P: *Land transportation & warehousing* - 100 TSS
Sector Q: *Water transportation* - 100 TSS, 0.164 total lead, 0.234 total zinc, 1.0 total iron, 1.5 total aluminum
Sector R: *Ship & boat building & repair* - 100 TSS
Sector S: *Airports* (that use an average of more than 100,000 gallons of glycol based chemical and/or 100 tons of urea annually) - 25 5 day carbonaceous biochemical oxygen demand ($CBOD_5$), 120 COD, 2.8 total ammonia (as nitrogen), 6.0-9.0 SU pH
Airports (that use less than an average of more than 100,000 gallons of glycol based chemical and/or 100 tons of urea annually) - 120 COD, 25 $CBOD_5$, 2.8 total ammonia (as nitrogen)
Sector T: *Treatment works* - 100 TSS, 25 $CBOD_5$
Sector U: *Grain mills* - 100 TSS
Fats & oils - 100 TSS, 25 $CBOD_5$, 120 COD, 2.8 total ammonia (as nitrogen)
Food & tobacco - 100 TSS, 25 $CBOD_5$, 120 COD, 2.8 total ammonia (as nitrogen), 1.0 total phosphorus (as phosphorus)
Sector V: *Textile mills* - 100 TSS
Sector W: *Furniture & fixtures* - 100 TSS
Sector X: *Printing & publishing* - 100 TSS, 0.0041 total silver
Sector Y: *Fabricated rubber products* - 0.234 total zinc, 0.164 total lead, 100 TSS
Plastic products - 100 TSS
Sector Z: *Leather tanning & finishing* - 100 TSS, 3.5 total chromium, 25 $CBOD_5$
Sector AA: *Fabricated metal products* - 1.5 total aluminum, 1.0 total iron, 0.234 total zinc, 100 TSS
Fabricated metal coating & engraving - 0.234 total zinc, 100 TSS
Sector AB: *Transportation equipment* - 100 TSS
Sector AC: *Electronic & optical goods*- 100 TSS
Electronic & electrical equipment (except computers)- 100 TSS, 0.028 total copper, 0.164 total lead

Effluent limitations from MPCA's MSGP (in mg/L unless otherwise specified):

- *Log storage & handling with wet decking discharge areas:* 6.0-9.0 SU pH

- *Phosphate agricultural chemicals:* 105 daily maximum, 35 monthly average total phosphorus (as phosphorus); 75 daily maximum; 25 monthly average total fluoride
- *Discharges from asphalt emulsion production areas:* 23 daily maximum, 15 monthly average TSS; 15 daily maximum, 10 monthly average oil & grease
- *Cement manufacturing:* 50 TSS, 6.0-9.0 SU pH
- *Mine dewatering:* 25 monthly average TSS (construction sand & gravel mining), 45 daily maximum TSS (industrial sand mining), 6.5-8.5 SU pH
- *Hazardous waste landfills:* 88 daily maximum, 27 monthly average TSS; 10 daily maximum, 4.9 monthly average total ammonia (as nitrogen); 220 daily maximum, 56 monthly average $CBOD_5$; 1.1 daily maximum, 0.54 monthly average total arsenic; 0.048 daily maximum, 0.029 monthly average phenol; 0.535 daily maximum, 0.296 monthly average total zinc; 1.1 daily maximum, 0.46 total chromium; 6.0-9.0 SU pH; 0.042 daily maximum, 0.019 alpha terpineol; 0.024 daily maximum, 0.015 monthly average aniline; 0.119 daily maximum, 0.073 monthly average benzoic acid; 0.059 daily maximum, 0.022 monthly average naphthalene; 0.024 daily maximum, 0.015 monthly average p-Cresol; 0.072 daily maximum, 0.025 monthly average pyridine
- *All landfills subject to 40 CFR part 445 subpart B*: 140 daily maximum, 37 monthly average $CBOD_5$; 88 daily maximum, 27 monthly average TSS; 10 daily maximum, 4.9 monthly average total ammonia (as nitrogen); 0.033 daily maximum, 0.016 monthly average alpha terpineol; 0.12 daily maximum, 0.071 monthly average benzoic acid; 0.025 daily maximum, 0.014 monthly average p-Cresol; 0.026 daily maximum, 0.015 monthly average phenol; 0.20 daily maximum, 0.11 monthly average total zinc; 6.0-9.0 SU pH

Basis of limits:
The benchmarks and effluent limits are based on U.S. EPA's recommendations and Minnesota's experience with various industrial sectors.

Additional controls based on sampling results:
Industrial stormwater sampling data is being used to establish permit controls. If benchmarks are exceeded, additional sampling is required. See pages 25 through 30 of Minnesota's draft MSGP (Reference 107) for details.

<u>Mississippi</u>
Sampling frequency:
Most industrial stormwater permit holders are not required to sample their discharges unless the receiving water has a wasteload allocation (WLA) established by a TMDL and MS DEQ suspects that the parameter for which there is a WLA is present at the facility.[108] Additional industrial facilities may be required to sample their stormwater discharges under Superfund Amendments & Reauthorization Act (SARA) Title III, Section 313; such facilities must sample annually for pH, TSS, and any water priority chemical exposed to stormwater.[109] Coal pile runoff and mine dewatering facilities are also required to collect annual discharge samples.

Program oversight:
MS DEQ uses state staff to oversee the industrial stormwater program.[110]

Sample collection:
Grab or composite samples are required during the first flush.

Pollutants monitored:
Stormwater discharges from facilities with coal pile runoff are also subject to EPA established numeric effluent limits (6.0-9.0 S.U. pH; 50.0 mg/L TSS; 0.01 mg/L total copper; 0.06 mg/L total zinc).[111] Mine dewatering facilities are required to collect annual grab samples for pH and are subject to the 6.0 – 9.0 S.U. effluent limits.[112] See also “sampling frequency”.

Basis of limits: No response.

Additional controls based on sampling results: No response.

<u>Missouri</u>
Sampling frequency:
MO DNR requires industrial facilities receiving permits to sample stormwater discharge at least quarterly, for effluent limitations. A measurable storm event is defined as a storm event that results in the accumulation of 0.1 inches or more of precipitation.[113] Permit holders are required to submit sampling results quarterly on paper.

Program oversight:
MO DNR uses state staff to oversee the industrial stormwater program. There are also EPA inspections of industrial stormwater discharges.

Different seasonal sampling requirements:
Seasonal sampling is currently for bacteria and ammonia, but this does not affect industrial storm water runoff.[114] Ammonia is an acute criterion and seasonal differences only apply to chronic criteria.

Sample collection:
Grab samples are required during the first 60 minutes of stormwater discharge.

Pollutants monitored:
No benchmarks or guideline concentrations exist.

The following effluent limits exist:

- pH - 6.5 - 9.0 SU
- COD - 90 mg/L daily maximum & 60 mg/L monthly average
- TSS - 100 mg/L daily maximum & 50 mg/L monthly average
- Ammonia as nitrogen - 12.1 mg/L daily maximum 4.6 mg/L monthly average
- BOD_5 - 45 mg/L daily maximum & 30 mg/L monthly average
- Settleable solids 1.5 ml/L/hr daily maximum & /1.0 ml/L/hr monthly average
- Oil & grease 15 mg/L daily maximum & /10 mg/L monthly average

The following pollutants are also required to be monitored, but the corresponding effluent limits are determined by water quality standards and beneficial use of the receiving waters: chromium (III), chromium (IV), total arsenic, total zinc, total copper, total lead, total iron, total phenols, total aluminum.

Basis of limits:
Effluent limits are based on best available technology and water quality standards.

Additional controls based on sampling results:
Sampling results are used to establish permit limits and controls, and follow up sampling is determined by sampling results (pollutants may also be removed from the monitoring list based on sampling results).

<u>Montana</u>
Sampling frequency:
MT DEQ requires industrial stormwater permit holders to sample their discharges semi-annually, with paper submittal of the results.[115]

Different seasonal sampling requirements:
Occasionally, snowmelt is sampled rather than stormwater runoff.[116]

Sample collection & analysis method:
Grab samples are required during first flush, while composite (flow or time weighted) samples are required occasionally.

Pollutants monitored:
For both benchmarks and effluent limitations, MT DEQ typically uses sector specific concentrations obtained from U.S. EPA's 2008 MSGP.

<u>Nebraska</u>
Sampling frequency:
NE DEQ does not require industrial stormwater permit holders to sample their stormwater outfalls.

Program oversight:
NE DEQ does not conduct regular inspections of industrial facilities.

<u>Nevada</u>
Sampling frequency:
Quarterly sampling is required only for facilities that have effluent limitations or have experienced a significant spill; sampling requirements do not include analysis for specific pollutants. Sampling data is self-retained.

Program oversight:
NV DEP uses state staff to oversee the industrial stormwater discharge program.

Different seasonal sampling requirements: None.

Sample collection & analysis method:
Grab samples are required to be collected during the first flush.

Pollutants monitored: Varies.

Additional controls based on sampling results:
Follow up sampling is determined by sampling results; however, sampling data is not otherwise used.

New Jersey
Basic industrial stormwater permit (5G2) is applicable to facilities that have no exposure of source materials to stormwater discharges. Since stormwater pollution from industrial "source materials" is prevented by compliance with this permit, it does not have numeric effluent limitations, nor does it require stormwater sampling.[117]

Concrete product facilities general stormwater permit[118]:
- No numeric effluent limitations, unless a benchmark is exceeded twice consecutively or six times during the permit term
- Sampling required for: rainfall, TSS, pH
- Benchmark concentration limits for stormwater only discharges to surface water include: a daily maximum of 100 mg/L TSS, daily maximum of 500 mg/L for TDS, daily maximum of 15 mg/L for oil & grease, daily maximum of 120 mg/L for COD, and pH range of 6.0 to 9.0 standard units
- Iron is only monitored and no benchmark or numeric limit exists

Scrap metal facilities general stormwater permit[119]:
- No numeric effluent limitations
- Sampling required 4 times a year for: flow, COD, petroleum hydrocarbons, pH, TSS
- For facilities with SIC code 5093 (scrap recycling): aluminum, arsenic, cadmium, copper, iron, lead, zinc

Mining general permit[120]:
- Quarterly sampling required
- Numeric effluent limitations exist for: oil & grease, pH, TSS. If discharging to trout streams: COD, dissolved oxygen, TDS

Hot mix asphalt plants[121]:
- Sampling required 3 times a year
- Numeric effluent limitations: oil & grease 15 mg/L (maximum) and 10 mg/L (30 day average)
- Benchmark: 100 mg/L for TSS, 120 mg/L maximum for COD, 500 mg/L maximum for TDS
- Monitor only (specific BMPs required to be implemented): benzene, methylene blue active substances (MBAS), chromium, copper, lead, zinc

Data submittal:
Paper submittal required quarterly.[122]

Sample collection & analysis method:
Grab samples are required, ideally during the first flush.[123]

Additional pollutants for which monitoring is required (as indicated in survey response):
Toluene, xylene, naphthalene, ethylene, nitrate and nitrite as nitrogen, ammonia as nitrogen.[124]

New York*

Sampling frequency:

NYSDEC requires most sectors of industry to sample stormwater discharges annually for both benchmarks and effluent limits.[125]

Sample collection:

Grab samples are required during the first flush.[126]

Pollutants monitored:

Benchmarks and effluent limitations vary by sector and are identical to U.S. EPA's 2008 MSGP.[127]

North Carolina

Sampling frequency:

NC DENR requires permitted facilities to sample stormwater discharge semi-annually for benchmark parameters. Sampling results must be submitted on paper semi-annually. NC DENR defines a representative storm event as "a storm event that measures greater than 0.1 inches of rainfall and that is preceded by at least 72 hours in which no storm event measuring greater than 0.1 inches has occurred. A single storm event may contain up to 10 consecutive hours of no precipitation. For example, if it rains for 2 hours without producing any collectable discharge, and then stops, a sample may be collected if a rain producing a discharge begins again within the next 10 hours." [128]

Program oversight:

NC DENR uses state staff inspection to oversee the industrial stormwater program.

Different seasonal sampling requirements: None.

Sample collection:

Grab samples are required, within the first flush.

Pollutants monitored:

NC DENR does not enforce effluent limitations in any of its industrial stormwater permits.

Benchmarks:

- pH 6-9 SU: vehicle maintenance activities; metal industries; food and cosmetics; scrap metal and recycling; ready-mix concrete; timber industries
- COD - 120 mg/L: SIC 20, 21, 24, 28, 4221-4225, 5093, Landfills
- TSS - 100 mg/L: SIC 10-14,20,21,24,28,2951,3273,33-38,4221-4225,5015,5093; landfills
- Total arsenic - 0.36 mg/L: individual permits with exposure risk
- Total zinc - 0.067 mg/L: individual permits with exposure risk.
- Total copper - 0.007 mg/L: individual permits with exposure risk
- Total lead - 0.03 mg/L: SIC 285, 33-38,5015,5093
- Total iron - 1.0 mg/L: individual permits with exposure risk
- Total phenols - 4.5 mg/L: discharges to trout waters
- Total chromium - 1 mg/L: SIC 285
- Total aluminum - 0.75 mg/L: individual permits with exposure risk

- Ammonia as nitrogen - 7.2 mg/L: individual permit storm water discharges with potential ammonia sources[129]
- Nitrate and nitrite as nitrogen - 10 mg/L: individual permit storm water discharges to NSW
- Total phosphorus - 2 mg/L: individual permit storm water discharges to NSW
- fluoride - 6 mg/L: individual permits with exposure risk
- Naphthalene - 1 mg/L: individual permits with exposure risk
- BOD_5 - 30 mg/L: individual permits with exposure risk
- Settleable solids: SIC 10-14

Other pollutants for which monitoring is required, but which do not have benchmarks or effluent limits:

- Turbidity: SIC10, 11, 12, 13, 14
- Oil & grease: all sites with vehicle maintenance activities
- Cadmium: SIC285, 5093
- Fecal coliform: SIC201, landfills
- Ethylene glycol: SIC5015, 5093
- Total toxic organics (TTO): SIC5015, 5093, selected subsets of SIC33-38

Basis of limits:
There are a variety of sources, including half the final acute value (FAV), half the lowest observed effect level (LOEL), North Carolina water quality standards, National Urban Runoff Plan (NURP) recommendations, EPA recommended water quality criteria, national primary drinking water standards, North Carolina action levels.

Additional controls based on sampling results:
Sampling data is being used to establish controls. Follow up sampling is required based on sampling results.

<u>North Dakota</u>

Sampling frequency:
Annual sampling is required only for the following industrial sectors: coal pile runoff (any stormwater discharge from coal storage piles); wood and paper products (SIC 2421-2426, mills; 2491, preserving; 2493, reconstituted wood products; and 2631, paperboard); chemical and related products (SIC 281, industrial inorganic chemicals; 282, plastics and synthetic materials; 284, soaps and detergents; and 287, agricultural chemicals); food and related products (SIC 2011, meat packing plants; 2015, poultry processing; and 207, fats and oils); primary metal industries (SIC 33); hazardous waste treatment, storage and disposal; landfills and land application; automobile salvage yards (SIC 5015); scrap recycling facilities (SIC 5093); air transportation. The permit holder must submit sampling data annually on paper.

Program oversight:
ND DoH uses state staff inspection to oversee the industrial stormwater program.

Different seasonal sampling requirements: None.

Sample collection:
Grab samples are required during first flush (unless conditions do not allow collection within first 30 minutes of storm).

Pollutants monitored:
Benchmarks:
- pH 6.0 - 9.0: coal pile runoff, wood products, chemicals, meat processing, fats & oils, primary metals, waste treatment, landfills, auto & scrap salvage, air transportation
- COD – 120 mg/L: wood products, chemicals, meat processing, fats & oils, waste treatment, landfills, auto & scrap salvage, air transportation
- TSS – 100 mg/L: wood products, chemicals, meat processing, fats & oils, primary metals, waste treatment, landfills, auto & scrap salvage. (For coal pile runoff the limit is 50 mg/L TSS)
- Total arsenic - 0.1685 mg/L: wood products, primary metals, waste treatment
- Total zinc - 0.117 mg/L: coal pile runoff, chemicals, primary metals, scrap salvage
- Total copper - 0.0636 mg/L: coal pile runoff, wood products, primary metals, scrap salvage
- Total lead - 0.0816 mg/L: primary metals, waste treatment, landfills, auto & scrap salvage
- Total phenols - 1.0 mg/L: wood products
- Ammonia as nitrogen - 15.0 mg/L: chemicals, meat processing, fats & oils, air transportation
- Nitrate and nitrite as nitrogen - 0.68 mg/L: chemicals, meat processing, fats & oils, air transportation
- Total phosphorus - 2.0 mg/L: chemicals
- BOD_5- 30.0 mg/L: meat processing, fats & oils, air transportation
- Oil & grease-no visible sheen: food products, auto & scrap salvage

Effluent limitations:
- pH - 6.0-9.0: coal pile runoff
- TDS - 50mg/L: coal pile runoff

Basis of limits:
Both benchmarks are based on U.S. EPA's MSGP and effluent limits are based on the steam electric point source category of U.S. EPA's MSGP.

Additional controls based on sampling results:
Sampling data is being used to evaluate BMPs. Additional follow up sampling is not required based on sampling results.

<u>Ohio</u>
Sampling frequency:
Permit holders within certain industrial sectors are required to sample annually. The permits of other industrial sectors do not include monitoring requirements. The storm event that requires sampling is a storm with at least 0.1 inches of precipitation that occurs at least 72 hours after the preceding measurable storm.[130] Sampling results are not required to be submitted, but are self-retained by the permit holder.

Program oversight:
OH EPA uses state staff inspection to oversee the industrial stormwater program.

Different seasonal sampling requirements: None.

Sample collection:
Grab or flow weighted composite samples are required, within the first flush up to 30 minutes (1 hour, if first 30 minutes is impractical) from the beginning of the storm event.

Pollutants monitored:
OH EPA's general industrial permit contains sampling requirements for several different pollutants, but does not contain benchmarks. Pollutants for which monitoring is required vary by industrial sector and a complete list can be found on page 20 of OH EPA's 2006 Industrial Stormwater General Permit (reference 130).

Effluent limitations are only applied to industrial sectors that generate coal pile runoff. For a facility with coal pile runoff, effluent limitations are: pH 6.0-9.0 SU, TSS 50.0 mg/L daily maximum.

Basis of limits:
OH EPA's current industrial general permit sampling requirements are patterned on U.S. EPA's original industrial general permit.

Additional controls based on sampling results:
OH EPA requires facilities to collect stormwater sampling data to allow facilities to assess their SWPPP. Follow up sampling is not required based on sampling results.

<u>Oregon</u>
Sampling frequency:
Permit holders are required to collect samples four times a year, twice between July 1st and December 31st and twice between January 1st and June 30th, except floating solids (1200-Z, 1200-COLS), turbidity (1200-A) and oil & grease sheen (benchmark: no visible sheen), which must be visually monitored once a month. Each collection must be at least 14 days apart. The storm event that requires sampling is not described in any of the permits, nor is the portion of the storm event to be sampled. Sampling results must be submitted to OR DEQ annually on paper, using OR DEQ approved discharge monitoring report forms.

Program oversight:
OR DEQ uses state staff to inspect industrial stormwater facilities, but municipalities sometimes collect stormwater samples from industrial facilities.[131]

Different seasonal sampling requirements: None.

Sample collection:
For most parameters, either grab or composite (time or flow-weighted) sampling is allowed. When sampling for pH, oil & grease, and *E. coli*, permit holders must use grab. OR DEQ requires the samples to be analyzed according to the methods described in 40 CFR §136.

Pollutants monitored:
Benchmarks: See Table 1-1 below.

Table 1-1. Oregon Industrial Stormwater Discharge Benchmarks (in mg/L, except E. coli in counts/100 mL)

	pH	TSS	Settleable solids	Total phosphorus	Total oil & grease	*E. coli*	BOD_5	Total copper	Total lead	Total zinc
1200-A	5.5-9	130	0.2	none	10	406	none	none	none	none
1200-COLS	5.5-9	50	none	0.16	10	406	33	.036	.06	.24
1200-Z	5.5-8.5	130	none	none	10	none	none	.1	.4	.6

For 1200-A permit holders discharging to water body listed on the 303(d) list for turbidity, there is also a 160 nephelometric turbidity unit (NTU) benchmark for turbidity.

Effluent limitations:
The 1200-A permit does not contain numeric effluent limitations. See Table 1-2Table 1-2: Oregon 1200-Z and 1200-COLS Stormwater Discharge Effluent Limitations below for effluent limitations of the 1200-Z and 1200-COLS permits.

Table 1-2: Oregon 1200-Z and 1200-COLS Stormwater Discharge Effluent Limitations

CFR Industry Category	Parameter	Limitation
Cement manufacturing facilities for runoff from material storage piles (40 CFR §411)	pH TSS	6.0 - 9.0 SU 50 mg/L
Steam powered electric power generation facilities with coal handling and storage facilities (40 CFR §423)	TSS	50 mg/L, daily maximum
Manufacturing of asphalt paving and roofing emulsions (40 CFR §443)	Oil & Grease pH	15 mg/L, daily maximum 10 mg/L, 30 daily average 6.0-9.0 SU

Basis of limits:
Most benchmarks are based on acute water quality standards with a dilution rate. Effluent limits are based on federal effluent limitation guidelines. [132]

Additional controls based on sampling results:
Industrial stormwater sampling data is used to evaluate BMP performance and determine how many facilities are meeting benchmarks. There is no follow up sampling based on sampling results.[133]

The sampling requirements for a facility may be waived for the remainder of the permit term if at least four consecutive sampling results meet the benchmarks specified in each permit. If benchmarks are exceeded for any of OR DEQ's permits, the facility must review its Stormwater Pollution Control Plan and submit an Action Plan within 30 days of receiving the sampling results. This Action Plan contains the results of the review, corrective actions to be taken, and a schedule for implementing those actions and/or controls.[134,135, 136]

<u>Pennsylvania</u>*

Sampling frequency:

PA DEP requires industrial stormwater permit holders to sample stormwater discharges semi-annually.[137]

Sample collection:

Grab samples are required during the first flush.[138]

Pollutants monitored:

PA DEP requires different industrial categories to analyze stormwater discharges for different pollutants. The monitoring requirements are very similar to those of Iowa. The only specified numeric effluent limit of 15 mg/L average total recoverable petroleum hydrocarbons applies to petroleum marketing terminals only. PA DEP also recommends specific non-structural BMPs, which vary by industrial category.[139]

<u>Rhode Island</u>

Sampling frequency:

RI DEM requires most industrial sectors to collect samples, but the sampling frequency varies by industrial sector. Depending on both the sector and the parameter, either quarterly or annual sampling is required.

Sample collection:

Grab samples are required during the first flush.[140]

Pollutants monitored:

Benchmarks and effluent limitations are identical to U.S. EPA's 2008 MSGP. See page 1-10.

Industrial sub-sectors and their benchmark parameters[141]:

Sector A:	*General sawmills and planning mills* - COD, TSS, zinc
	Wood preserving facilities - arsenic, copper
	Log storage and handling - TSS
	Hardwood dimension and flooring mills - COD, TSS
Sector B:	*Paperboard mills* - COD.
Sector C:	*Industrial inorganic chemicals* - aluminum, iron, nitrate and nitrite as nitrogen
	Plastics, synthetic resins - zinc
	Soaps, detergents, cosmetics, perfumes - nitrate and nitrite as nitrogen, zinc
	Agricultural chemicals - nitrate and nitrite as nitrogen, lead, iron, zinc, phosphorus
Sector D:	*Asphalt paving and roofing materials* - TSS
Sector E:	*Clay products* - aluminum
	Concretep products - TSS, iron
Sector F:	*Steel works, blast furnaces, and rolling & finishing mills* - aluminum, zinc
	iron and steel foundries - aluminum, TSS, copper, iron, zinc
	Non-ferrous rolling and drawing - copper, zinc
	Non-ferrous foundries (castings) - copper, zinc
Sector G:	*copper ore mining and dressing* - COD, TSS, nitrate and nitrite as nitrogen
Sector H:	*Coal mines and coal-mining related facilities* - TSS, aluminum, iron
Sector J:	*Dimension stone, crushed stone, and non-metallic minerals* (except fuels) - TSS
	Sand and gravel mining - nitrate and nitrite as nitrogen, TSS

Sector K: *Hazardous waste treatment storage or disposal* - ammonia, magnesium, COD, arsenic, cadmium, cyanide, lead, mercury, selenium, silver
Sector L: *Landfills, land application sites, and open dumps* - iron, TSS
Sector M: *Automobile salvage yards* - TSS, aluminum, iron, lead
Sector N: *Scrap recycling &waste recycling facilities* - copper, aluminum, iron, lead, zinc, TSS, COD
Sector O: *Steam electric generating facilities* - iron
Sector Q: *Water transportation facilities* - aluminum, iron, lead, zinc
Sector S: *Airports with deicing activities* - BOD, COD, ammonia, pH
Sector U: *Grain mill products* - TSS
Fats and oils - BOD, COD, nitrate and nitrite as nitrogen, TSS
Sector Y: *Rubber products* - zinc
Sector AA: *Fabricated metal products except coating* - iron, aluminum, zinc, nitrate and nitrite as nitrogen
Fabricated metal coating and engraving - zinc, nitrate and nitrite as nitrogen

South Carolina*
Sampling frequency:
SC DHEC requires certain industrial sectors to sample their stormwater discharges. Semi-annual sampling is required for Section 313 of the Emergency Planning & Community Right to Know Act (EPCRA) Title III facilities, primary metal industries, land disposal units/incinerators/boilers and industrial furnaces (BIF), wood treatment, coal pile runoff, battery reclaimers. Annual sampling is required for the following facility types: airports, coal-fired steam electric facilities, animal handling/meat packing.[142]

Sample collection:
For each parameter, both a grab sample during the first flush and either a flow or a time weighted composite sample are required.

Pollutants monitored:
The following is a list of industries and the pollutants for which sampling is required, according to SC DHEC's 2006 industrial stormwater permit (reference 142142).

- *EPCRA Title III Section 313*: oil and grease, BOD_5, COD, TSS, TKN, total phosphorus, pH, acute whole effluent toxicity with *Ceriodaphnia dubia*, and any Section 313 water priority chemical for which the facility is subject to reporting requirements under section 313 of EPCRA
- *Primary metal industries*: oil and grease, BOD_5, COD, TSS, pH, acute whole effluent toxicity with *Ceriodaphnia dubia*, total lead, total cadmium, total copper, total arsenic, total chromium, and any pollutant limited in an effluent guideline to which the facility is subject
- *Land disposal units/incinerators/boilers and industrial furnaces*: TKN; oil and grease; COD; TOC; pH; TDS; ammonia; total and dissolved magnesium; nitrate and nitrite as nitrogen; total recoverable arsenic, barium, cadmium, chromium, cyanide, lead, selenium, silver; total mercury; acute whole effluent toxicity with *Ceriodaphnia dubia*
- *Wood treatment*: oil and grease, COD, TSS, pH
- *Coal pile runoff*: oil and grease; pH; TSS; total recoverable copper, nickel, zinc
- *Battery reclaimers*: oil and grease, COD, TSS, pH, total recoverable copper, total recoverable lead, and acute whole effluent toxicity with *Ceriodaphnia dubia*

- *Airports:* oil and grease, BOD_5, COD, TSS, pH, and the primary ingredient used in the deicing materials used at the site (e.g., ethylene glycol, urea, etc.)
- *Coal-fired steam electric facilities*: oil and grease, pH, TSS, total recoverable copper, total recoverable nickel, total recoverable zinc
- *Animal handling/meat packing*: BOD_5, COD, TSS, pH, TKN, total phosphorus, fecal coliform

South Dakota*
The following information is from SD DENR's MSGP, with a stated expiration date of November 14, 2008.

Sampling frequency:
SD DENR requires only facilities with coal pile runoff to sample semi-annually.[143] All other facilities are not required to sample stormwater runoff on a regular basis; the Secretary of the Department may require sampling on a case-by-case basis.

Pollutants monitored:
Any facility with coal pile runoff associated storm water is required to sample for the following pollutants: oil and grease, pH, TSS, total recoverable copper, total recoverable nickel, total recoverable zinc. The following effluent limits exist for storm water associated with coal pile runoff: 50 mg/L TSS, 6.0-9.0 SU pH.

Tennessee*
Sampling frequency:
For those sectors required to sample, annual collection for benchmarks and numeric effluent limitations is required.[144]

Sample collection:
Grab samples are required during the first flush.[145]

Pollutants monitored:
Benchmarks and effluent limitations vary by industrial sector. See reference 144.

Texas
Sampling frequency:
TCEQ's survey response indicates that sampling is not required, but the MSGP issued in August 2006 (valid until August 2011) states that annual sampling for daily maximum numeric effluent limits is required for all sectors of industry that possess or use the following hazardous metals: arsenic (0.3 mg/L), barium (4.0 mg/L), cadmium (0.2 mg/L), chromium (5.0 mg/L), copper (2.0 mg/L), lead (1.5 mg/L), manganese (3.0 mg/L), mercury (0.01 mg/L), nickel (3.0 mg/L), selenium (0.2 mg/L), silver (0.2 mg/L), zinc (6.0 mg/L).[146] A facility must certify or prove with analytical samples that its discharge does not contain concentrations of the above metals that are greater than the minimum analytical level specified in the permit.[147] According to TCEQ's 2006 MSGP, sampling for daily average and daily composite effluent limitations is not required of any facility.[148]

Program oversight:
TCEQ staff oversee the industrial stormwater permit program.

Sample collection:
TCEQ's 2006 MSGP requires grab sample collection.

Pollutants monitored:
Benchmark concentrations vary by sector and can be found on Pages 53 to 95 of TCEQ's 2006 MSGP (reference 51). See "sampling frequency" above for effluent limitations.

Utah

Sampling frequency:
UT DEQ requires annual sampling for effluent limits of industrial stormwater that consists of coal pile runoff.[149] Other industrial sectors listed below are required to sample quarterly during the second and fourth year of the permit term.[150]

Sample collection:
Grab samples are required during the first flush.[151]

Pollutants monitored:
Benchmarks:

Sector A:	*General sawmills & planing mills* - 120 mg/L COD, 100 mg/L TSS, 0.117 mg/L total recoverable zinc
	Wood preserving facilities - 0.16854 mg/L total recoverable arsenic, 0.0636 mg/L total recoverable copper
	Log storage and handling - 100 mg/L TSS
	Wood products facilities not elsewhere classified - 120 mg/L COD, 100 mg/L TSS
Sector B:	*All paper product facilities* - 120 mg/L COD
Sector C:	*Agricultural chemicals* - 0.68 mg/L nitrate and nitrite as nitrogen, 0.0816 total recoverable lead, 1.0 mg/L total recoverable iron, 0.117 mg/L total recoverable zinc, 2.0 mg/L phosphorus
	Industrial inorganic chemicals - 0.75 mg/L total recoverable aluminum, 1.0 mg/L total recoverable iron, 0.68 mg/L nitrate and nitrite as nitrogen
	Soaps & cosmetics - 0.68 mg/L nitrate and nitrite as nitrogen, 0.117 mg/L total recoverable zinc
	Plastics, synthetics & resins - 0.117 total recoverable zinc
Sector D:	*Asphalt paving & roofing* - 100 mg/L TSS
Sector E:	*Clay products* - 0.75 total recoverable aluminum
	Concrete & gypsum products - 100 mg/L TSS, 1.0 mg/L total recoverable iron, 6.5-9.0 pH
Sector F:	*Steel works & blast furnaces* - 0.75 mg/L total recoverable aluminum, 0.117 mg/L total recoverable zinc
	iron & steel foundries - 0.75 mg/L total recoverable aluminum, 0.117 mg/L total recoverable zinc, 100 mg/L TSS, 0.0636 mg/L total recoverable copper, 1.0 mg/L total recoverable iron
	Non-ferrous metals - 0.0636 mg/L total recoverable copper, 0.117 mg/L total recoverable zinc
Sector G:	*All metal mining facilities* - 120 mg/L COD, 100 mg/L TSS, 0.68 mg/L nitrate and nitrite as nitrogen
Sector H:	*Coal mining facilities* - 0.75 mg/L total recoverable aluminum, 1.0 mg/L total recoverable iron, 100 mg/L TSS
Sector J:	*Sand & gravel mine dewatering* - 100 mg/L TSS, 0.68 mg/L nitrate and nitrite as nitrogen

Sector K: *Hazardous waste* - see sector specific requirements at http://www.waterquality.utah.gov/UPDES/k-haztsd.pdf
Sector L: *Landfills* - 100 mg/L TSS, 1.0 mg/L total recoverable iron
Sector M: *Automobile salvage yards* - 0.75 mg/L total recoverable aluminum, 100 mg/L TSS, 1.0 mg/L total recoverable iron, 0.0816 total recoverable lead
Sector N: *Scrap & waste recycling* - 0.75 mg/L total recoverable aluminum, 0.0636 mg/L total recoverable copper, 120 mg/L COD, 100 mg/L TSS, 1.0 mg/L total recoverable iron, 0.0816 total recoverable lead, 0.117 mg/L total recoverable zinc
Sector Q: *Water transportation* - 0.75 mg/L total recoverable aluminum, 1.0 mg/L total recoverable iron, 0.0816 total recoverable lead, 0.117 mg/L total recoverable zinc
Sector S: *Airport deicing operations* - 30 mg/L BOD_5
Sector U: *Grain mill products* - 100 mg/L TSS
Fats & oils products - 100 mg/L TSS, 30 mg/L BOD_5, 0.68 mg/L nitrate and nitrite as nitrogen, 120 mg/L COD
Sector Y: *Rubber product manufacturing* - 0.117 mg/L total recoverable zinc
Sector AA: *Fabricated metal products* - 1.0 mg/L total recoverable iron, 0.117 mg/L total recoverable zinc, 0.68 mg/L nitrate and nitrite as nitrogen, 0.75 mg/L total recoverable aluminum

Effluent limitations:

- Coal pile runoff : 50 mg/L TSS, 6.0 to 9.0 pH
- Wet decking discharges at log storage and handling areas: 6.0 to 9.0 pH
- Phosphate fertilizer manufacturing runoff: 105.0 mg/L daily maximum, 35.0 mg/L 30 day average total phosphorus; 75.0 mg/L daily maximum, 25.0 mg/L 30 day average fluoride
- Direct discharges from asphalt paving & roofing emulsions production: 23.0 mg/L daily maximum, 15.0 mg/L 30 day average TSS; 15.0 mg/L daily maximum, 10 mg/L 30 day average oil & grease; 6.0 to 9.0 pH
- Sand & gravel mine dewatering: 6.0 to 9.0 pH; 25.0 mg/L 30 day average, 35.0 mg/L daily maximum TSS
- Hazardous waste treatment, storage, or disposal: see sector specific requirements at http://www.waterquality.utah.gov/UPDES/k-haztsd.pdf.
- Landfills- 140 mg/L daily maximum, 37 mg/L monthly average BOD_5; 88 mg/L daily maximum, 27 mg/L monthly average TSS; 10 mg/L daily maximum, 4.9 mg/L monthly average ammonia; 0.033 mg/L daily maximum, 0.016 mg/L monthly average alpha terpineol; 0.12 mg/L daily maximum, 0.071 mg/L monthly average benzoic acid; 0.025 mg/L daily maximum, 0.015 mg/L monthly average p-Cresol; 0.026 mg/L daily maximum, 0.015 mg/L monthly average phenol; 0.20 mg/L daily maximum, 0.11 mg/L monthly average total zinc; 6.0-9.0 pH
- Steam electric power generating facilities: 1.0 mg/L total recoverable iron
- Airport deicing operations; 120 mg/L COD, 19 mg/L ammonia, 6 to 9 pH

Vermont

Sampling frequency:

VT DEC requires permit holders to sample quarterly for benchmarks for the first year of the permit term. Permit holders must submit the sampling data annually on paper. A measurable storm event has at least 0.1 inches of precipitation and occurs at least 72 hours after the preceding storm event.

Program oversight:
VT DEC uses state staff to inspect permitted industrial stormwater discharges.

Different seasonal sampling requirements:
None

Sample collection:
Grab samples are required during the first flush.

Pollutants monitored:
Sector specific requirements exist; both benchmarks and effluent limitations are identical to those in U.S. EPA's 2008 MSGP. See page 1-10.

Basis of limits:
U.S. EPA's MSGP.

Additional controls based on sampling results:
Sampling data is not being used to require additional controls, but follow-up sampling is required based on sampling results.

<u>Virginia</u>
Sampling frequency:
Sampling requirements vary by sector, but sectors required to monitor must do so annually for benchmarks and effluent limits, and quarterly for visual inspection.[152] Sampling results are required to be submitted annually on paper. The storm event that requires sampling is any storm that results in discharge from a facility that occurs at least 72 hours after the preceding measurable storm.[153]

Program oversight:
VA DEQ uses state staff to oversee the industrial stormwater permit program.

Different seasonal sampling requirements: None.

Sample collection:
Permit holder is required to obtain grab samples during the first flush.

Pollutants monitored:
See Reference 152 for sector definitions.

Benchmarks, by sector (in mg/L, unless otherwise specified):
- pH - 6 to 9 SU: E, G, S
- COD - 120: S
- TSS - 100: A, D, E, F, G, H, K, L, M, N, P, R, S, U, AD
- Total arsenic - 0.05: A, G, K
- Total zinc - 0.12: C, F, G, N, Q, Y, AA
- Total copper - 0.018: A, F, G, N

- Total lead - 0.12: G, K, M, N
- Total iron - 1 mg/L: C, E, F, G, H, L, M, N, O, Q, AA
- Total chromium - 0.016: A, N
- Total aluminum - 0.75: C, E, F, H, M, N, Q, AA
- Nitrate and nitrite as nitrogen - 2.2: C, U
- Total phosphorus - 2: C
- BOD_5 - 30: B, S, U
- TKN - 1.5: K, S, U, Z
- Total petroleum hydrocarbons (TPH) - 15: P
- Sectors G, K, N - same as U.S. EPA's 2008 MSGP.

Effluent limitations, by sector (in mg/L, unless otherwise specified):
- pH - 6.0 to 9.0 S.U.: A, D, E, and any facility with coal pile runoff
- TSS - 50.0 mg/L: D, E and any facility with coal pile runoff
- Total phosphorus - 105.0 mg/L daily max: C
- Fluoride - 75.0 mg/L daily max: C
- No debris- Sector A facilities with wet deck storage

Basis of limits:
All effluent limits are identical to those of EPA's 2008 MSGP and benchmarks are based on EPA's 1995 MSGP, with variations made by VA DEQ.

Additional controls based on sampling results:
Industrial stormwater sampling data is used to establish permit controls and follow up sampling is required based on sampling results.

<u>Washington</u>
Sampling frequency:
Industrial stormwater permit holders are required to sample quarterly for benchmarks and submit the sampling data on paper each quarter. Specific industrial sectors are also subject to effluent limits, for which quarterly sampling is also required. The recommended storm event to be sampled is at least 0.1 inches of precipitation that is preceded by at least 24 hours of no greater than trace precipitation.[154]

Program oversight:
WA DOE staff oversee the industrial stormwater permit program.

Different seasonal sampling requirements: No response.

Sample collection & analysis method:
Permit holder may take grab, time weighted composite, or flow weighted composite samples, but samples must be collected within the first hour after the storm begins. WA DOE requires the samples to be analyzed according to the methods described in 40 CFR §136.[155]

Pollutants monitored:
All facilities have the following benchmarks: pH 6-9 SU, total zinc 117 µg/L, turbidity 25 NTU, oil & grease 15 mg/L. If a facility exceeds the total zinc benchmark two consecutive times, the permittee must sample for copper and lead in future sampling events. Additional benchmarks exist for specific industrial sectors, as specified in Section S4.E of the Industrial Stormwater General Permit. See Reference 154.

The following industrial sectors are subject to the numeric effluent limitations specified in 40 CFR 445: hazardous waste landfills, non-hazardous waste landfills, coal piles.

Basis of limits: No response.

Additional controls based on sampling results: No response.

<u>West Virginia</u>
Sampling frequency & storm event requiring sampling:
Permit holder is required to sample for benchmarks once every 6 months, with paper submittal of data (on a discharge monitoring report) required annually. The storm event that requires sampling is a storm with at least 0.1 inches of precipitation that occurs at least 72 hours after the preceding measurable storm.[156]

Program oversight:
WV DEP uses state staff to oversee industrial stormwater discharges.

Different seasonal sampling requirements: None

Sample collection:
The permit holder is required to collect grab samples during the first flush (within the first 30 minutes of stormwater discharge).

Pollutants monitored:
The following pollutants are required to be monitored: pH, COD, TSS, ammonia as nitrogen, nitrate and nitrite as nitrogen, total phosphorus, BOD_5, total recoverable zinc, total recoverable lead, total recoverable iron, total recoverable zinc, total recoverable aluminum, surfactants, oil and grease, total recoverable copper, ammonia, chloride, cyanide.

Benchmarks:
See reference 57 for WV DEP's sector definitions.

- pH - 6-9: Sectors E, H, V, W
- COD - 120 mg/L: Sectors A, B, D, F, G, H, I, J, L, P, R, W
- TSS - 100 mg/L: Sectors A, D, E, F, G, H, I, J, L, P, R, S, T, U, V
- Ammonia as nitrogen - 4 mg/L: Sector H
- Nitrate and nitrite as nitrogen - 0.68 mg/L: Sector C, J, O, V
- Total phosphorus - 2 mg/L: Sector C
- BOD_5 - 30 mg/L: Sector H, J

Effluent limitations:
- Fluoride: 75 mg/L max daily, 25 mg/L average monthly (for SIC 2874).

Basis of limits:
Benchmarks are pollutant-specific concentrations, and discharges that meet these benchmarks will be in attainment of state water quality standards.

Additional controls based on sampling results:
Industrial stormwater sampling data is being used to see if a facility's SWPPP is effective. No follow-up sampling is required based on sampling results.

Wisconsin*
Sampling frequency:
WI DNR requires Tier 1 facilities (heavy industry), as well as auto dismantling & scrap recycling facilities to conduct annual chemical sampling.[157]

Sample collection:
Composite samples are required during the first flush, except for those parameters which require grab samples.[158]

Pollutants monitored:
WI DNR does not require sampling for specific pollutants, but instead requires Tier 1 permit holders to develop a chemical stormwater sampling plan as part of the SWPPP. The exception to this rule is that auto dismantling & scrap recycling facilities are required to sample for naphthalene; TSS; conductivity; COD; total recoverable copper, lead, zinc.[159] None of the aforementioned permits include specific benchmarks or effluent limits.

Wyoming*
Sampling frequency:
WY DEQ requires industrial stormwater discharges to be sampled annually.[160]

Different seasonal sampling requirements:
In addition to discharges due to storm events greater than 0.1 inches that occur at least 72 hours after the previous event, industrial facilities are permitted to collect samples of runoff due to snowmelt.[161]

Sample collection:
Grab samples are required during the first flush.[162]

Pollutants monitored:
Benchmarks:
- General sawmills & planing mills: 120 mg/L COD, 100 mg/L TSS, 0.117 mg/L total recoverable zinc
- Wood preservation with chlorophenol: 120 mg/L COD, 100 mg/L TSS, 0.117 mg/L total recoverable zinc, 0.16854 mg/L total recoverable arsenic, 0.0636 mg/L total recoverable copper
- Log storage & handling: 100 mg/L TSS
- Other wood products facilities: 120 mg/L COD, 100 mg/L TSS
- Clay products: 0.75 mg/L total recoverable aluminum, 100 mg/L TSS
- Concrete & gypsum products: 1.0 mg/L total recoverable iron, 100 mg/L TSS

- Miscellaneous non-metallic mineral products: 100 mg/L TSS
- Mining/metallic mineral ores: 0.68 mg/L nitrate and nitrite as nitrogen, 120 mg/L COD, 100 mg/L TSS
- Scrap & waste recycling: 120 mg/L COD, 100 mg/L TSS, 0.117 mg/L total recoverable zinc, 0.0636 mg/L total recoverable copper, 1.0 mg/L total recoverable iron, 0.0816 mg/L total recoverable lead, 0.75 mg/L total recoverable aluminum
- Automobile salvage yards: 100 mg/L TSS, 1.0 mg/L total recoverable iron, 0.0816 mg/L total recoverable lead, 0.75 mg/L total recoverable aluminum

Effluent limitations:

- Coal pile runoff: 50 mg/L TSS; 6.5-9.0 pH
- Paving & roofing (asphalt emulsion manufacturers only): 15 mg/L 30 day average, 23 mg/L daily maximum TSS; 10 mg/L 30 day average, 10 mg/L daily maximum oil & grease; 6.5-9.0 pH
- Cement manufacturing: 50 mg/L TSS; 6.5-9.0 pH

** Indicates information obtained solely from the Internet.*

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[16] Ibid.

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Chapter 2 : Municipal Stormwater Permit Requirements
2.1 Introduction & Trends

To benchmark wet weather regulations related to municipal stormwater permitting programs, U.S. Environmental Protection Agency (EPA) Headquarters (HQ) and Regional personnel, as well as State municipal stormwater personnel were surveyed on their municipal separate storm sewer (MS4) permitting programs including sampling requirements and the use of total maximum daily load (TMDL) controls as they apply to MS4 permits.

The following 28 agencies responded to one or more questions in the Municipal Stormwater Permit Requirements Survey: U.S. EPA Region 9, AL, AK, CA, CO, CT, FL, IL, IN, KY, LA, MI, MN, MS, MO, MT, NV, NC, ND, OH, OK, OR, RI, TX, UT, VA, WA, WV. In all cases, the survey responses were supplemented with internet based research. Information for agencies not listed above is based solely on internet research and is indicated with an asterisk. The 4 states that do not have National Pollutant Discharge Elimination System (NPDES) primacy are Idaho, Massachusetts, New Hampshire, and New Mexico; the District of Columbia also does not have NPDES primacy. Alaska has been approved for primacy and the transfer of the U.S. EPA issued permits to the Alaska Department of Environmental Conservation (AK DEC) is in progress.

82% of the respondents (22 agencies) require Phase I MS4s to sample their discharges. Out of the 27 participants, none have established effluent limits for municipal stormwater and none generally require Phase II MS4s to sample discharges. Only California, Colorado, and Florida, or 12% of the respondents hire contractors to inspect permitted MS4s. 32% of respondents (6 out of 19 agencies) have sampling requirements that vary depending on the season. 54% of respondents (13 out of 24 agencies) require additional sampling for MS4s that discharge into a water body with an approved TMDL.

2.2 Monitoring Requirements

<u>U.S. EPA HQ</u>*
U.S. EPA requires MS4 permits to implement six minimum control measures to reduce the pollutants discharged into receiving waters to the maximum extent practicable. The six minimum control measures are: public education and outreach, public participation and involvement, illicit discharge detection and elimination (IDDE), construction site control measures, post construction runoff control, and pollution prevention/good housekeeping. U.S. EPA regulations require MS4s to estimate their annual pollutant loadings and mean event concentrations for specified pollutants in their stormwater discharges, and recommend that municipalities develop a stormwater monitoring program.[1] The pollutants requiring load estimates and mean concentrations include: 5 day biochemical oxygen demand (BOD_5); total suspended solids (TSS); chemical oxygen demand (COD); total nitrogen, phosphorus; total ammonia and organic nitrogen; dissolved phosphorus, cadmium, copper, lead, zinc.[2]

<u>U.S. EPA Region 3</u>*
The District of Columbia (DC) does not have NPDES primacy in Region 3; all states in this region have been delegated primacy. See the District of Columbia on page 2-5.

<u>Alabama</u>

Sampling frequency & sampling results submittal:
Alabama Department of Environmental Management (AL DEM) does require MS4s to collect samples.[3]

Sample collection: No response.

Pollutants monitored: varies by monitoring plan.[4]

Basis of limits: No response.

State inspection: No response.

Additional controls/sampling based on sampling results: No response.

Different seasonal sampling requirements: No response.

Unregulated discharges to surface waters within MS4s: No response.

Monitoring of unregulated communities: No response.

<u>Alaska</u>

Sampling frequency & sampling results submittal:
AK DEC requires MS4s to conduct quarterly sampling, with annual paper submittal.[5]

Sample collection:
Grab samples are required during the first flush.

Pollutants monitored: pH, BOD_5, turbidity, dissolved oxygen, temperature, flow, TSS. No benchmarks or numeric effluent limits exist.

State inspection:
AK DEC does not hire contractors to inspect MS4s.

Additional controls/sampling based on sampling results:
No additional sampling or controls are required based on sampling results.

Different seasonal sampling requirements: None.

Unregulated discharges to surface waters within MS4s:
Unregulated discharges to surface waters within the boundaries of MS4s are not addressed in AK DEC's municipal stormwater program.

Monitoring of unregulated communities:
Municipal stormwater not automatically regulated under the Phase I or Phase II federal regulations is not addressed in Alaska's municipal stormwater program.

California State Water Resources Control Board
Sampling frequency & sampling results submittal:
Sampling is required in all MS4 permits, but the frequency varies throughout the nine different regions, as each Regional Control Board sets the requirements for its municipalities. Annual paper and electronic submittal are used throughout the regions, but the state prefers electronic submittal of data.[6]

Sample collection:
Sample collection method varies throughout the regions; however, most require time weighted composite during the first flush and compositing up to the first 8 hours of the storm to determine event mean concentrations.

Pollutants monitored:
Most permits require sampling for pH, oil & grease, conductivity, total pphosphorus, TSS, total Kjeldahl nitrogen (TKN), nitrate and nitrite, fecal coliform, *E. coli*, *Enterococcus*, chloropyrifos, and metals. There are no statewide standard benchmarks, but municipal action levels are included in some permits.

Basis of limits:
Municipal action levels are based on water quality objectives for each specific water body.

State inspection:
California uses contractor inspection with state oversight.

Additional controls/sampling based on sampling results:
Additional sampling is not required based on sampling results, but additional controls and best management practices (BMPs) may be required based on sampling results. Sampling data from each municipality is used by the Regional Water Boards to determine compliance with the maximum extent practicable standard established in the Clean Water Act.

Different seasonal sampling requirements:
Some Regional Water Boards (typically June to September) require dry weather sampling in addition to the wet weather sampling. See below for San Diego County's sampling frequency.

Unregulated discharges to surface waters within MS4s:
Unregulated discharges are addressed through local municipalities. Local municipalities are required to draft and adopt ordinances to ensure that the local agency has proper authority to enforce the provisions of the permit and manage these unregulated discharges.

Monitoring of unregulated communities:
Unregulated communities are defined by population and are not addressed in California's municipal stormwater program.

San Diego Regional Water Quality Control Board*
Sampling frequency & sampling results submittal:
Permit holders are required to sample twice during wet weather stormwater flows and twice during dry weather stormwater flows. [7]

Sample collection:
Flow weighted composites (during first 3 hours of flow) or grab samples are required.[8]

Pollutants monitored:
Mass loadings required, with flow data obtained from nearby United States Geologic Survey (USGS) gauging stations or estimated according to U.S. EPA Storm Water Sampling Guidance Document (EPA-833-B-92-001), Section 3.2.1. Temperature, pH, specific conductance, biochemical oxygen demand (BOD), oil and grease, total coliform, fecal coliform, *Enterococcus*, TSS, total dissolved solids (TDS), turbidity, total hardness, pH, dissolved phosphorus, nitrite, nitrate, TKN, ammonia, COD, methylene blue active substances (MBAS), total organic carbon (TOC), total dissolved carbon (TDC), diazinon, chlorpyrifos, malathion, pyrethroids. Total and dissolved metals: antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium, zinc. Discharges to Chollas Creek must also be sampled for polychlorinated biphenyls (PCBs), chlordane, and polycyclic aromatic hydrocarbons (PAHs). Bioassessments and toxicity tests are also required, at varying frequencies for each discharge point or stormwater outfall.[9]

Basis of limits:
San Diego County's MS4 permit does not contain benchmarks or effluent limits. The pending draft permit for Orange County does contain action levels.[10]

Colorado
Sampling frequency:
Colorado Department of Public Health & Environment (CDPHE) requires Phase I MS4s to conduct sampling, according to a monitoring plan included in Phase I individual permits.[11] Sampling frequency and parameters vary by each monitoring plan and no benchmarks or effluent limits exist.

Unregulated discharges to surface waters within MS4s:
Unregulated stormwater discharges direct to surface waters are addressed through public education within the municipalities.

Monitoring of unregulated communities:
For communities not regulated under Phase I and Phase II regulations, CDPHE designates permit coverage based on various factors, including population growth and water quality impairment.

Connecticut

Sampling frequency & sampling results submittal:
Connecticut Department of Environmental Protection (CT DEP) requires permitted municipalities to sample their stormwater discharges annually, but allows the permit holder to utilize volunteers or another third party to collect samples.[12] Annual paper submittal of sampling results is required.

Sample collection:
Grab samples are required at 6 different stormwater outfalls, during the first 6 hours of the storm event.

Pollutants monitored:
No benchmarks or effluent limits exist, but sampling for the following parameters is required: pH, oil & grease, hardness, conductivity, COD, total phosphorus, TSS, turbidity, ammonia, TKN, nitrate and nitrite as nitrogen, *E. coli*, and rainfall pH.

State inspection:
CT DEP does not hire contractors to inspect MS4s.

Additional controls/sampling based on sampling results:
No follow-up sampling or additional controls are required; however, sampling results are used to build a municipal sampling database for statistical analysis.

Different seasonal sampling requirements:
None

Unregulated discharges to surface waters within MS4s:
CT DEP does not address unregulated discharges to surface waters within the boundaries of MS4s.

Monitoring of unregulated communities:
CT DEP has developed permits to cover discharges not otherwise regulated under Phase I or II, such as the commercial stormwater permit. CT DEP also requires industries not included in the Multi-Sector General Permit (MSGP) to obtain permit coverage, but does not yet have any MS4 permits for towns not otherwise covered under Phase I or II regulations.

District of Columbia*

Sampling frequency & sampling results submittal:
DC is required to collect samples from representative outfalls, internal sampling stations, and/or in-stream monitoring locations at least three times per year, with annual submittal of the results.[13]

Pollutants monitored:
With the exception of pollutants that have a waste load allocation (WLA) established in Anacostia River or Rock Creek TMDL reports, no effluent limits or benchmarks exist. The following pollutants require monitoring: pH, temperature, total ammonia as nitrogen, organic nitrogen, total nitrogen, volatile organic compounds (VOCs), acid extractable compounds, base/neutral extractable compounds, pesticides, PCBs, metals, cyanides, total phenols, hardness, oil & grease, fecal coliform, and fecal streptococcus.[14]

Sample collection:
Grab samples (within the first two hours of the storm) may be used for pH, temperature, cyanide, oil and grease, fecal coliform, fecal streptococcus, total phenols, residual chlorine, VOCs. Composite samples (either flow or time weighted), collected once per hour for at least three hours, are required for all other parameters.

Florida

Sampling frequency & results submittal:
Regulated Phase I MS4s are required to develop a monitoring plan to evaluate the implementation of their Stormwater Management Program; however, the plans vary in pollutants monitored and monitoring frequency. The majority of MS4s conduct ambient monitoring of 8 to 12 storm events per year. MS4s are required to submit sampling data annually on paper. Municipal stormwater sampling is conducted by both permit holders and volunteers. [15]

Sample collection:
Florida Department of Environmental Protection (FL DEP) requires permit holders to sample the first flush of a storm event (up to the first 30 minutes of discharge). A specific sample collection method is not required, but most Phase I MS4s collect grab samples.

Pollutants monitored:
Because each permit holder develops an individual monitoring plan, there are no specific pollutants that require consistent monitoring.

State inspection:
FL DEP uses contractor inspections, with state oversight, to oversee municipal stormwater discharges.

Additional controls/sampling based on sampling results:
No follow-up sampling is required based on sampling results; however, if sampling results indicate a problem with a specific parameter, the MS4 must implement additional controls, called corrective action(s). Possible corrective action(s) include structural BMPs, retrofits, and public education.[16]

Different seasonal sampling requirements:
None

Unregulated discharges to surface waters within MS4s:
FL DEP does not address unregulated stormwater discharges within the boundaries of an MS4.

Monitoring of unregulated communities:
FL DEP does not define unregulated communities, but maintains the authority to designate which MS4s are regulated. Designation requirements include: "discharges deemed to be a significant contributor of pollutants to surface water where a TMDL has been adopted, areas with a population density of at least 1,000 people per square mile, a population of at least 10,000, and discharge to a Class I (Drinking Water Source) or Class II (Shellfish Harvesting) water bodies or physically interconnected to another regulated MS4 public petition."[17]

Illinois

Sampling frequency & sampling results submittal:
Illinois Environmental Protection Agency (IL EPA) requires municipal stormwater permit holders to collect ambient water samples both upstream and downstream of MS4 discharges on an annual basis. MS4s are required to submit the sampling results annually.[18]

Sample collection: No response.

Pollutants monitored:
No municipal stormwater effluent limits have been established.

Additional controls/sampling based on sampling results: No response.

Different seasonal sampling requirements: None.

Unregulated discharges to surface waters within MS4s:
IL EPA does not address unregulated stormwater discharges within the boundaries of an MS4.

Monitoring of unregulated communities:
IL EPA does not regulate stormwater in municipalities that are not automatically regulated under the Phase I or Phase II federal regulations.

Indiana

Sampling frequency & sampling results submittal:
Indiana Department of Environmental Management (IDEM) does not generally require MS4s to sample their stormwater discharges.[19]

State inspection:
IDEM does not hire contractors to inspect MS4s.

Unregulated discharges to surface waters within MS4s:
For new development and re-development projects, unregulated direct discharges to surface waters are addressed by MS4s, through local ordinances.

Monitoring of unregulated communities:
IDEM does not currently regulate stormwater in municipalities not designated under U.S. EPA's Phase I and Phase II federal regulations, but the Department does have the authority to designate these municipalities based on significant impacts to water quality.

Kentucky

Sampling frequency & sampling results submittal:
Kentucky Department of Environmental Protection (KY DEP) requires Phase I MS4s to conduct quarterly sampling.[20] The current Phase II draft permit has sampling requirements only if the MS4 community has

an approved TMDL that specifies urban runoff related impairments. Sampling results must be submitted on paper in the community's annual report.

Sample collection:
Grab samples are required.

Pollutants monitored:
pH; oil & grease; hardness; BOD_5; COD; dissolved phosphorus; total phosphorus; TSS; ammonia; TKN; nitrate and nitrite as nitrogen; fecal coliform; *E. coli*; total recoverable lead, copper, cadmium, zinc; total phenols; TOC. No benchmarks or effluent limits exist.

State inspection:
KY DEP does not hire contractors to inspect MS4s.

Additional controls/sampling based on sampling results:
No additional sampling is required based on sampling results; however, if a TMDL is approved, the permit holder should evaluate the effectiveness of BMPs installed on site if monitoring shows no reduction in the pollutant concentration. MS4s use the sampling data to assess Storm Water Management Plan (SWMP) effectiveness.

Different seasonal sampling requirements:
Dry weather sampling requirements differ from wet weather requirements.

Unregulated discharges to surface waters within MS4s:
KY DEP does not address unregulated discharges to surface waters within the boundaries of MS4s.

Monitoring of unregulated communities:
KY DEP does not regulate storm water in municipalities not automatically regulated under the Phase I or Phase II federal regulations.

<u>Louisiana</u>
Sampling frequency & sampling results submittal:
Louisiana Department of Environmental Quality (LA DEQ) requires only Phase I MS4s to sample semi-annually at representative outfalls, with paper submittal annually.[21]

Sample collection:
Grab samples are required during the first flush.

Pollutants monitored:
Phase I MS4s are required to sample for the following pollutants: pH; oil & grease; hardness; BOD_5; COD; dissolved phosphorus; total phosphorus; TSS; ammonia; TKN; nitrate and nitrite; Fecal coliform; TDS; total cadmium, copper, mercury, nickel, lead, zinc; temperature; total PCBs; chlorides; chlorine. Benchmarks and effluent limits do not exist.

Additional controls/sampling based on sampling results:
LA DEQ does not require additional sampling or the installation of additional controls based on sampling results, but sampling data is used to determine whether BMPs and control measures are performing effectively.

Different seasonal sampling requirements:
None

Unregulated discharges to surface waters within MS4s:
LA DEQ does not address unregulated discharges to surface waters within the boundaries of MS4s.

Monitoring of unregulated communities:
LA DEQ does not address unregulated communities, but defines unregulated communities as, "smaller communities."

Michigan

Sampling frequency & results submittal:
Michigan Department of Environmental Quality (MI DEQ) requires 36 inch or greater MS4 outfalls to waters with *E. coli* or phosphorus TMDLs to be monitored once to collect a representative sample of a wet weather event. Dry weather screening for illicit discharges, as part of the illicit discharge elimination program (IDEP), is also required.[22] Sampling is conducted by the permit holder. Paper submittal of results is required once during the permit term for TMDL sampling. As part of IDEP, paper submittal of sampling results from each outfall is required once every five years.

Sample collection:
Representative samples are required to be collected. This is currently open to interpretation, as the term "representative sample" has not yet been defined. The State is working to prepare a definition or guidance for permittees. For IDEP, grab samples are required during dry weather flows.

Pollutants monitored:
During storm flows, sampling is required for pH, total phosphorus, *E. coli*. During dry weather flows, sampling is required for pH, ammonia, surfactants, and temperature. No benchmarks or effluent limits exist.

State inspection:
MI DEQ does not hire contractors to inspect MS4s.

Additional controls/sampling based on sampling results:
Sampling data is used to reduce daily loads or identify illicit discharges. Additional sampling and other follow up procedures may be required where illicit discharges are identified during dry weather screening. *E. coli* and total phosphorus sampling results require the development of actions to reduce the pollutant load to TMDL waters.

Different seasonal sampling requirements: None.

Unregulated discharges to surface waters within MS4s:
Unregulated discharges are not addressed.

Monitoring of unregulated communities:
An unregulated discharge of municipal stormwater may be regulated if the State designates them as a significant contributor.

<u>Minnesota</u>
Sampling frequency & results submittal:
Phase I MS4s are required to monitor monthly, or obtain 10 samples annually during the non-ice period (March to November).[23] In addition, "the permittee shall, to the extent feasible, develop and implement a cooperative monitoring, analysis and reporting effort between the permittee and all other adjacent MS4s, government agencies and watershed districts."[24] Samples must be collected from a stormwater discharge resulting from 0.1 inches or more of precipitation. Results must be electronically submitted annually. Phase II MS4s are not required to monitor their stormwater discharges.

Sample collection:
Permittees are required to obtain grab and flow weighted composite samples. During the non-ice period, continuous flow data-loggers are used to document continuous flows. The mass balance approach is also used to determine pollutant loads due to stormwater, with upstream and downstream samples taken annually and seasonally, including calculation of chloride loads due to road salt application during winter.

Pollutants monitored:
pH, hardness, BOD_5, dissolved phosphorus, total phosphorus, TSS, ammonia, ammonia and organic nitrogen, TKN, nitrate and nitrite, *E. coli*, TDS, total copper, chloride, monthly total flow, daily average flow, total lead precipitation, total volatile solids (TVS), total zinc.

Minnesota's municipal stormwater permits require monitoring for the above pollutants, but benchmarks or effluent limitations do not exist.

State inspection:
Minnesota Pollution Control Agency (MPCA) does not conduct sampling of permitted municipal stormwater discharges.

Additional controls/sampling based on sampling results:
No additional sampling or controls are required based on sampling results, but sampling data is being used for the following purposes: "(1) characterizing pollutant event mean concentrations; (2) estimating total annual and seasonal pollutant load to bodies of water; (3) estimating total annual volume to bodies of water; (4) estimating effectiveness of stormwater system management devices and practices; and (5) calibrating stormwater models. The data will also be used for anti-degradation and TMDL purposes."[25]

Different seasonal sampling requirements:
During periods when ice is likely to form (December to March), permit holders are required to collect winter thaw grab samples on 2 occasions. This is a new requirement.

Unregulated discharges to surface waters within MS4s:
Unregulated discharges are not addressed outside of IDDE minimum control measures, except under special conditions when unregulated discharges are known to occur.

Monitoring of unregulated communities:
MPCA defines unregulated communities as smaller communities not covered by U.S. EPA's Phase I or Phase II designations, and does not address unregulated communities in its municipal stormwater program.

<u>Mississippi</u>
Sampling frequency & results submittal:
Mississippi Department of Environmental Quality (MS DEQ) does not require MS4s to sample their discharges.[26]

State inspection:
MS DEQ does not hire contactors to inspect MS4s.

Unregulated discharges to surface waters within MS4s:
MS4s may choose to regulate industries or commercial establishments with large parking lots that discharge directly to surface waters.

Monitoring of unregulated communities:
MS4s not defined under Phase I federal regulations are addressed in MS DEQ's Phase II General Permit.

<u>Missouri</u>
Sampling frequency & sampling results submittal:
Missouri Department of Natural Resources (MO DNR) does not generally require MS4s to sample their discharges, but MS4s may be required to sample if discharging to surface waters for which TMDLs have been developed.[27]

State inspection:
MO DNR does not hire contactors to inspect MS4s.

Unregulated discharges to surface waters within MS4s:
There are three Phase I MS4s in Missouri, and they are required to complete an industrial inspection program and monitor the city-wide system for a broad assessment of discharges. Missouri's 149 Phase II MS4s are encouraged to develop an industrial inspection program.

Monitoring of unregulated communities:
MO DNR defines unregulated communities as having fewer than 1,000 people within the urbanized area or fewer than 10,000 outside the urbanized area. The agency does not address unregulated communities in its municipal stormwater program.

Montana

Sampling frequency & sampling results submittal:
Montana Department of Environmental Quality (MT DEQ) requires 7 cities to conduct sampling (at two locations in each city) and submit the results on paper semi-annually. While routine sampling is conducted by the permit holder, additional sampling may be conducted by other parties (federal, state, other municipalities), as needed.[28]

Sample collection:
Grab and composite (flow or time weighted) samples may be used. Sample collection must occur during the storm's first flush.

Pollutants monitored:
The following benchmarks exist:

- pH - 6-9 standard units (SU)
- Oil & grease - 10 mg/L
- COD - 80 mg/L
- Total phosphorus - 0.41 mg/L
- TSS - 125 mg/L
- Total nitrogen- 2.00 mg/L
- Total recoverable copper- 0.040 mg/L
- Total recoverable lead- 0.165 mg/L
- Total recoverable zinc- 0.210 mg/L
- Flow must also be monitored and reported semi-annually.

No effluent limits exist.

Basis of limits:
Most benchmarks are median concentrations from Nationwide Urban Runoff Program (NURP) information and oil & grease is compared to receiving surface water standards.

State inspection:
MT DEQ uses state staff to oversee the municipal stormwater permitting program.

Additional controls/sampling based on sampling results:
Additional follow up sampling may be required, if necessary. Sampling results are compared to benchmarks to assess pollutant sources and BMP effectiveness. Thus, MS4s may need to consider additional BMPs and/or control measures, depending on sampling results. As the data becomes available from Montana's seven largest cities, it will be "collected and used for various planning purposes by MT DEQ and permittees in order to supplement national urban runoff quality information."[29]

Different seasonal sampling requirements:
Depending on the sampling location, snowmelt may be sampled instead of stormwater runoff.

Unregulated discharges to surface waters within MS4s:
Regulated small MS4s may create local requirements (ordinances) that apply to unregulated discharges, as a part of their MPDES permit-based SWMP initiatives, even if not formally required to do so. MT DEQ may also require a facility or activity-based MPDES permit independent of the MS4 permit, for a specific industrial or construction activity. MT DEQ also has various non-point source storm water initiatives.

Monitoring of unregulated communities:
MT DEQ does not specifically define unregulated communities, but they may be addressed if permitted Small MS4s elect to do so through SWMPs.

<u>Nevada</u>

Sampling frequency & sampling results submittal:
Nevada Department of Environmental Protection (NV DEP) requires MS4s to sample their discharges.[30] No response was provided for the remaining 28 questions, but Clark County's MS4 permit states that the permittee must develop a monitoring plan.[31]

<u>New Jersey</u>*

Sampling frequency & sampling results submittal:
New Jersey Department of Environmental Protection's (NJ DEP's) permits for both Phase I and Phase II MS4s contain only narrative standards and do not require sampling of discharges or stormwater outfalls.[32, 33]

<u>New York</u>*

Sampling frequency & sampling results submittal:
New York Department of Environmental Conservation (NYSDEC) does not require MS4s to specifically develop a monitoring component within their SWMP.[34] However, specific BMPs are required for MS4s discharging to certain impaired sectors of watersheds.[35] See Section 2.3 page 2-25.

<u>North Carolina</u>

Sampling frequency & sampling results submittal:
North Carolina Department of Environment & Natural Resources (NC DENR) requires Phase I MS4s to develop a monitoring program. These permittee-designed monitoring programs vary in sampling frequency and pollutants monitored, and the analytical results are self retained. Phase II MS4s are not required to conduct sampling, unless sampling is required under a TMDL. [36]

Sample collection:
Varies by monitoring program.

State inspection:
NC DENR uses state staff, rather than contractors, to oversee the municipal stormwater permitting program.[37]

Additional controls/sampling based on sampling results:
Sampling data is used to determine the effectiveness of the permittee monitoring programs.

Different seasonal sampling requirements:
None.

Unregulated discharges to surface waters within MS4s:
Unregulated discharges to surface waters are regulated by the MS4 within whose boundaries they fall.

Monitoring of unregulated communities:
NCDENR does not define or monitor unregulated communities, and addresses only those communities defined by EPA's Phase I or Phase II regulations.

North Dakota

Sampling frequency & sampling results submittal:
North Dakota Department of Health (ND DoH) does not generally require MS4s to sample their discharges.[38]

State inspection:
ND DoH does not hire contactors to inspect MS4s.

Unregulated discharges to surface waters within MS4s:
ND DoH does not address unregulated discharges to surface waters within the boundaries of MS4s.

Monitoring of unregulated communities:
ND DoH does not address unregulated communities, but defines unregulated communities based on population criteria.

Ohio

Sampling frequency & sampling results submittal:
Ohio Environmental Protection Agency (OH EPA) requires Phase I MS4s to conduct "some form of sampling, either chemical or in-stream biological."[39] Sampling frequency and pollutants monitored are dependent on the MS4's monitoring program, which the permit holder is required to develop.[40] OH EPA does not currently require Phase II MS4s to sample.

State inspection:
OH EPA does not hire contractors to inspect MS4s.

Unregulated discharges to surface waters within MS4s:
OH EPA does not address unregulated discharges to surface waters within the boundaries of MS4s.

Monitoring of unregulated communities:
OH EPA has the authority to designate additional MS4 communities, if warranted, and has designated 7 additional communities based on the state's 303(d) list.

Oklahoma

Sampling frequency & sampling results submittal:
Oklahoma Department of Environmental Quality (OK DEQ) requires Phase I municipalities to sample semi-annually at 6 representative monitoring locations in micro-watersheds, with sampling results submitted electronically once per year.[41]

Sample collection:
Flow weighted composite sampling is required during the first 3 hours of discharge and grab sampling is required during the first 2 hours of discharge.

Pollutants monitored:
No benchmarks or effluent limits exist, but sampling for the following pollutants is required: pH, oil & grease, hardness, BOD_5, COD, dissolved phosphorus, total phosphorus, TSS, TKN, nitrate and nitrite as nitrogen, fecal coliform, TDS, total cadmium, total copper, total lead, total zinc, temperature, total mercury, total thallium.

State inspection:
OK DEQ does not hire contractors to inspect MS4s.

Additional controls/sampling based on sampling results:
No follow-up sampling or additional controls are required based on sampling results, but results are incorporated into OK DEQ's annual water quality assessment report.

Different seasonal sampling requirements:
None.

Unregulated discharges to surface waters within MS4s:
Phase I MS4s are required to implement a dry/wet weather screening program. Phase II MS4s are required to implement a dry weather screening program.

Monitoring of unregulated communities:
OK DEQ may monitor unregulated communities, as necessary, according to the community's population, density, discharge to sensitive waters, high growth/growth potential, and contiguity to urbanized areas.

Oregon

Sampling frequency & results submittal:
Phase I MS4s are required to conduct in-stream and stormwater outfall sampling at varying frequencies, since all of Oregon's Phase I permits are individual, rather than general, permits.[42] No Phase II MS4s require monitoring. Permittees are required to submit the sampling results annually (either electronically or on paper) as well as retain a copy.

Sample collection:
Phase I MS4s are required to collect grab and composite samples during the first flush, up to 3 hours after the storm event. The permit holder may decide whether to use time or flow weighted composite samples. Oregon Department of Environmental Quality (OR DEQ) requires samples to be analyzed according to the methods described in 40 CFR §136.

Pollutants monitored & basis of limits:
In-stream sampling pollutants include: pH, hardness, BOD_5, conductivity, total and dissolved phosphorus, TSS, ammonia, *E. coli*, dissolved oxygen, chloride, total and dissolved metals (copper, lead, nickel, zinc), chlorophyll-a.

MS4 outfall sampling pollutants include: pH, hardness, BOD_5, conductivity, total and dissolved phosphorus, TSS, ammonia, *E. coli*, dissolved oxygen, total and dissolved metals (copper, lead, nickel, zinc), temperature, and particle size distribution.

Benchmarks exist, but are permit-specific and dependent on any waste load allocation (WLA) specified in TMDLs. There are no effluent limitations.

State inspection:
OR DEQ does not conduct sampling of permitted municipal stormwater discharges.

Additional controls/sampling based on sampling results:
No additional sampling or controls are required based on sampling results, but "the sampling data has been used to determine trends in surface water quality associated with the MS4. The sampling data has also been used to characterize pollutant loads from land uses and to identify illicit discharges or connections. Some sampling has been conducted to determine BMP effectiveness."[43]

Different seasonal sampling requirements: None.

Unregulated discharges to surface waters within MS4s:
MS4s have monitored pollutant loads from unregulated stormwater sources to determine pollutant loads based on land use.

Monitoring of unregulated communities:
OR DEQ defines unregulated communities as communities not subject to U.S. EPA's Phase I or Phase II regulations. Unregulated communities are addressed if they have been identified as a designated management agency under a TMDL, in which case they may be required to develop a stormwater strategy through a TMDL implementation plan.

<u>Pennsylvania</u>*

Sampling frequency & results submittal:
Pennsylvania Department of Environmental Protection (PA DEP) does not require small (Phase II) MS4s to conduct sampling of their discharges.[44] Information on permit requirements for Phase I MS4s was not detected on the internet.

Rhode Island

Sampling frequency & results submittal:

Rhode Island Department of Environmental Management (RI DEM) requires sampling only of MS4s that have discharges during dry weather conditions, with sampling data to be self retained by the MS4 permit holder.[45]

Sample collection:

Grab samples are required.

Pollutants monitored: pH, conductivity, and fecal coliform must be monitored. No benchmarks or effluent limits exist.

State inspection:

RI DEM does not use contractors to oversee the municipal stormwater program.

Additional controls/sampling based on sampling results:

Additional sampling or analysis for other parameters may be based on the initial analytical results, but are not required. Sampling data is also used for the detection, tracking, and elimination of illicit discharges and to determine priorities for the IDDE program.

Different seasonal sampling requirements: None

Unregulated discharges to surface waters within MS4s:

Unregulated discharges are not addressed.

Monitoring of unregulated communities:

RI DEM may designate MS4s as needing a permit if they discharge to a water body with a TMDL. In addition to TMDL-designated MS4s, there exist requirements for MS4s outside of urbanized areas that are either in census designated places (CDPs) with a minimum population or that discharge to special resource protection waters. There exist no monitoring requirements for communities outside urbanized areas or CDPs.

Texas

Sampling frequency & results submittal:

Permit holders must sample once per season for effluent limits and submit data annually, on paper.[46]

Sample collection:

Grab and flow-weighted composite are required during the first flush.

Pollutants monitored:

No benchmarks or effluent limits exist, but samples must be analyzed for the following pollutants: pH, oil & grease, hardness, BOD_5, COD, dissolved phosphorus, total phosphorus, TSS, ammonia and organic nitrogen, TKN, nitrate and nitrite as nitrogen, *E. coli*, fecal streptococcus, TDS, cadmium, chromium, copper, lead, zinc, and temperature.

State inspection:
Texas Commission on Environmental Quality (TCEQ) does not use contractors to oversee the municipal stormwater program.

Additional controls/sampling based on sampling results:
Additional sampling is not required based on sampling results. Additional controls, such as BMPs or special studies, are required based on sampling results.

Different seasonal sampling requirements:
None

Unregulated discharges to surface waters within MS4s:
Unregulated discharges are not addressed.

Monitoring of unregulated communities:
TCEQ is able to regulate communities not subject to U.S. EPA's Phase I or Phase II regulations, as urbanized areas with less than 1001 people. These communities are able to apply for waivers from an MS4 permit.

<u>Utah</u>
Sampling frequency & sampling results submittal:
Utah Department of Environmental Quality (UT DEQ) requires its three Phase I MS4s to develop a monitoring program. Thus, sampling frequency and collection methods vary by permit.[47] Paper submittal of sampling results is required annually. Phase II MS4 permits do not include analytical sampling.

Sample collection:
Sample collection methods include: base flow grab samples, grab samples taken on the rising limb of the hydrograph, and flow weighted composites during the storm event.

Pollutants monitored:
Pollutants monitored vary by facility, but include the following parameters: pH, oil & grease, hardness, BOD_5, COD, dissolved phosphorus, total phosphorus, TSS, ammonia, TKN, nitrate and nitrite as nitrogen, fecal coliform, fecal streptococcus, total & dissolved metals (cadmium, copper, lead, zinc). No benchmarks or effluent limits exist.

State inspection:
UT DEQ does not hire contractors to inspect MS4s.

Additional controls/sampling based on sampling results:
No additional controls or sampling is required based on sampling results. Sampling results are used to determine BMP effectiveness and annual pollutant loading (in pounds), which indicates the change in water quality due to stormwater discharges.

Different seasonal sampling requirements:
None

Unregulated discharges to surface waters within MS4s:
UT DEQ does not address unregulated direct discharges to surface waters.

Monitoring of unregulated communities:
UT DEQ defines unregulated communities as significant contributors, but does not address unregulated communities in its municipal stormwater program.

Virginia

Sampling frequency & sampling results submittal:
Virginia Department of Conservation and Recreation (VA DCR) permits MS4s and requires sampling. While permit holders must retain and submit analytical results annually, sampling frequency and parameters vary among permits.[48] MS4 operators conduct a range of sampling including analytical, biological (macroinvertebrates), physical (geomorphological). Volunteers often conduct floatables or trash monitoring.[49]

Sample collection:
Flow weighted grab and composite samples are required.

Pollutants monitored:
Monitored pollutants vary by permit and are often driven by TMDLs. No benchmarks or effluent limits exist.

Arlington County MS4 is required to monitor the following pollutants: fecal coliform, fecal streptococcus, TSS, TDS, BOD, COD, total phosphorus, nitrate and nitrite, TKN, total ammonia, total nitrogen, pH.[50]

Fairfax County MS4 is required to monitor the following pollutants: ammonia as nitrogen, COD, E. coli, fecal streptococcus, nitrate and nitrite, TDS, TSS, TKN, total phosphorus.[51]

State inspection:
VA DCR does not hire contractors to inspect MS4s.

Additional controls/sampling based on sampling results:
Neither follow up sampling nor additional controls are required based on sampling results, but sampling data is used to monitor long term results.

Different seasonal sampling requirements:
VA DCR has different wet and dry season sampling requirements, where appropriate.

Unregulated discharges to surface waters within MS4s:
VA DCR does not address unregulated discharges to surface waters within MS4s.

Monitoring of unregulated communities:
VA DCR does not regulate storm water in municipalities that are not automatically regulated under the Phase I or Phase II federal regulations.

<u>Washington</u>
Sampling frequency & sampling results submittal:
Washington Department of Ecology (WA DOE) requires Phase I MS4s (or their hired consultants) to maintain 3 sampling components:

1) Stormwater Monitoring (characterization): permittees must sample 3 outfalls representing various land use types.[52] Counties must select an outfall from each of the following land use types: commercial, high density residential and low density residential. Cities must select an outfall from each of the following: commercial, high density residential and industrial.[53] Ports of Seattle and Tacoma must sample at only 1 outfall. All Phase I MS4s must sample 67% of the forecasted qualifying storm events, up to a maximum of 14 events.[54]
2) Targeted SWMP Effectiveness Monitoring: permittees must develop a monitoring plan to determine the effectiveness of their SWMP. In this plan, they are required to address the effectiveness of a targeted action and the effectiveness of achieving a targeted environmental outcome. All plans vary in sampling frequency and pollutants monitored, but some include sediment and stormwater sampling and survey conducting.
3) BMP Effectiveness Monitoring: permittees must sample influent and effluent of two different BMP types at four different sites. Ports must sample influent and effluent of one BMP type at two different sites. Required sampling frequency is such that samples are taken at least 12 times a year, and BMP effectiveness monitoring component is anticipated to last for a year or two of the permit term, but this is dependent on whether the goals are reached.

Sampling results are currently required to be submitted annually on paper and in electronic format (as an Excel file). WA DOE is in the process of requiring permittees to submit data directly to the Department's Environmental Information Management (EIM) system, where the state's environmental data is stored. This decision has not been finalized.

Sample collection:
For stormwater characterization and BMP effectiveness sampling, flow weighted composites must be collected for at least 75% of the storm event hydrograph for storms less than 24 hours in duration. For storms longer than 24 hours, samples must capture 75% of the hydrograph of the first 24 hours only.

Pollutants monitored:
Phase I permits include no benchmarks or effluent limitations.

Pollutants required to be monitored varies between the three components specified above:

1) Stormwater Monitoring (characterization): pH, hardness, conductivity, BOD_5, total phosphorus, TSS, turbidity, TKN, nitrate and nitrite, fecal coliform, total petroleum hydrocarbons (grab samples), chloride, methylene blue activated substances (MBAS), ortho-phosphate, total and dissolved copper, zinc, cadmium and lead, mercury (in commercial and industrial areas only),

PAHs, phthalates, herbicides (2,4-D, mecoprop, triclopyr), insecticides (diazinon, malathion, chlorpyrifos, dichlobenil, prometon), and fungicides (pentachlorophenol).
In addition, sediment monitoring is required annually (using in-line stormwater traps) for the following: total solids, grain size, TOC, zinc, cadmium, lead and mercury, PAHs, phthalates, phenolics, PCBs and pesticides (pentachlorophenol, diazinon, chlorpyrifos and malathion only).

2) Targeted SWMP Effectiveness Monitoring: permit holder decides.
3) BMP Effectiveness Monitoring:
   BMP influent and effluent:
   - For basic, enhanced, or phosphorus treatment BMPs: TSS, particle size distribution, pH, total and ortho-phosphorus, hardness, total and dissolved copper and zinc.
   - For oil control BMPs: TSS, particle size distribution, pH, semi-volatile and volatile petroleum products (NWTPH-Dx and Gx), and oil sheen.

   Within the BMP: Measure accumulated sediment, analytical sampling for total solids, grain size, total volatile solids, semi-volatile petroleum products (NWTPH-Dx), total phosphorus, and total cadmium, copper, lead and zinc.

State inspection:
WA DOE does not use contractors to inspect MS4 permit holders.

Additional controls/sampling based on sampling results:
No additional sampling or controls are required based on sampling results, but stormwater characterization sampling data is used to evaluate runoff characteristics and pollutant loading from various land uses within a permittee’s jurisdiction, in order to detect changes over time related to stormwater management actions within the drainage basin. Targeted SWMP effectiveness monitoring is used to evaluate the effectiveness of elements of the SWMP in smaller drainage basins. BMP effectiveness sampling data is used to test BMPs listed in WA DOE’s Stormwater Management Manual for Western Washington for effectiveness and performance.

Different seasonal sampling requirements:
In Western Washington (there are no Phase I MS4s in Central or Eastern Washington), the Stormwater Characterization Monitoring Program requires 60 to 80% of the captured storm events to be during the wet season (October 1 – April 30) and 20 to 40% of the captured storm events to be during the dry season (May 1 – September 30).

Unregulated discharges to surface waters within MS4s: No response.

Monitoring of unregulated communities:
WA DOE does not monitor communities not automatically regulated under EPA’s Phase I or Phase II federal regulations.

West Virginia

Sampling frequency & sampling results submittal:
West Virginia Department of Environmental Protection (WV DEP) requires permitted MS4s to conduct semi-annual sampling, with annual submittal either electronically or on paper discharge monitoring report (DMR).[55]

Sample collection:
Grab samples are required during the first flush.

Pollutants monitored:
Sampling parameters include total phosphorus, TKN, nitrate and nitrite. No benchmarks or effluent limits exist.

State inspection:
WV DEP does not use contractors to inspect MS4 permit holders.

Additional controls/sampling based on sampling results:
No additional sampling is required based on sampling results, but sampling data is used to determine program effectiveness. Additional controls may be required for discharges into impaired water bodies (see Section 2.3).

Different seasonal sampling requirements: None.

Unregulated discharges to surface waters within MS4s:
WV DEP does not address unregulated discharges to surface waters within MS4s.

Monitoring of unregulated communities:
WV DEP does not monitor communities not automatically regulated under EPA's Phase I or Phase II regulations.

Wisconsin*

Sampling frequency & sampling results submittal:
Wisconsin Department of Natural Resources (WI DNR) requires MS4s to develop a SWMP. Specific monitoring requirements are not indicated, with the exception of a required 40% reduction in annual average mass of TSS to the state's surface waters by March 10, 2013.[56]

2.3 Requirements For Discharges To TMDL Waters

TMDL pollutants addressed in MS4s specifies pollutants which are identified in approved TMDLs and include a reference to one or more specific MS4. The appearance of a pollutant in the list below means that either an MS4 has been assigned a WLA for the specified pollutant or that an MS4 has additional requirements to monitor and/or implement controls for the specified pollutant. In the latter case, no specific pollutant load has been assigned to an MS4.

Alabama
TMDL pollutants addressed in MS4s: fecal coliform, turbidity, TSS, sediment oxygen demand (SOD), carbonaceous biochemical oxygen demand (CBOD), nitrogenous biochemical oxygen demand (NBOD), pH, sediment, total phosphorus.[57]

Alaska
There are no additional sampling requirements for MS4s that discharge to water bodies with approved TMDLs.

TMDL pollutants addressed in MS4s: fecal coliform, anthropogenic debris.[58]

Arkansas
MS4s that discharge to water bodies with approved TMDLs are required to conduct monitoring as specified in the TMDL report and/or implementation plan.[59]

TMDL pollutants addressed in MS4s: fecal coliform.[60]

California
In areas with a TMDL, flow must also be sampled, allowing for the pollutant load to be determined. Also, additional BMPs are required. For example, in Los Angeles, TMDL requirements for trash include installation and maintenance of full capture devices.

TMDL pollutants addressed in MS4s: fecal coliform; total coliform; *Enterococcus*; sediment; nitrate as nitrogen; boron; chloride; sulfate; TDS; trash; total phosphorus; total nitrogen; total recoverable copper, lead, zinc, selenium; diazinon; chlorpyrifos.[61]

Colorado
Additional sampling and/or controls may be required for MS4s that discharge to a water body with a TMDL, but it varies among monitoring plans.

TMDL pollutants addressed in MS4s: *E. coli*.[62]

Connecticut
No additional sampling is required for MS4s that discharge to a water body with a TMDL, but municipalities must review their SWMP and make any modifications necessary to comply with the TMDL.

TMDL pollutants addressed in MS4s: *E. coli*, total nitrogen, fecal coliform, total phosphorus.[63]

District of Columbia*
TMDL pollutants addressed in MS4s: TSS; BOD; total nitrogen, phosphorus; oil & grease; fecal coliform; total zinc, lead, mercury, arsenic; chlordane; dichlorodiphenyldichloroethane (DDD); dichlorodiphenyltrichloroethane (DDT); dichlorodiphenyldichloroethylene (DDE); dieldrin; PAHs; heptachlor epoxide.[64]

Florida

No additional sampling or controls are required for an MS4 that discharges to a water body with a TMDL.

TMDL pollutants addressed in MS4s: total coliform, total nitrogen, fecal coliform, total phosphorus, nitrate, BOD. [65]

Illinois

IL EPA does require additional sampling and controls beyond the six minimum control measures for MS4s that discharge to a water body with a TMDL.

TMDL pollutants addressed in MS4s: fecal coliform, total phosphorus, chloride (from road salt), nitrate, *E. coli*.[66]

Indiana

IDEM does not require additional sampling or controls beyond the six minimum control measures for an MS4 that discharges to a water body with a TMDL.

TMDL pollutants addressed in MS4s: *E. coli*, fecal coliform, total phosphorus, nitrate and nitrite.[67]

Kentucky

If a Phase II MS4 discharges to a water body with a TMDL that specifies an urban related impairment, then sampling is required for the MS4. After establishment of an approved TMDL for a pollutant that is found in the permittee's stormwater discharges, the permittee shall identify the impaired stream segment(s) and/or tributaries as well as the location of all known major MS4 outfalls discharging the pollutant of concern to those segments. The permittee shall also "evaluate the discharge load associated with the identified major MS4 outfalls for the pollutant,"[68] including monitoring and reporting. Prior to any reopening of this permit, the permittee shall consider and propose applicable and appropriate BMPs for its MS4 to reach the TMDL's waste load goal, and must provide a schedule of implementation for those BMPs. Any "applicable limitations, conditions and requirements contained in the TMDL are also to be addressed in the Stormwater Quality Management Plan (SWQMP)."[69]

TMDL pollutants addressed in MS4s: fecal coliform.[70]

Louisiana

LA DEQ does not require additional sampling or controls beyond the six minimum control measures for a MS4 that discharges to a water body with a TMDL.

TMDL pollutants addressed in MS4s: TSS, ammonia, organic nitrogen, BOD_5, CBOD, SOD, dissolved oxygen.[71,72]

Maine*
Maine Department of Environmental Protection (ME DEP) requires MS4s that discharge to a water body with an approved TMDL to review their stormwater plan for consistency with the TMDL implementation plan. ME DEP may also issue a watershed specific general permit or may require an individual permit.[73]

TMDL pollutants addressed in MS4s: total phosphorus, impervious cover (percent reduction specified), lead, zinc, TSS, dissolved oxygen, *Enterococcus*, fecal coliform.[74]

Michigan
MI DEQ requires MS4s that discharge to a water body with an approved *E. coli* or total phosphorus TMDL to sample their discharges for the pollutant of concern. Additional sampling may be required, as determined on a case by case basis (see page 2-9). Other than additional sampling, the permit holder must identify and prioritize actions that they determine will improve water quality.

TMDL pollutants addressed in MS4s: *E. coli*, phosphorus.

Minnesota
There are no additional sampling requirements for an MS4 that discharges to a water body with a TMDL, but MPCA does use TMDL goals to further control MS4 discharges beyond the six minimum control measures. Specifically, certain BMPs, either selected from options provided by MPCA or developed by the MS4, may be required to meet WLAs.

The six minimum control measures, as defined by 40 CFR § 122.34, are 1) public education and outreach, 2) public involvement and participation, 3) IDDE, 4) construction site stormwater runoff control, 5) post construction stormwater management in new development and re-development, 6) pollution prevention and good housekeeping.

TMDL pollutants addressed in MS4s: total phosphorus, fecal coliform, total chloride (from road salt), TSS, BOD.[75]

Mississippi
No additional sampling is required but MS DEQ may require additional management controls for MS4s that discharge to water bodies with TMDLs.

TMDL pollutants addressed in MS4s: sediment from land use runoff and in-channel processes.[76]

Missouri
Sampling requirements vary depending on the TMDL. A MS4 may be asked to monitor all potential urban contaminants and associated parameters, but “a typical recommendation is quarterly sampling of at least 3 grab samples and one low flow from selected representative sites.”[77] There is also one existing cooperative TMDL monitoring project involving 6 regulated MS4s discharging to the James River near Springfield, Missouri. For TMDL associated controls beyond the six minimum control measures, MO DNR is currently in the process of requiring flow control in the Hinkson Creek watershed for three co-permittees in Boone County. Flow control will be achieved by requiring low impact development (LID) and retrofit measures.

TMDL pollutants addressed in MS4s: BOD.[78]

Montana
Additional sampling may be required based on WLAs built into MPDES permitting authorizations. Using BMPs and other control measures (as specified in the SWMP), regulated Small MS4s must address pollutants of concern for listed impaired water bodies to ensure compliance with water quality standards in the receiving surface waters.

TMDL pollutants addressed in MS4s: sediment, total phosphorus, total nitrogen.[79]

Nevada*
Additional sampling may be required of the Clark County MS4, which includes the city of Las Vegas, if a WLA has been established for a pollutant determined to result from stormwater discharge.[80] None of the TMDL reports on the NV DEP website (http://ndep.nv.gov/BWQP/tmdl.htm) have identified an MS4 as a source of any pollutant of concern.

New Jersey*
TMDL pollutants addressed in MS4s: fecal coliform, total coliform, total phosphorus.[81]

New York*
For MS4s discharging into water bodies with documented impairments, specific BMPs are required. For New York City MS4s east of the Hudson Watershed, BMPs addressing phosphorus control are required; these BMPs consist mostly of public education and IDDE requirements.[82] Other specific BMPs required of MS4s address pathogen (Oyster Bay Watershed, Peconic Estuary) and nitrogen (Peconic Estuary) impairments.[83]

TMDL pollutants addressed in MS4s: fecal coliform, total nitrogen, total phosphorus.[84]

North Carolina
Phase II MS4s are not required to monitor their discharges unless they discharge to a water body with a TMDL. If identified in a TMDL, both Phase I and Phase II MS4s must develop a monitoring program specific to the pollutant of concern.

TMDL pollutants addressed in MS4s: total nitrogen, total phosphorus, fecal coliform (colony forming units/day), turbidity (expressed as TSS), copper, impaired biological integrity (reduction in impervious cover required in Swift Creek Watershed).[85]

North Dakota
ND DoH does not require additional sampling for MS4s that discharge into a water body with a TMDL. For TMDL associated controls beyond the six minimum control measures, ND DoH requires MS4s to include or adjust the stormwater management program to meet the schedules, objectives or WLAs set in applicable TMDLs.

TMDL pollutants addressed in MS4s: None. All TMDLs appear to be associated with nonpoint source pollution.[86]

Ohio

TMDLs have added sampling requirements to Phase I MS4 permits and have affected the construction/post-construction minimum control measures required in specific watershed construction general permits."[87]

TMDL pollutants addressed in MS4s: total phosphorus, fecal coliform, TSS, nitrate and nitrite, TDS.[88]

Oklahoma

Additional sampling may be required for MS4s that discharge to a water body with a TMDL, as specified in the TMDL report. OK DEQ does not utilize TMDL goals to further control MS4 discharges.

TMDL pollutants addressed in MS4s: fecal coliform, *Enterococcus, E. coli*.[89]

Oregon

The permittee must sample for all of the parameters for which a WLA has been identified in the applicable TMDL. Also, the MS4 must show progress towards meeting the WLA identified in the TMDL by showing reductions in pollutant loading. This is accomplished by modeling the pollutant loads from the MS4 and accounting for reductions achieved through BMP implementation. "Each permit cycle, the MS4 permittee is required to show additional progress towards meeting the WLA by implementing additional BMPs to reduce the pollutants of concern. This often requires additional BMPs to be implemented beyond the six minimum measures."[90]

TMDL pollutants addressed in MS4s: *E. coli*, total phosphorus, settleable volatile solids, lead.[91]

Pennsylvania*

TMDL pollutants addressed in MS4s: lead, total nitrogen, total phosphorus, sediment.[92]

Rhode Island

There are no additional sampling requirements for MS4s that discharge into water bodies with approved TMDLs, but a TMDL may specify changes to the 6 minimum control measures if it is relevant to the pollutant of concern. RI DEM's MS4 General Permit requires the delineation of areas contributing to outfalls that discharge to waters with approved TMDLs; impacts on these areas from the municipality's wet weather discharges must be identified. Later this year, RI DEM will issue the MS4 General Permit that may require TMDL Implementation Plans to specify structural BMPs.

TMDL pollutants addressed in MS4s: fecal coliform; dissolved zinc, copper, and lead.[93]

South Carolina*

South Carolina Department of Health & Environmental Control (SC DHEC) requires any MS4s that discharge to water bodies with approved TMDLs to include in their SWMP a section discussing measures and controls that will address any pollutants included in TMDLs. In addition, MS4s must incorporate into their SWMP any other conditions applicable specifically to their discharges as identified in the TMDL implementation plan.[94]

TMDL pollutants addressed in MS4s: fecal coliform, pH (6-8.5).[95]

<u>Tennessee</u>*
Tennessee Department of Environment & Conservation (DEC) requires any MS4s that discharge to water bodies with approved TMDLs to review existing stormwater control measures and describe why they comply with TMDL requirements or specify changes to be made.[96]

TMDL pollutants addressed in MS4s: TSS; *E. coli*; fecal coliform; total nitrogen, phosphorus; CBOD.[97]

<u>Texas</u>
TCEQ is in the process of addressing bacteria issues, which might result in additional sampling requirements for MS4s that discharge into a water body having a bacteria TMDL. No additional controls are required for MS4s that discharge into a water body with a TMDL.

TMDL pollutants addressed in MS4s: fecal coliform, *E. coli*, *Enterococcus*, BOD, ammonia as nitrogen.[98]

<u>Utah</u>
UT DEQ does not require additional sampling or controls for MS4s that discharge into a water body with a TMDL.

TMDL pollutants addressed in MS4s: TSS, total phosphorus, BOD, TDS, total ammonia.[99]

<u>Virginia</u>
VA DCR does require monitoring of any facility operated by an MS4 that could be a significant source of a TMDL pollutant or where a TMDL pollutant has been historically or currently stored. Other than sampling, VA DCR does not require additional controls for MS4s that discharge into a water body with a TMDL.

TMDL pollutants addressed in MS4s: fecal coliform, *Enterococcus*, *E. coli*, sediment, PCBs.[100]

<u>Washington</u>
For those MS4s that discharge into a water body with a TMDL, WA DOE requires specific actions to be taken. If an MS4 is addressed in Appendix 2 of the Phase I MS4 permit, additional monitoring requirements are required, according to a quality assurance project plan (QAPP) that is approved by WA DOE. If the TMDL pollutant is bacterial in nature, municipalities are required to develop and submit to the DOE a Bacterial Pollution Control Plan, which considers a pet waste ordinance, bacterial pollution education, and other control measures.[101]

TMDL pollutants addressed in MS4s: fecal coliform, BOD, and dissolved oxygen. [102,103]

West Virginia
WV DEP's general MS4 permit requires the Stormwater Management Plan to include BMPs specifically targeted to achieve any WLAs prescribed by TMDLs approved for receiving waters; the permittee must also include a monitoring program in their SWMP.

TMDL pollutants addressed in MS4s: fecal coliform.[104]

Wisconsin*
Wisconsin Department of Natural Resources (WI DNR) requires MS4s to determine whether they discharge into water bodies with approved TMDLs.[105] If so, the permit holder must review its stormwater controls to determine if the WLA is being achieved with the current controls.

TMDL pollutants addressed in MS4s: total phosphorus.[106]

2.4 State's Involvement in Public Education

Minnesota*
The Minnesota Stormwater Steering Committee has identified the need to develop a statewide coordinator for stormwater public education. As of this writing, it is not clear that such a position has yet been designated. [107]Also, the Twin Cities Metro Area provides resources at http://www.cleanwatermn.org/.

New Jersey*
NJ DEP has created 6 public service radio announcements, 3 television commercials, 4 posters distributed to all schools, public libraries, parks, municipal complexes, and highway rest areas statewide.[108] Resources and outreach programs are also available through NJ DEP's Division of Watershed Management.[109] NJ DEP also created a website (http://www.cleanwaternj.org/) that provides stormwater educational resources of various media.

Washington*
Stormwater education guidelines and recommendations are provided, available on WA DOE's website.[110]

2.5 Statewide Illicit Discharge Elimination Program (IDEP)

New Hampshire*
New Hampshire Department of Environmental Services (NH DES) collaborates with Department of Public Works and the municipality that detects illicit discharge in order to eliminate the discharge. [111]

New Jersey*
NJ DEP has begun a source track down program using wet weather sampling to identify illicit connections and cooperatively work with municipalities to eliminate them.[112]

North Carolina
No statewide IDEP has been implemented.[113]

* *Indicates information obtained solely from the Internet.*

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[18] Municipal Stormwater Permit Requirements Survey. IL EPA Response. 19 August 2009. Unless otherwise indicated, this reference applies to all information regarding Illinois' municipal stormwater permitting program.
[19] Municipal Stormwater Permit Requirements Survey. IDEM Response. 30 July 2009. Unless otherwise indicated, this reference applies to all information regarding Indiana's municipal stormwater permitting program.
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[21] Municipal Stormwater Permit Requirements Survey. LA DEQ Response. 22 July 2009. Unless otherwise indicated, this reference applies to all information regarding Louisiana's municipal stormwater permitting program.
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[23] Municipal Stormwater Permit Requirements Survey. MPCA Response. 23 July 2009. Unless otherwise indicated, this reference applies to all information regarding Minnesota's municipal stormwater permitting program.
[24] Municipal Stormwater Permit Requirements Survey. MPCA Response. 23 July 2009.
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Chapter 3: Construction Stormwater Permit Requirements

3.1 Introduction & Trends

Construction Stormwater Permit Requirements

In an effort to benchmark federal and state policies related to construction stormwater programs, the U.S. Environmental Protection Agency (EPA), state agencies, and EPA regional offices were surveyed with regards to their construction stormwater permit requirements. The survey focused on specific best management practices (BMP) recommendations, BMP Selection Process methods, evaluation of BMP effectiveness, monitoring requirements, and permit enforcement. The survey elicited 16 responses, including: EPA Region 9, CT, FL, KS, LA, MA, MT, NC, ND, OH, OR, TX, UT, VT, VA, and WA. This report contains survey responses as well as supplemental information gathered from agency websites.

According to the survey responses, 39% (7 of 18 agencies) require operators to install specific stormwater BMPs. An additional 39% (7 of 18 agencies) have incorporated BMP recommendations into their construction stormwater permits that operators can implement on a voluntary basis. 22% (4 of 18 agencies) have not developed specific stormwater BMP requirements. State agencies that have developed specific stormwater BMP requirements draw from several sources of information when developing these requirements. 38% (3 of 8 agencies) rely on agency studies, 63% (5 of 8 agencies) rely on industry studies, 25% (2 of 8 agencies) rely on product specifications, and 75% (6 of 8 agencies) rely on site inspections (75%) when developing BMP requirements. Furthermore, only 17% (4 of 18 agencies) require parameter-specific monitoring of stormwater discharges. The only parameters that agencies may require operators to monitor include turbidity, total suspended solids (TSS), and pH. Among the state agencies surveyed, only North Carolina and Ohio make a distinction in their regulatory approach between wetlands and other water bodies and have developed specific stormwater regulations that only pertain to wetlands.

Construction Nonpoint Source (NPS) Pollution Requirements

In an effort to benchmark federal and state policies related to nonpoint source (NPS) pollution management, the U.S. Environmental Protection Agency (EPA), state agencies, and EPA regional offices were surveyed with regards to their NPS pollution programs. The survey focused on specific best management practices (BMP) recommendations, BMP selection, evaluation of BMP effectiveness, monitoring requirements, and permit enforcement. The survey elicited 17 responses, including: EPA Region 3, EPA Region 9, IA, IN, KS, LA, ME, MO, MN, NC, ND, NJ, NM, NV, OR, VA, and VT. This report contains survey responses as well as supplemental information gathered from agency websites.

According to the results of the survey, 90.5% (19 of 21 agencies) recommend specific BMPs for the purpose of managing NPS pollution associated with earth change activities. Among the agencies that recommend specific BMPs, 69% (11 of 16 agencies) recommend BMPs for agricultural earth change activities, 81% (13 of 16 agencies) recommend BMPs for urban earth change activities, and 43% (6 of 14 agencies) recommend BMPs for forestry-related earth change activities. State agencies that have developed specific stormwater BMP requirements draw from several sources of information when developing BMP requirements. 60% (9 of 15 agencies) rely on agency studies, 47% (7 of 15 agencies) rely on industry research, 27% (4 of 15 agencies) rely on product specifications, and 67% (10 of 15 agencies) rely on site inspections when developing BMP requirements. Furthermore, only 29% (5 of 17 agencies) require parameter-specific monitoring of NPS pollution associated with urban earth change activities. 41% (7 of 15 agencies) recommend monitoring of NPS pollution, while 29.4% (5 of 15 agencies) do not require or recommend monitoring of NPS pollution. The only parameters that agencies may require operators to monitor include turbidity, total suspended solids (TSS), total phosphorus, oil and grease, and dissolved oxygen, and pH. Among the state agencies surveyed, 88% (15 of 17 agencies) do not make a distinction in their approaches between wetlands and other water bodies and thus have not developed specific NPS regulations that only pertain to wetlands.

3.2 Construction Stormwater Permit Requirements

3.2.1 Criteria for Regulation of Stormwater Discharges

U.S. EPA Region 9
The National Pollutant Discharge Elimination System (NPDES) construction stormwater permit developed by the U.S. EPA specifies narrative standards, design standards, and stormwater BMPs.[1]

Connecticut
The NPDES construction stormwater permit developed by the Connecticut Department of Environmental Protection (CT DEP) specifies narrative standards, design standards, and specific stormwater BMPs.[2]

Florida
The Florida Department of Environmental Protection's (FL DEP) construction stormwater permit contains narrative standards and specific BMP requirements[3].

Indiana
The Indiana Department of Environmental Management's (IDEM) construction stormwater permit contains performance standards, but excludes narrative standards, design standards, or specific stormwater BMPs.

Iowa
The Iowa Department of Natural Resources' (IA DNR) construction stormwater permit contains recommended performance standards, narrative standards, and recommended stormwater BMPs.

Kansas
The NPDES construction stormwater permit developed by the Kansas Department of Health and Environment (KDHE) does not include narrative standards, design standards, performance standards, specific BMP requirements or numeric limits.[4]

Massachusetts
The Massachusetts Department of Environmental Protection (MA DEP) does not have NPDES primacy, and the U.S. EPA administers the state's NPDES stormwater permitting program.[5]

Michigan
The Michigan Department of Environmental Quality's (MI DEQ) construction stormwater permit includes narrative standards only[6].

Montana

The NPDES construction stormwater permit developed by the Montana Department of Environmental Quality (MT DEQ) specifies narrative standards.[7]

North Carolina

The NPDES construction stormwater permit developed by the North Carolina Department of Environment and Natural Resources' (NC DENR) specifies design standards that apply to stormwater, erosion, and sedimentation BMPs. Furthermore, NC DENR's Erosion and Sedimentation Act establishes regulatory requirements for controlling erosion and sedimentation due to construction activities.[8]

North Dakota

The North Dakota Department of Health's (ND DoH) NPDES construction stormwater permit includes narrative standards, design standards, and specific BMP requirements.[9]

Ohio

The Ohio Environmental Protection Agency's (OH EPA) NPDES construction stormwater permit includes narrative standards, design standards, and performance standards that apply to stormwater, erosion, and sedimentation BMPs. OH EPA also requires operators to install specific stormwater BMPs for the purpose of controlling stormwater associated with permitted construction activities.[10]

Oregon

The Oregon Department of Environmental Quality's (OR DEQ) NPDES construction stormwater permit includes narrative standards and specific stormwater BMP recommendations.[11]

Texas

The NPDES construction stormwater permit developed by the Texas Commission on Environmental Quality (TCEQ) specifies narrative standards, design standards, and BMPs.[12]

Utah

The NPDES construction stormwater permit developed by the Utah Department of Environmental Quality (UT DEQ) specifies narrative standards and design standards.[13]

Virginia

The NPDES construction stormwater permit developed by the Virginia Department of Conservation and Recreation (VA DCR) specifies performance standards for stormwater BMPs.[14]

Vermont

The NPDES construction stormwater permit developed by the Vermont Department of Environmental Conservation (VT DEC) specifies narrative standards, design standards, and BMPs.[15]

Washington

The Washington Department of Ecology (WA DOE) has developed a stormwater permit that specifies narrative standards, design standards, performance standards, specific BMPs, and benchmarks.[16]

3.2.2 BMP Requirements & Recommendations

EPA Region 9

Specific BMP Recommendations

Region 9 issues the "Final 2008 Construction General Permit," which was developed by U.S. EPA Headquarters (HQ). This permit requires operators to install specific stormwater BMPs for the purpose of managing stormwater associated with construction activities.[17] The stormwater BMP requirements are the same for all types of construction activities, but the requirements vary according to the number of acres disturbed.[18]

For construction activities that disturb 10 or more acres, operators must install sedimentation basins capable of storing run-off produced by a 2-year, 24-hour storm. If the installation of a temporary sediment basin or analogous BMP is not feasible, the operator must install smaller sediment basins or sediment traps. In addition to sediment traps, operators must install silt fences, vegetative buffer strips, or analogous sediment control BMPs on all down slope boundaries and at side slope boundaries where appropriate.[19]

For construction activities that disturb less than 10 acres, operators must, at a minimum, install: silt fences, vegetative buffer strips, or analogous sediment control BMPs on all down slope boundaries and on side slope boundaries where appropriate. As an alternative, operators may choose to install a sediment basin capable of storing the runoff generated by a 2-year, 24-hour storm event.[20] Additional stormwater, erosion, and sedimentation control BMPs are specified in the permit. Operators are required to implement BMPs to address off-site sediment tracking and dust control, runoff management, erosive velocity control, post-construction stormwater management, construction and waste materials control, non-construction wastes control, erosion control and stabilization, etc.[21]

BMP Selection Process

The Region 9 Office does not use models or other assessment tools to determine which BMPs should be recommended or to evaluate the effectiveness of stormwater BMPs.

Application Process

U.S. EPA Region 9 issues the "Final 2008 Construction General Permit" that was developed by EPA HQ. The general permit contains information about required "sediment controls" and lists categories of stormwater BMPs which operators must install as part of their Stormwater Pollution Prevention Plans (SWPPPs).[22] Operators and permit applicants may also refer to a stormwater BMP manual that contains detailed information about the required/recommended stormwater BMPs.[23]

EPA Region 9 has developed an interactive electronic map that permit applicants can use to locate 303(d) listed water bodies and outstanding resource waters (ORWs).

Evaluating BMP Effectiveness at Permitted Sites

There is no information available regarding the agency's procedure for evaluating BMP effectiveness.

Evaluating BMP Effectiveness at Non-Permitted Sites
U.S. EPA Region 9 does not inspect construction activities that are not permitted under the NPDES construction stormwater permitting program.[24]

Arkansas*

Specific BMP Recommendations
The Arkansas Department of Environmental Quality (AR DEQ) has developed specific stormwater BMP recommendations and requirements for the purpose of managing stormwater associated with construction activities. AR DEQ's construction stormwater permit contains a list of possible stabilization practices, structural practices, and post-construction practices that operators may choose to install. Requirements pertaining to sediment basins and velocity dissipation devices are also included in the permit, and the requirements are nearly identical to those specified in the U.S. EPA's general stormwater permit.[25]

AR DEQ has also developed setback requirements to protect riparian buffer zones. For construction activities that involve clearing and grading, operators are required to maintain a 25 foot buffer between the bank of an adjacent water body and the boundary of the construction activity. For construction activities that are located adjacent to a 303(d) listed water body, an Extraordinary Resource Water (ERW), an Ecologically Sensitive Water body (ESW), or a Natural and Scenic Waterway (NSW), operators may be required to maintain a 50 foot buffer zone.[26]

BMP Selection Process
There is no information available on AR DEQ's website regarding the process used to develop BMP recommendations/requirements.

Application Process
AR DEQ's construction stormwater permit does not contain a list of recommended stormwater BMPs. AR DEQ directs permit applicants to download a U.S. EPA manual with guidance on preparing SWPPPs.[27]

Evaluating BMP Effectiveness at Permitted Sites
There is no information available on AR DEQ's website with regards to evaluating the effectiveness of stormwater BMPs.

California*

Specific BMP Recommendations
The California State Water Resources Control Board's (CSWRCB) general permit for stormwater discharges associated with construction activity does not recommend specific stormwater BMPs.[28] CSWRCB has developed a draft permit that does include BMP recommendations in the form of "good housekeeping" practices. The recommended "good housekeeping" practices vary according to one of three risk level assigned to each construction activity. Operators are required to determine their construction activity's risk level according to the methods outlined in the draft permit's appendices. Once the risk level is confirmed, operators are required to adhere to the good housekeeping and BMP recommendations that are specific to the appropriate risk level.[29] [30] [31]

BMP Selection Process

The Los Angeles Region Water Quality Control Board performed an assessment of structural and non-structural BMPs that are commonly implemented at large construction sites and summarized the results in a report that has been published on the CSWRCB's website. The report recommends specific stormwater BMPs and includes basic installation and maintenance recommendations for optimizing the performance and effectiveness of these BMPs. The recommended erosion control BMPs include: scheduling, preservation of existing vegetation, and slope stabilization. The scheduling BMP involves scheduling construction activities in an effort to minimize the size of the construction site's footprint at any given point in time. The recommended sediment control BMPs include: sediment basins, fiber rolls, and silt fences. The report also provides recommendations for tracking control BMPs, spill prevention and control measures, concrete waste management, etc.[32]

Application Process

CSWRCB encourages permit applicants to use the California Stormwater Quality Association's "Stormwater Best Management Practice Handbook" which provides detailed guidance for selecting and implementing stormwater BMPs.[33]

Evaluating BMP Effectiveness at Permitted Sites

The Los Angeles Region Water Quality Control Board published a report on the effectiveness of stormwater BMPs.

Evaluating BMP Effectiveness at Non-Permitted Sites

There is no information available on CSWRCB's website with regards to whether the agency inspects construction activities that are not regulated under the stormwater permitting program.

<u>City of San Diego, California</u>

Specific BMP Recommendations

The City of San Diego has developed specific stormwater BMP requirements that vary according to many factors, including the type of construction activity, the number of acres disturbed, etc.
Applicants are required to complete and submit a "stormwater BMP requirements applicability checklist" with their permit applications.[34] The results of the checklist determine each project's priority designation, which will help determine any additional permittee BMP requirements. High priority construction sites are required to install low impact development (LID) BMPs, source control BMPs, and treatment control BMPs.[35] Additional BMPs are dependent on the construction site's "project development project category" designation. Project categories include: restaurant, commercial development greater than 1 acre, parking lot, etc. Many projects will have more than one project category designation, and will be required to implement each corresponding set of BMPs. For example, a commercial project that involves the building of a parking lot and the disturbance of 1 or more acres will be required to implement two sets of BMPs.

BMP Selection Process

There is no information available on City of San Diego's website regarding the methods used to select stormwater BMPs.

Application Process

The required stormwater BMPs are not specified in the construction stormwater permit, but applicants may download a stormwater BMP manual from the City of San Diego's Stormwater SWPPP website that provides detailed information about stormwater BMP requirements and provides guidance for selecting stormwater BMPs.[36]

The City of San Diego provides applicants with access to an interactive map that allows users to determine the location of 303(d) listed waterbodies. The map also specifies the pollutants that are causing impairment of 303(d) listed waterbodies. The City of San Diego also provides a BMP Selection Process matrix that lists the pollutant-specific removal efficiencies for each BMP.

Evaluating BMP Effectiveness at Permitted Sites

The City of San Diego assesses the "adequacy" of the stormwater BMPs implemented at construction activities according to whether the BMPs demonstrates compliance with the City's standards. The following is a list of performance standards that apply to construction BMPs:

Using pre-construction conditions as a standard, there must be no measurable increase in pollutant levels in stormwater runoff.

There must be no slope erosion.

The velocity of stormwater discharges must not exceed preconstruction velocities.

The natural hydrology of the site and riparian buffers must be preserved to the greatest extent possible.[37]

Evaluating BMP Effectiveness at Non-Permitted Sites

There is no information available on City of San Diego's website in regards to whether the city inspects construction activities that are not regulated on the stormwater permitting program.

<u>Colorado*</u>

Specific BMP Recommendations

The Colorado Department of Public Health and Environment (CDPHE) has not developed specific stormwater BMP recommendations or requirements for the purpose of managing stormwater discharges associated with construction activities.[38] CDPHE encourages applicants to select and install BMPs that are designed for the purpose of "source control." Planting vegetation and stabilizing exposed soil, thus preventing erosion, is more cost effective then treating sediment-laden stormwater which may be achieved by sediment settling basins.[39]

BMP Selection Process

The CDPHE does not require the installation of specific stormwater BMPs, but it does provide guidance that applicants must follow when selecting storm water and erosion control BMPs. Applicants are required to identify potential pollutant sources that will likely exist at their proposed construction sites and identify any pollutants that may be generated by these activities/sources. To assist applicants in their assessment of potential pollutant sources, the stormwater permit provides a long list of common pollutant sources. Applicants must then select BMPs that are designed to effectively remove these pollutants. The SWPPP must identify each practice that is likely to generate pollutants and list BMPs that will be installed to control these specific pollutants.[40]

Application Process
CDPHE's construction stormwater permit does not contain a list of recommended stormwater BMPs. The permit application does include a 19 page appendix with guidance for preparing a "stormwater management plan." The appendix includes links to stormwater BMP design manuals and provides information about training opportunities for BMP inspectors.[41] In addition, CDPHE refers permit applicants to a stormwater BMP manual compiled by the Urban Flood Control and Draining District, which is headquartered in Denver, Colorado. The manual contains BMP design criteria and guidance for selecting stormwater BMPs, and is "highly respected across the country."[42]

Evaluating BMP Effectiveness at Permitted Sites
CDPHE recommends that applicants refer to the "Analysis of Treatment System Performance" report available on the International Storm Water BMPs Database Program website.[43] The report is released annually by a consortium of consulting firms that have partnered with the American Society of Civil Engineers and the U.S. EPA, among others, which analyzes the effectiveness of stormwater BMPs. Monitoring data from all over the globe is submitted to the International Stormwater BMP database, which is utilized to assess the performance of the major categories of stormwater BMPs. The BMP categories include detention basin, biofilter, media filter, wetland basin, etc. The report provides comparative BMP performance results for major pollutants, including TSS, total Phosphorus, total Nitrogen, total Kjeldahl Nitrogen (TKN), and total Nitrate as Nitrogen, Lead, and Zinc.[44]

Evaluating BMP Effectiveness at Non-Permitted Sites
There is no information available on CDPHE's website in regards to whether the agency inspects construction activities that are not regulated under the stormwater permitting program.

<u>Connecticut</u>
Specific BMP Recommendations
The CT DEP requires operators to install specific stormwater BMP for the purpose of controlling stormwater discharges associated with construction activities.[45] CT DEP recommends specific stabilization practices including: silt fences, temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffer strips, and preservation of mature vegetation. CT DEP recommends structural practices including drainage swales, sediment traps, check dams, subsurface drains, pipe slope drains, level spreaders, storm drain inlet protection, and outlet protection.[46]

In addition to these BMP recommendations, CT DEP has developed erosion and sedimentation control minimum requirements. These requirements differ slightly depending on the number of acres disturbed. Large construction activities that disturb more than five acres are required to install sediment settling ponds. The sediment basins must have a storage volume of 134 cubic yards per acre drained. Small construction activities that disturb between 2 and 5 acres are required to install sediment swales, sediment mini-basins, or analogous sedimentation control BMPs. The sedimentation control BMPs must have a storage volume of 134 cubic yards per acre drained.[47,48]
Operators are required to install post-construction stormwater BMPs that are designed to remove suspended solids and oil and grease. CT DEP has developed a performance standard for post-construction stormwater BMPs that requires the removal of 80 percent of TSS from stormwater discharges. CT DEP recommends post-construction stormwater BMPs and control measures, including

stormwater detention structures, vegetated swales, vegetated buffers, sediment removal chambers, and "sequential systems (which combine several practices)."[49]

BMP Selection Process
CT DEP does not use models or other assessment tools to determine which BMPs should be recommended or to evaluate the effectiveness of proposed stormwater BMPs.[50] CT DEP has developed a stormwater BMP Manual, the "2004 Connecticut Stormwater Quality Manual" that provides detailed technical information about stormwater BMPs. The manual includes a chapter describing the selection criteria that SWPPP designers should consider when evaluating stormwater BMPs. The manual enables SWPPP designers to evaluate the effectiveness of stormwater BMPs by comparing the pollutant removal efficiencies for common stormwater BMPs. The manual also provides estimates of each stormwater BMP's run-off volume reduction effectiveness, stream protection effectiveness, and peak flow control effectiveness.[51] In addition, the manual evaluates stormwater BMPs in terms of: land use selection criteria, physical/site feasibility factors, downstream resource selection criteria, maintenance criteria, and winter and cold weather selection criteria. The information presented in the BMP manual enables the SWPPP designer to select the stormwater BMPs that are best suited to the unique physical conditions that exist at the proposed construction site.[52]

Application Process
CT DEP's NPDES construction stormwater general permit contains a list of both recommended and required stormwater BMPs. Operators may also refer to a stormwater BMP design manual that contains detailed information about both recommend and required stormwater BMPs.[53] The stormwater BMP Manual is available on CT DEP's website.

CT DEP has not developed an interactive electronic map tool that permit applicants can use to locate wetlands and/or outstanding resource waters or to determine whether a particular section of river is on the 303(d) list.

Evaluating BMP Effectiveness at Permitted Sites
CT DEP relied on agency studies, industry research, product specifications, and site inspections to evaluate the effectiveness of the recommended stormwater BMPs.[54]

Evaluating BMP Effectiveness at Non-Permitted Sites
CT DEP does not inspect construction activities that are not permitted under a stormwater permitting program.

Florida

Specific BMP Recommendations:
The Florida Department of Environmental Protection (FL DEP) has transferred permitting authority to four of the five regional Water Management Districts (WMDs). In addition to following the requirements specified in FL DEP's construction stormwater permit, operators must adhere to any special requirements developed by the WMDs. Each water management district has developed its own BMP design manual that outlines the storm water BMPs and controls measures considered most effective and appropriate given the unique physical conditions (i.e., geographic and hydrologic) of each WMD.

The agency's minimum requirements pertaining to sediment basins and discharge outlets are nearly identical to the requirements outlined in the U.S. EPA's general stormwater permit. In addition to these specific BMP requirements, the construction stormwater permit contains a list of stormwater BMPs that operators can implement on a voluntary basis.[55]

Application Process
According to the survey respondent, FL DEP's construction stormwater permit recommends specific stormwater BMPs that operators may implement on a voluntary basis. In addition, operators may also utilize the agency's stormwater BMP manual, "Erosion and Sedimentation Control Designer and Reviewer Manual," which provides guidance for selecting stormwater BMPs. The manual also contains detailed information including design specifications for dozens of stormwater BMPs.[56] Furthermore, the agency has developed an interactive electronic map tool that permit applicants can use to locate wetlands and outstanding resource waters (ORWs) or to determine whether a particular section of river or lake is on the 303(d) list.

Evaluating BMP Effectiveness at Permitted Sites
There is no information available on FL DEP's website regarding the methods used to evaluate the performance and effectiveness of stormwater BMPs.

Evaluating BMP Effectiveness at Non-Permitted Sites
FL DEP does not inspect construction activities that are not regulated under the agency's stormwater permitting program.

<u>Indiana</u>
Specific BMP Recommendations
The general NPDES permit authorizing stormwater discharges associated with construction activities does not recommend specific BMPs, but it does recommend certain performance objectives. BMPs must be implemented to reduce sediment run-off and to minimize the discharge of construction debris, garbage, wastewater, and concrete truck washout to surface waters.[57]

BMP Selection Process
According to the survey respondent, IDEM does not rely on models or other assessment tools to evaluate the effectiveness of stormwater BMPs.

Application Process
IDEM's construction stormwater permit does not contain a list of stormwater BMPs, although permit applicants may utilize the agency's stormwater BMP manual, "Indiana Storm Water Quality Manual." The manual contains guidance for developing a SWPPP, as well as technical information pertaining to erosion and sedimentation control BMPs, NPS BMPs, and post-construction BMPs.[58] The agency has also provided a link to the Illinois Natural Resources Conservation Service's "Illinois Urban Manual."[59] IDEM has not developed an interactive electronic map tool that permit applicants can use to locate bodies of water on the state's 303(d) list.

Evaluating BMP Effectiveness at Permitted Sites
There is no information available regarding the methods IDEM utilizes to evaluate the effectiveness of stormwater BMPs.

Evaluating BMP Effectiveness at Non-Permitted Sites
IDEM does not inspect construction activities that are not regulated under the agency's construction stormwater permitting program.

<u>Iowa</u>
Specific BMP Recommendations
IA DNR's construction stormwater permit does contain recommended stabilization practices, structural practices, and stormwater management practices. The requirements that pertain to sediment basins are nearly identical to the requirements specified in the U.S. EPA's construction stormwater permit. Recommended stormwater management practices include stormwater detention structures, stormwater retention structures, and flow attenuation structures. The permit also specifies a performance standard for stormwater management structures that operators are encouraged to uphold, although the standard is not enforced. The performance standard sets a TSS removal efficiency of 80% for flows that exceeds predevelopment levels.[60]

BMP Selection Process
There is no information available regarding the methods IA DNR uses to evaluate the effectiveness of stormwater BMPs.

Application Process
IA DNR's construction stormwater permit contains a list of stormwater BMPs that operators may choose to install on a voluntary basis. In addition, permit applicants have access to IA DNR's "Iowa Construction Site Erosion Control Manual," which contains detailed information about recommended erosion control measures and stormwater BMPs that operators can utilize to fulfill regulatory requirements.[61]

Evaluating BMP Effectiveness at Permitted Sites
IA DNR does conduct inspections of construction activities to evaluate stormwater BMP performance and permit compliance. Construction activities that discharge to MS4s may be subject to inspections by IA DNR as well as authorized representatives from the MS4.[62]

Evaluating BMP Effectiveness at Non-Permitted Sites
IA DNR does not inspect or monitor construction activities that are not regulated under the agencies construction stormwater permitting program.

<u>Illinois</u>
Specific BMP Recommendations
The Illinois Environmental Protection Agency (IL EPA) recommends specific stabilization practices and structural practices for the purpose of erosion control. Some of the recommended stabilization practices listed in the agency's construction stormwater permit include temporary seeding, permanent seeding,

mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, and preservation of mature vegetation. Additionally, the agency lists recommended structural practices including sediment traps, check dams, pipe slope drains, level spreaders, storm drain inlet protection, rock outlet protection, reinforced soil retaining systems, gabions, and sediment basins.[63]

BMP Selection Process
There is no information available regarding the methods IL EPA utilizes to determine which BMPs to recommend.

Application Process
IL EPA's construction stormwater general permit contains lists of stormwater BMPs that operators may choose to install on a voluntary basis. In addition, operators may refer to the IL EPA's "Illinois Urban Manual," which provides guidance for choosing appropriate stormwater BMPs and developing effective SWPPPs.[64]

Evaluating BMP Effectiveness at Permitted Sites
There is no information available regarding the methods IL EPA utilizes to evaluate the effectiveness of stormwater BMPs.

Evaluating BMP Effectiveness at Non-Permitted Sites
There is no information available to determine whether IL EPA evaluates the effectiveness of stormwater BMPs installed at construction activities that are not permitted under the agency's construction stormwater permitting program.

<u>Kansas</u>

Specific BMP Recommendations
For construction activities that disturb 10 or more acres, operators must install sedimentation basins with a minimum of 3,600 cubic feet of storage capacity per acre drained. KDHE's construction stormwater permit does not specify any additional stormwater BMP requirements or recommendations. The permit does list stormwater BMPs that operators may choose to install on a voluntary basis, including possible structural BMPs and non-structural BMPs.[65] KDHE does not, however, endorse or recommend specific stormwater BMPS.

BMP Selection Process
KDHE does not use models or other assessment tools to determine which BMPs should be recommended or to evaluate the effectiveness of stormwater BMPs.

Application Process
KDHE's NPDES construction stormwater general permit contains lists of stormwater BMPs that operators may choose to install. KDHE encourages permit applicants to refer to a stormwater BMP manual developed by the U.S. EPA which is available for download on KDHE's website. The manual provides guidance for selecting and installing stormwater BMPs.[66] KDHE has not developed an interactive electronic map tool that permit applicants can use to locate wetlands and/or outstanding resource waters or to determine whether a particular section of river is on the 303(d) list.

Evaluating BMP Effectiveness at Permitted Sites
KDHE reviews the SWPPPs for each proposed construction activity before issuing an NPDES construction stormwater permit.

Evaluating BMP Effectiveness at Non-Permitted Sites
KDHE does not assess the effectiveness of stormwater BMPs installed at construction activities that are not permitted under the NPDES construction stormwater permit program.

<u>Louisiana</u>
Specific BMP Recommendations
The Louisiana Department of Environmental Quality (LA DEQ) has not developed specific stormwater BMP recommendations or requirements for the purpose of managing stormwater discharges associated with construction activities.[67] The construction stormwater general permit does contain a list of possible erosion and sedimentation controls that operators may utilize as part of their SWPPPs. The list of practices is similar to the list of erosion and stabilization practices specified in the U.S. EPA's "NPDES General Permit for Stormwater Discharges for Construction Activities."[68]

BMP Selection Process
LA DEQ does not use models or other assessment tools to determine which BMPs should be recommended or to evaluate the effectiveness of stormwater BMPs.[69]

Application Process
LA DEQ's stormwater permit application does not contain a list of stormwater BMPs, and there is no reference or link to a stormwater BMP manual on LA DEQ's Louisiana Pollutant Discharge Elimination System Permit website.

LA DEQ has not developed an interactive electronic map that permit applicants can use to locate wetlands and/or outstanding resource waters or to determine whether a particular section of river is on the 303(d) list.[70]

Evaluating BMP Effectiveness at Permitted Sites
The LA DEQ performs site inspections in an effort to evaluate the condition and effectiveness of stormwater BMPs.[71]

Evaluating BMP Effectiveness at Non-Permitted Sites
The LA DEQ performs site inspections at construction activities that are not permitted under the construction stormwater permitting program, and these site inspections are performed in order to evaluate the effectiveness of stormwater BMPs.[72]

<u>Massachusetts</u>
Specific BMP Recommendations
MA DEP does not have NPDES primacy, and the U.S. EPA issues the "NPDES general permit for stormwater discharges from construction activities." The general permit requires the installation of

sediment basins and additional stormwater BMPs for the purpose of “erosive velocity control, post-construction management, erosion control and stabilization, etc.”[73] The agency also recommends that operators install stormwater BMPs included in the “Massachusetts Stormwater Handbook,” although the installation of these BMPs is voluntary.[74]

For construction activities that disturb 10 or more acres, operators must install sedimentation basins capable of storing the run-off produced by a 2-year, 24-hour storm. If the installation of a temporary sediment basin or analogous BMP is not feasible, then operators must install smaller sediment basins or sediment traps. In addition to sediment traps, operators must install silt fences, vegetative buffer strips, or analogous sediment control BMPs on all down slope boundaries and at side slope boundaries where appropriate.[75]

For construction activities that disturb less than 10 acres, operators must at a minimum, install silt fences, vegetative buffer strips, or analogous sediment control BMPs on all down slope boundaries and on side slope boundaries where appropriate. As an alternative, operators may choose to install a sediment basin capable of storing the runoff generated by a 2-year, 24-hour storm event.[76] Additional stormwater and erosion and sedimentation control BMPs are specified in the permit.[77]

BMP Selection Process

There is no information available regarding the process used to select the stormwater BMPs specified in the construction stormwater permit.

Application Process

Permit applicants may download the “Massachusetts Stormwater Handbook” which includes a chapter on structural stormwater BMPs. The manual profiles many different stormwater BMPs, and each profile includes information about advantages/disadvantages, design specifications, site constraints, maintenance procedures, applicability, etc. When possible, removal efficiencies for appropriate pollutants are also included in the profiles of each stormwater BMP.[78]

The MA DEP maintains an interactive map that allows permit applicants and other public users to determine the locations of 303(d) listed waterbodies, wetlands, and outstanding resource waters.

Evaluating BMP Effectiveness at Permitted Sites

There is no information available regarding the process used to assess the effectiveness of stormwater BMPs specified in the construction stormwater permit.

Michigan

Specific BMP Recommendations

MI DEQ's construction stormwater permit does not require the installation of specific stormwater BMPs. MI DEQ has developed three different manuals that contain detailed information about recommended stormwater BMPs including the "BMP Manual," the "Construction Stormwater Manual," and the "Soil Erosion and Sedimentation Control Manual."[79]

BMP Selection Process

MI DEQ does not use models or other assessment tools to determine which BMPs should be recommended or to evaluate the effectiveness of stormwater BMPs.

Application Process

MI DEQ's stormwater permit application does not contain a list of stormwater BMPs, although permittees may refer to one or more of the agency's aforementioned stormwater BMP manuals. The manuals contain technical information about stormwater BMPs and erosion and sedimentation control BMPs.

MI DEQ has not developed an interactive electronic map that permit applicants could use to locate wetlands and/or outstanding resource waters or to determine whether a particular section of river is on the State of Michigan's 303(d) list.

Evaluating BMP Effectiveness at Permitted Sites

MI DEQ performs site inspections to ensure that stormwater BMPs are being maintained properly and are performing effectively. Inspectors will visually observe stormwater discharges at discharge outlets and observe the condition of receiving waterbodies. Inspectors will also evaluate the condition of stormwater BMPs to ensure proper installation and maintenance

Evaluating BMP Effectiveness at Non-Permitted Sites

MI DEQ will inspect non-permitted construction activities if the agency received complaints from the public.

Minnesota

Specific BMP Recommendations

The Minnesota Pollution Control Agency (MPCA) construction stormwater permit contains a set of minimum requirements that apply to construction activities that disturb more than 10 acres, including the requirement that construction activities of this scale install sediment basins. The requirements pertaining to sediment basins are nearly identical to those outlined in the U.S. EPA's general stormwater permit.[80]

Construction activities that are located within 1 mile of specially designated waterbodies may be required to install specific best management practices as dictated by MPCA. The specific BMPs that an operator may be required to install vary depending on the type of waterbody that the construction activity is discharging to. Special waterbodies include the Mississippi River, recreational rivers, trout streams, "scientific areas," and 303(d) listed impaired waterbodies.[81]

The following is a list of BMPs that may be required at construction activities that discharge stormwater to special or impaired waterbodies.[82]

1. Exposed soil must be covered and stabilized within seven days after work has been completed.
2. Post-Construction BMPs: Operators must install permanent stormwater management systems to treat 1 inch of runoff discharged from newly construction impervious surfaces. If possible, a minimum of 0.5 inches of runoff must be infiltrated.
3. A buffer zone separating the construction site from the special waterbody must be implemented.
4. Enhanced runoff controls: The permanent stormwater management system must be designed such that the pre and post-construction run-off volumes are the same for a 1 or 2 year 24-hour rainfall event.
5. Temperature controls for discharges to trout waters are required.

For construction activities that discharge stormwater to trout streams, MPCA provides operators with the option of installing one or more specific BMPs.[83]

1. Minimize the area of new impervious surfaces.
2. Minimize discharges from impervious surfaces by directing stormwater discharges to vegetated areas such as grass swales.
3. Use infiltration or evapotranspiration to divert stormwater discharges that are in excess of pre-project conditions away from trout streams.
4. When ponding is used as a stormwater BMP, operators must maximize shading and filtered bottom withdrawals. Vegetated swales should be installed at discharge outlets and the pond should be able to draw down in 24 hours or less.

Riparian buffers:
Riparian buffers are considered a BMP under MPCA's general construction stormwater permit, and construction activities that discharge stormwater to special water bodies may be required to maintain the riparian buffers lining streams, rivers, and lakes. According to the general permit, the depth of the riparian buffer must be maintained at a minimum of 100 feet. Riparian buffers retard the flow of stormwater runoff and promote infiltration, which reduces pollutant discharges to lakes and streams.[84]

BMP Selection Process
There is no information available regarding the process MPCA uses to select the stormwater BMPs specified in the agency's construction stormwater permit.

Application Process
As previously mentioned, MPCA construction stormwater permit contains a list of required stormwater BMPs that operators are required to install. In addition, MPCA directs permit applicants to an interactive web-based mapping system, available on the agency's website that allows users to identify all "special" and impaired waterbodies in the vicinity of their construction sites. The program allows users to retrieve information about the specific BMP requirements that correspond with each special waterbody. Permit applicants may also download one or more stormwater BMP manuals that MPCA has published on their website, including the "Minnesota Stormwater Manual.," and "Protection Water Quality in Urban Areas- A Manual."[85] [86]

Evaluating BMP Effectiveness at Permitted Sites
Operators are required to inspect erosion and sedimentation control BMPs to ensure that the controls are operating effectively. If a defective stormwater BMP is discovered, operators are required to replace or repair the control within 24 hours. BMP inspections are to be performed by permittees.[87]

MPCA also performs its own inspections of construction activities to evaluate the effectiveness of stormwater BMPS.

Evaluating BMP Effectiveness at Non-Permitted Sites
There is no information available in regards to whether MPCA inspects construction activities that are not regulated under the agency's construction stormwater permitting program.

<u>Montana</u>
Specific BMP Recommendations
MT DEQ has not developed Specific BMP Recommendations or requirements for the purpose of regulating stormwater discharges associated with construction activities.[88] MT DEQ's permit does however list stormwater BMPs that permit applicants should consider when developing their SWPPPs. The permit contains a list of possible stabilization measures, which includes: temporary seeding, permanent seeding, mulching, sod stabilization, vegetative buffer/filter strips, and grassed waterways. The permit also contains a list of possible structural measures for the purpose of diverting stormwater away from exposed soil. Some of the structural measures include: straw bale dikes, sediment control (silt) fences, earth dikes, brush barriers, drainage swales, check dams, subsurface drains, pipe slope drains, rock outlet protection, and drain inlet and outlet protection. The stormwater permit also contains a list of possible post-construction stormwater BMPs that should be considered, including stormwater detention structures and stormwater retention structures.[89]

BMP Selection Process
MT DEQ does not use models or other assessment tools to determine which stormwater BMPs should be recommended or to evaluate the effectiveness of BMPs.

Application Process
MT DEQ has not developed stormwater BMP requirements, although the agency's stormwater permit does contain lists of BMPs that applicants are encouraged to install on a voluntary basis. MT DEQ does encourage permit applicants to refer to the U.S. EPA's National Menu of Stormwater Best Management Practices website, which provides detailed technical information about recommended BMPs.[90]

MT DEQ has not developed an interactive electronic map that permit applicants can use to locate wetlands or outstanding resource waters or to determine whether a particular section of river is on the 303(d) list.

Evaluating BMP Effectiveness at Permitted Sites
MT DEQ performs site inspections to ensure that stormwater BMPs have been installed correctly and are being maintained properly. MT DEQ will only evaluate the effectiveness of a stormwater BMP as part of an investigation following a BMP failure; MT DEQ inspectors do not normally evaluate BMP

effectiveness during routine site inspections. Furthermore, MT DEQ does not evaluate the "adequacy" of stormwater BMPs during the review of SWPPPs.[91]

Evaluating BMP Effectiveness at Non-Permitted Sites

MT DEQ does not inspect construction activities that are not permitted under the stormwater permitting program.[92]

New York

Specific BMP Recommendations

The New York Department of Environmental Conservation (NYSDEC) requires operators to install erosion controls and stormwater BMPs that comply with design standards outlined in the agency's "New York Standards and Specifications for Erosion and Sedimentation Control."[93] In addition, construction activities located within three specific watersheds are required to implement erosion and sedimentation controls as well as stormwater BMPs that comply with "enhanced phosphorus removal standards," as outlined in the New York Stormwater Management Design Manual.[94] All construction activities located within the boundaries of the New York City Watershed are required to comply with this requirement.[95]

BMP Selection Process

The "New York Stormwater Management Design Manual" provides a list of "acceptable stormwater management practices (SMPs) that applicants are encouraged to implement at their constructions activities. The SMPs were selected because they meet certain performance standards and design criteria. All SWPs characterized in the manual meet the following performance standards and criteria:[96]

1. Can capture and treat the full water quality volume.
2. Exhibit an 80% TSS removal efficiency and a 40% total phosphorus removal efficiency.
3. Demonstrate "acceptable longevity in the field."
4. Include a built-in pretreatment mechanism.

Application Process

Although NYSDEC's construction stormwater permit does not contain a list of recommended stormwater BMPs, permit applicants may download the "New York Stormwater Management Design Manual," which contains detailed information about recommended erosion controls and stormwater BMPs. The manual includes a selection tool that SWPPP designers can utilize when selecting appropriate stormwater BMPs. The selection tool consists of five matrices, and designers are instructed to move from one selection matrix to the next. Each matrix is devoted to a different selection criterion. The land-use selection matrix allows SWPPP designers to choose stormwater BMPs based on whether they are more appropriate for residential construction activities or "ultra urban" construction activities. The stormwater management capability matrix allows designers to evaluate stormwater BMPs based on pollutant removal efficiency and "channel protection." The five selection matrices include land use, physical feasibility, watershed/regional factors, stormwater management capability, and community and environmental factors.[97]

Evaluating BMP Effectiveness at Permitted Sites

Operators are required to perform regular inspections to ensure that stormwater BMPs are performing effectively.[98] This is required of all permitted construction activities, including those permitted activities located within the New York City Watershed east of the Hudson River that disturb between 5000 square feet and 1 acre.

Evaluating BMP Effectiveness at Non-Permitted Sites
There is no information available with regard to whether NYSDEC requires inspections at construction activities that are not permitted under the agency's construction stormwater permitting program.

North Carolina:
Specific BMP Recommendations
If NC DENR determines that a construction activity is likely to generate stormwater discharges that may lead to nonattainment of water quality standards, NC DENR may require the operator to apply for 401 Water Quality Certification. Construction activities that are regulated under the 401 Quality Certification program may be subject to specific stormwater BMP requirements.[99]

NC DENR's construction stormwater permit does not require the installation of specific stormwater BMPs, although applicants are encouraged to implement BMPs presented in the agency's stormwater BMP manual that is available on the North Carolina Division of Water Quality's website.[100] The stormwater BMP Manual can be used to determine which stormwater regulatory requirements a construction activity may be subject to under the agency's stormwater permitting program, as regulatory requirements differ depending on the watershed and proximity to outstanding resource waters (ORW) and saltwater bodies.[101] In addition, the stormwater BMP Manual provides detailed information about stormwater BMPs, including pollutant removal efficiencies, design specifications, maintenance requirements, etc.[102]

Construction activities that are located within the Neuse River Basin must adhere to the requirements of the Neuse River Basin Nutrient Sensitive Waters Management Strategy. The primary objective of the Neuse stormwater program is to reduce the nitrogen load of stormwater discharges, and operators are required to install nitrogen-reducing BMPs or purchase nitrogen credits from the Ecosystem Enhancement Program (EEP) in order to achieve a "computed post-development nitrogen load of 3.6 lb/ac/yr."[103]

Construction activities that discharge stormwater to a freshwater outstanding resource water (ORW) are subject to a different set of regulatory requirements specified under the Outstanding Resource Waters section of the North Carolina Administrate Code.[104] According to the rule, operators must choose to follow a low density development scheme or a high density development scheme. The low density option requires that stormwater runoff be transported by "vegetated conveyances" and the conveyance system must not include a "discrete stormwater collection system."[105] Furthermore, operators that choose the low density option must preserve at least a 30 foot wide vegetative buffer between the construction activity and the outstanding resource water (ORW). The high density option requires the installation of detention ponds or an alternative stormwater control BMP. Furthermore, the stormwater collection systems must be designed to control runoff generated by a one inch rainfall event.[106] Stormwater BMP requirements do not vary according to the size of the construction activity.

BMP Selection Process
NC DENR does not use models or other assessment tools to determine which stormwater BMPs to recommend or to evaluate the effectiveness of stormwater BMPs.

Application Process
NC DENR directs permit applicants to an "interactive web-based mapping system" that allows users to determine whether their construction activities are subject to the terms of the post-construction permitting program and/or other "storm water permitting requirements."[107, 108]

Recommended stormwater BMPs are not listed in the agency's construction stormwater permit, but BMP recommendations and pertinent BMP specifications can be found in a stormwater BMP Manual that is available on the North Carolina Division of Water Quality's website.[109]

Evaluating BMP Effectiveness at Permitted Sites
NC DENR relies upon industry research and its own agency studies to evaluate BMP effectiveness.[110]

Evaluating BMP Effectiveness at Non-Permitted Sites
NC DENR does not inspect construction activities that are not permitted under its stormwater permitting programs, and the agency does not determine the effectiveness of stormwater BMPs at non-permitted construction activities.[111]

North Dakota

Specific BMP Recommendations
ND DoH's construction stormwater permit contains a list of erosion and sedimentation control practices that operators are required to install when appropriate. The requirements pertaining to sediment basins and discharge outlets are nearly identical to the requirements outlined in the U.S. EPA's general stormwater permit. ND DoH has included more definitive requirements that pertain to vegetative buffers. For every 125 feet of disturbed land draining to a vegetative buffer, the buffer must have a minimum width of 25 feet. The buffer's slope must not exceed 5%, while the area of disturbance must not have a slope in excess of 6%. The buffer must be planted with grassy vegetation that is 3 to 12 inches tall and no more than 10% of the buffer may consist of woody vegetation.[112]

BMP Selection Process
ND DoH does not use models or other assessment tools to determine which BMPs should be recommended or to evaluate the effectiveness of stormwater BMPs.

Application Process
Recommended stormwater BMPs are listed in the agency's construction stormwater permit. Operators may also refer to ND DoH's stormwater BMP manual, "A Guide to Temporary Erosion Control Measures for Contractors, Designers, and Inspectors," which provides guidance for selecting stormwater BMPs. The manual also contains detailed information including design specifications for dozens of stormwater BMPs.[113]

Evaluating BMP Effectiveness at Permitted Sites
ND DoH relies on site inspections to evaluate the effectiveness of stormwater BMPs.

Evaluating BMP Effectiveness at Non-Permitted Sites
According to the survey respondent, ND DoH does monitor the condition and effectiveness of stormwater BMPs at construction activities that are not regulated under the agency's stormwater permitting program. The agency monitors these non-permitted activities through "wet weather observations."[114]

Ohio

Specific BMP Recommendations
OH EPA has developed three different construction stormwater permits--a general construction stormwater permit, and two alternative construction stormwater permits that were specifically developed for construction activities located within the Olentangy and Big Darby Watersheds.[115]

OH EPA's construction stormwater general permit requires operators to install sediment settling basins if certain conditions are met. A sediment settling basin may be required if the proposed construction activity is likely to disturb 10 or more acres or if the volume of stormwater run-off from the drained area exceeds the "design capacity of silt fences or other sediment barriers." If operators are required to install sediment settling basins, the sediment basin's dewatering zone must have a storage volume of 1800 cubic feet per acre drained. In addition, the dewatering zone must have a minimum drain time of 48 hours.[116]

According to the alternative stormwater permit developed for the Olentangy watershed, sediment settling ponds are only required if the proposed construction activity is likely to disturb 10 or more acres or if the volume of stormwater run-off exceeds the "design capacity of silt fences or other sediment barriers." Sediment settling basins must have a storage volume of 134 cubic yards per acre of drained. In addition, OH EPA has developed a performance standard for sediment settling basins installed in the Olentangy watershed. The level of TSS in the discharge must not exceed 45 mg/l for a 24 hour, 0.75-inch rainfall event. The alternative stormwater permit also requires operators to install silt fences or analogous erosion and sediment control BMPs at construction activities that disturb less than 5 acres. The silt fences must be installed on "level contour down slopes."[117]

Both the general permit and the alternative permits include a list of recommended post-construction stormwater BMPs. Operators that choose to install one or more of these recommended stormwater BMPs are encouraged to adhere to the design standards that are specified in the permit. OH EPA specifies a target "drain time" for each recommended post-construction BMP, and this measure serves as a design standard.[118, 119] Operators are allowed to install alternative stormwater BMPs, but OH EPA will only approve alternative BMPs if the operator can demonstrate that the alternative BMP can achieve a minimum TSS removal efficiency of 80%.[120]

The alternative stormwater permit developed for the Olentangy watershed also specifies Riparian Setback Requirements. These requirements only apply when a construction activity discharges stormwater to a perennial or intermittent stream.[121] The stormwater general permit has a similar requirement that applies to construction activities that discharge to surface waters. According to the general permit, the recommended setback distance between the high water mark and the construction activity's boundary is

25 feet. Operators are encouraged to preserve the riparian habitat within this protected area, thus allowing the undisturbed area to serve as a buffer.[122]

BMP Selection Process
OH EPA works with the Ohio Department of Natural Resources and relies on various stormwater BMP design manuals when evaluating stormwater BMPs and deciding which BMPs to recommend. OH EPA does not utilize models or other assessment tools when evaluating the effectiveness of proposed stormwater BMPs.

Application Process
OH EPA's construction stormwater general permits contain lists of required stormwater BMPs. Permit applicants may also refer to the "Rainwater and Land Development Manual," which provides guidance for selecting stormwater BMPs.

Evaluating BMP Effectiveness at Permitted Sites
OH EPA relies upon industry research and its own site inspections to evaluate the effectiveness of stormwater BMPs.

Evaluating BMP Effectiveness at Non-Permitted Sites
OH EPA does not inspect construction activities that are not permitted under the NPDES stormwater permitting program.

<u>Oregon</u>
Specific BMP Recommendations
OR DEQ recommends specific stormwater BMPs which operators can implement on a voluntary basis. Stormwater BMP recommendations and requirements are the same for all types of construction activities, and the recommendations do not vary according to number of acres disturbed.

The construction stormwater permit recommends specific run-off controls, erosion prevention methods, and sediment controls. The recommended run-off controls include: slope drains, energy dissipaters, temporary diverse dikes, and grass-lined channels. The permit also recommends erosion prevention methods, including clearing and grading practices, and vegetative erosion control practices. In addition, the permit recommends specific sediment controls including peripheral erosion and sediment controls, and practices for reducing sediment tracking.[123]

If a construction activity discharges to an impaired water body with a Total Maximum Daily Load (TMDL) for sedimentation or turbidity, the construction operator two options.

First, the operator may monitor the stormwater discharge for turbidity and compare the turbidity to a benchmark value of 160 Nephelometric Turbidity Units (NTUs). If the level of turbidity in the stormwater discharge is greater than the benchmark value, the operator must evaluate the effectiveness of their erosion and sedimentation control plan (ESCP) and address any inadequacies. If the supplemental BMPs and other improvements fail to reduce turbidity, then the operator must install one or more approved stormwater BMPs.[124]

Second, the permittee may forego the monitoring and install one or more approved stormwater BMPs.[125] The approved stormwater BMPs include: compost berms, erosion control mats, and vegetative buffers. Operators may also choose to install trackifiers, which are used in combination with perimeter sediment control BMPs. Finally, operators may choose to treat stormwater discharges with electro-coagulation.[126]

BMP Selection Process

Operators are required to explain their reasoning for selecting the stormwater BMPs that are included in their SWPPP. OR DEQ does not use models to evaluate the effectiveness of stormwater BMPs.[127]

Application Process

The OR DEQ's NPDES construction stormwater general permit contains a list of recommended stormwater BMPs that operators are encouraged to implement at their construction activities.[128]

OR DEQ has developed specific stormwater BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies that are impaired due to sediment or turbidity. OR DEQ provides permit applicants with access to an electronic map that provides the location of 303(d) listed waterbodies that are impaired due to sediment or turbidity.[129]

Evaluating BMP Effectiveness at Permitted Sites

OR DEQ performs site inspections in order to evaluate the effectiveness of stormwater BMPs. OR DEQ also requires operators to inspect and evaluate the performance of erosion and sedimentation control BMPs. Operators are required to inspect stormwater discharges for sediment or turbidity, and if the qualitative assessments reveal significant amounts of sediment, additional erosion and sedimentation control BMPs must be installed and/or deficiencies must be addressed.[130]

Evaluating BMP Effectiveness at Non-Permitted Sites

OR DEQ does not inspect construction activities that are not permitted under the NPDES stormwater permitting program.

<u>South Carolina</u>

Specific BMP Recommendations

The South Carolina Department of Health and Environmental Control's (SC DHEC) minimum requirements pertaining to sediment basins and discharge outlets are nearly identical to the requirements outlined in the U.S. EPA's general stormwater permit. Besides these minimum controls, the permit does not contain a list of recommended stormwater BMPS.

SC DHEC has developed a BMP performance standard in the form of a removal efficiency goal. Construction activities that disturb 10 or more acres are required to install sediment basins that achieve removal efficiencies of 80% for TSS or peak settleable concentrations of 0.5 ml/L. Construction activities that disturb 5 or more acres are also encouraged to implement stormwater and erosion control BMPs that collectively achieve the same removal efficiency goal of 80% for TSS.[131]

SC DHEC requires permittees to identify pollutant sources associated with activities occurring off-site that supply the permitted construction activity with materials. This includes concrete plants and asphalt production plants. The SWPPP must describe control measures and stormwater BMPs that will be implemented to manage stormwater discharges at these additional sites.

BMP Selection Process

SC DHEC relies at least in part, on a report published in 1993 by researchers at Clemson University that evaluates the effectiveness of different categories of nonpoint source best management practices (BMPs). In some cases, the researchers assessed the effectiveness of stormwater and erosion control BMPs by measuring pollutant removal efficiencies. The researchers also provided a detailed discussion of the advantages and disadvantages of each BMP category.

Application Process

SC DHEC's construction stormwater permit does not contain a list of recommended stormwater BMPs, although permit applicants are encouraged to use the agency's "South Carolina DHEC Storm Water Management BMP Handbook," which provides detailed information about erosion prevention BMPs, sedimentation control BMPs, and post-construction stormwater controls. Furthermore, applicants are encouraged to refer to the agency's list of 303(d) listed waterbodies in order to determine the status of waterbodies that their construction activity might discharge to.

Evaluating BMP Effectiveness at Permitted Sites

Operators that are responsible for construction activities that disturb 10 or more acres are required to prepare monthly Erosion Prevention and Sediment Control reports.[132] Operators are required to identify any erosion control BMPs that aren't functioning properly and describe adverse impacts that may have been suffered as a result of deficient BMPs. The reports must be submitted to the SC DHEC. For construction activities that disturb less than 10 acres, operators are still required to prepare monthly reports that must be made available to SC DHEC upon request.[133]

Evaluating BMP Effectiveness at Non-Permitted Sites

There is no information available to determine whether SC DHEC evaluates the effectiveness of stormwater BMPs installed at construction activities that are not permitted under the agency's construction stormwater permitting program.

<u>Texas</u>

Specific BMP Recommendations

TCEQ recommends BMPs for the purpose of regulating stormwater discharges associated with construction activities.[134] The stormwater BMP recommendations are the same for all types of construction activities, and the recommendations do not vary according to number of acres disturbed.[135] TCEQ has developed an erosion control BMP manual that provides detailed information about recommended erosion control BMPs including information about installation.[136] TCEQ also encourages permit applicants to refer to the stormwater BMP recommendations and technical information that is available through the International Stormwater BMP Database.[137] Operators that are planning to develop land on the "recharge, transition, or contributing zones of the Edwards Aquifer" are encouraged to use a technical guidance manual that was developed by TCEQ. The manual provides detailed technical information about appropriate stormwater BMPs.[138]

BMP Selection Process
TCEQ does not use models or other assessment tools to evaluate stormwater BMPs or to determine which BMPs should be recommended.

Application Process
Recommended stormwater BMPs are not listed in the NPDES construction stormwater permit, but permit applicants may download an erosion control BMP manual developed by TCEQ or refer to the International Stormwater BMP Database, both of which provide detailed technical information about recommended BMPs.

TCEQ has developed an interactive electronic map that permit applicants can use to locate impaired streams and rivers on the 303(d) list.

Evaluating BMP Effectiveness at Permitted Sites
There is no information available regarding TCEQ's procedure for evaluating the effectiveness of stormwater BMPs.

Evaluating BMP Effectiveness at Non-Permitted Sites
TCEQ does not inspect construction activities that are not permitted under the construction stormwater permitting program.[139]

<u>Utah</u>
Specific BMP Recommendations
According to the survey respondent, UT DEQ has not developed specific BMP requirements for the purpose of controlling stormwater associated with construction activities.[140] UT DEQ's construction stormwater permit does contain a list of stabilization practices that includes the following BMPs: permanent seeding, mulching, geo-textiles, sod stabilization, vegetative buffer strips, protection of trees, and preservation of mature vegetation. Furthermore, for construction activities that disturb more than 10 acres, operators are strongly encouraged to install temporary sediment basins with 3,600 cubic feet of storage capacity per acre drained. For construction activities that disturb less than 10 acres, operators are encouraged to install at a minimum, silt fences, vegetative buffer strips, or analogous sedimentation control BMPs on all down slope boundaries.[141]

BMP Selection Process
UT DEQ does not use models or other assessment tools to determine which stormwater BMPs should be recommended or to evaluate the effectiveness of BMPs.[142]

Application Process
UT DEQ's website includes a link to the U.S. EPA's National Menu of Stormwater Best Management Practices website, which provides detailed technical information about recommended stormwater BMPs.[143] UT DEQ has not developed an interactive electronic map that permit applicants can use to locate wetlands and/or outstanding resource waters or to determine whether a particular section of river is on the 303(d) list.[144]

Evaluating BMP Effectiveness at Permitted Sites

UT DEQ relies on site inspections to assess whether stormwater BMPs are being maintained properly and are performing effectively.[145]

BMP Effectiveness: Non-permitted sites

UT DEQ does not inspect construction activities that are not permitted under the stormwater permitting program.[146]

<u>Vermont</u>

Specific BMP Recommendations

VT DEC has developed specific stormwater BMP requirements that operators are required to follow.[147] The BMP requirements do not vary according to the type of construction activity undertaken, although the requirements do vary according to the number of acres disturbed.[148] VT DEC requires permit applicants to complete a Risk Evaluation, which will determine their construction activities' risk category. Construction activities are either labeled "low risk" or "moderate risk," and there are a different set of permit requirements associated with each risk categorization.[149] Low risk construction activities are required to install the stormwater BMPs and erosion and sedimentation controls that are presented in the "Low Risk Site Handbook for Erosion Prevention and Sediment Control."[150] The manual contains simplified information about the BMPs, including installation and maintenance information. The manual also provides photographs of BMPs that have been properly installed and maintained and BMPs that have not been properly installed.

Moderate risk construction activities are required to follow the guidelines presented in "The Vermont Standards and Specification for Erosion Prevention and Sediment Control" manual. This manual provides standards and specifications for erosion prevention BMPs and sediment control BMPs.[151]

BMP Selection Process

VT DEC gathered information from the New York Department of Conservation's BMP manual when developing stormwater BMP requirements.[152] VT DEC does not utilize models or related assessment tools to evaluate the effectiveness of stormwater BMPs.

Application Process

The required stormwater BMPs are not included in the construction stormwater permit, but applicants may download stormwater BMP manuals from VT DEC's website that provide technical information that SWPPP designers and operators are required to follow when selecting and installing stormwater BMPs.[153, 154]

The VT DEC has developed an interactive electronic map that permit applicants can use to locate 303(d) listed streams and rivers and outstanding resource waters (ORW). The electronic map primarily shows the locations of 303(d) listed waterbodies that are impaired due to stormwater.[155]

Evaluating BMP Effectiveness at Permitted Sites

VT DEC relied on industry research to assess the effectiveness of individual stormwater BMPs and when determining BMP requirements.[156]

Evaluating BMP Effectiveness at Non-Permitted Sites

VT DEC does not inspect construction activities that are not permitted under a stormwater permitting program.[157]

Virginia

Specific BMP Recommendations

VA DCR does require operators to install specific erosion and sedimentation controls, but operators are encouraged to install stormwater BMPs specified in Part II of the Virginia Stormwater Management Regulations or the Virginia BMP Clearinghouse.[158] [159] Stormwater BMP recommendations and requirements are the same for all types of construction activities. In addition, BMP requirements do not vary according to the number of acres disturbed by the construction activity.[160]

Erosion and sedimentation controls must be designed according to the minimum standards outlined in "Virginia Erosion and Sediment Control Law, Regulations, and Certification Regulations." As a minimum, sediment traps must be installed when construction activities disturb less than 3 acres. The sediment traps must have the capacity to store 134 cubic yards of stormwater per acre drained. For construction activities that disturb 3 or more acres, operators are required to install sediment basins with the capacity to store 134 cubic yards per acre drained. Furthermore, the sediment basin must be designed to withstand and process the stormwater generated by a 25-year, 24 hour storm event. Additional minimum standards can be found in the "Virginia Erosion and Sediment Control Law, Regulations, and Certification Regulations."[161]

BMP Selection Process

To ensure attainment of water quality criteria, VA DCR requires operators to select and install stormwater BMPs that meet either the technology-based criteria or performance-based criteria specified in the Virginia Stormwater Management Regulations.[162] Operators that choose to abide by the performance-based criteria must demonstrate that the post-development stormwater runoff load is comparable to the pre-development load. In an effort to achieve this goal, operators must install stormwater BMPs that achieve the target pollutant removal efficiencies that are specified in Table 3-1. The stormwater permit provides a list of recommended stormwater BMPs, and for each BMP, VA DCR has specified a target phosphorus removal efficiency.[163] Operators that choose to abide by technology-based criteria must install stormwater BMPs that meet the same target pollutant removal efficiencies specified in Table 3-1.[164]

Table 3-1. Pollutant Removal Efficiencies from Virginia Stormwater Management General Permit No.: VAR10

Water Quality BMP*	Target Phosphorus Removal Efficiency	Percent Impervious Cover
Vegetated filter strip	10%	16-21%
Grassed Swale	15%	
Constructed wetlands	20%	22-37%
Extended detention (2 x WQ Volume)	35%	
Retention basin I (3 x WQ Volume)	40%	
Bioretention basin	50%	38-66%
Bioretention filter	50%	
Extended detention-enhanced	50%	
Retention basin II (4 x WQ Volume)	50%	
Infiltration (1 x WQ Volume)	50%	
Sand filter	65%	67-100%
Infiltration (2 x WQ Volume)	65%	
Retention basin III (4 x WQ Volume with aquatic bench)	65%	

BMP Selection Process
VA DCR does not use models or other assessment tools to evaluate stormwater BMPs or to determine which BMPs should be recommended.[165]

Application Process
VA DCR's construction stormwater permit does not contain a list of recommended stormwater BMPs, although operators are required to review BMP standards and recommendations outlined in the "Virginia Stormwater Management Regulation" and "Virginia Erosion and Sediment Control Law, Regulations, and Certification Regulations" documents."[166] [167] In addition, permit applicants are encouraged to refer to VA DCR's stormwater BMP manual that contains design standards and specifications for recommended stormwater BMPs.[168] The manual identifies criteria that operators and SWPPP designers should consider when selecting stormwater BMPs, including site feasibility. The manual provides guidance for assessing site feasibility by describing the appropriate physical conditions that must exist in order to install each recommended stormwater BMP. Some of the additional selection criteria include environmental impacts, watershed stormwater management requirements, pollutant removal efficiency, technology-based water quality criteria and performance-based water quality criteria.[169]

VA DCR is developing a website called the "Virginia Stormwater BMP Clearinghouse" that operators and SWPPP designers will be able to use to retrieve information about BMP design standards and specifications. The website will feature technical information about traditional stormwater BMPs, LID practices, ESD practices, and manufactured treatment devices (MTDs). Furthermore, VA DCR will use the website to publish the results of an agency sponsored research effort to "evaluate and certify the performance claims of manufactured/proprietary BMPs approved for use in Virginia."[170]

VA DCR has not developed an interactive electronic map that permit applicants can use to locate wetlands and/or outstanding resource waters or to determine whether a particular section of river is on the 303(d) list.

Evaluating BMP Effectiveness at Permitted Sites

VA DCR primarily considers pollutant removal efficiencies when considering which stormwater BMPs to recommend. VA DCR also performs site inspections to evaluate stormwater BMP performance and effectiveness.[171] VA DCR is currently evaluating the "performance claims of manufactured BMPs" and will publish the results of its findings on the Virginia Stormwater BMP Clearinghouse website.[172]

Evaluating BMP Effectiveness at Non-Permitted Sites

VA DCR does not inspect construction activities that are not permitted under the NPDES stormwater permitting program.[173]

<u>Washington</u>

Specific BMP Recommendations

Although the construction stormwater permit does not list specific stormwater BMPs that contractors are required to implement, contractors are instructed to rely on WA DOE's "Stormwater Management Manual" when developing their SWPPPs.[174] The manual includes explicit instructions and guidelines for selecting stormwater BMPs and includes detailed information about recommended stormwater BMPs, including design specifications, maintenance requirements, and information about "conditions of use." The manual identifies pollutant-specific BMPs and source-specific BMPs.[175] According to the survey respondent, BMP requirements and recommendations do not vary according to the type of construction activity undertaken, but the requirements do vary according to the number of acres disturbed. Construction activities that disturb 3 acres or more are required to install sediment ponds, while activities that disturb less than 3 acres are required to install sediment traps or equivalent BMPs.

Pursuant to the construction stormwater permit, contractors are required to include strategies for addressing 12 "elements" in their SWPPPs.[176] Examples of these elements include: control flow rates, install sediment controls, stabilize soils, protect slopes, and protect drain inlets. The manual includes a list of recommended BMPs for each of these elements. The recommended BMPs for protecting slopes include: temporary and permanent seeding, surface roughening, grass lined channels, and interceptor dikes and swales. According to the survey respondent, BMP recommendations do not vary according to the type of construction activity being undertaken, although the recommendations do vary according to the number of acres.

BMP Selection Process

Contractors are encouraged to rely on the State of Washington's "Stormwater Management Manual," which includes explicit instructions and guidelines for selecting stormwater BMPs. Furthermore, WA DOE has developed benchmark monitoring values for turbidity, transparency, and pH, and these benchmarks will likely influence the BMP Selection Process. The benchmark monitoring value for turbidity is 25 NTUs, while the benchmark for transparency is 31 cm. The benchmark for pH is 8.5 standard units.[177]

Application Process
WA DOE maintains an interactive map that allows permit applicants and the general public to determine the locations of impaired streams and rivers on the state's 303(d) list.

Evaluating BMP Effectiveness at Permitted Sites
The WA DOE has assessed the effectiveness of stormwater BMPs through consideration of agency studies, industry research, product specifications, and site inspections.

<u>Wisconsin</u>
Specific BMP Recommendations
Operators are required to install BMPs that achieve a sediment removal efficiency of 80%. These controls must be maintained at this standard until the construction site has undergone final stabilization. In addition to this performance standard, operators are required to install stormwater BMPs according to technical standards published in a series of documents collectively referred to as the "Stormwater Management Technical Standards." The standards are published on the agency's website.[178]

Furthermore, operators are required to develop SWPPPs that address a list of requirements specified in Wisconsin Department of Natural Resources (WI DNR's) construction stormwater permit. The pollution prevention plan must include descriptions of sediment controls, interim and permanent stabilization practices, structural practices for diverting flow away from disturbed soils, structural practices for storing flows discharging from the construction sites, BMPs for managing overland flow across the construction site, BMPs for trapping sediment in channelized flow, BMPs for protecting down slope drainage inlets, BMPs for preventing the tracking of sediment onto paved surfaces, BMPs for minimizing sedimentation, BMPs for protecting separate storm drain inlet structures from sedimentation, BMPs for stabilizing drainage ways, and BMPs for permanent stabilization. Additional requirements are specified in the agency's construction stormwater permit.

BMP Selection Process
There is no information available regarding the methods WI DNR uses to select the recommended stormwater BMPs included in the agency's construction stormwater permit.

Application Process
WI DNR's construction stormwater permit contains a list of stormwater BMPs that operators may choose to implement on a voluntary basis. Once stormwater BMPs have been selected, operators must install them according to technical standards specified in the agency's "Stormwater Management Technical Standards" documents. Operators must review WI DNR's list of 303(d) listed waterbodies, which is published on the agencies website, to determine whether their construction activity discharges to an impaired water body. Construction activities that discharge to 303(d) listed waterbodies must design SWPPPs that will prevent the discharge of any pollutants for which the water body is impaired.

Evaluating BMP Effectiveness at Permitted Sites
There is no information available regarding the process WI DNR uses to determine which stormwater BMPs to recommend in its construction stormwater permit.

Evaluating BMP Effectiveness at Non-Permitted Sites
There is no information available in regards to whether WI DNR inspects non-permitted sites that are not regulated under the agency's construction stormwater permit.

3.2.3 Additional Permit Requirements

U.S. EPA Region 9
Outstanding Resource Waters
The Region 9 Office has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies or outstanding water resources.

Wetlands
U.S. EPA Region 9 does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to stormwater management.[179]

Certification Requirements
EPA Region 9 does not require operators, BMP installers, and/or those responsible for inspecting BMPs to obtain certification. Inspections must be conducted by "qualified personnel." A qualified inspector must be knowledgeable in the principles of erosion and sediment control" and must be able to evaluate the condition and effectiveness of stormwater BMPs.[180]

Arkansas*
Outstanding Resource Waters
For construction activities that are located adjacent to a 303(d) listed water body, an ERW, an ESW, or a NSW, operators may be required to maintain a 50 foot buffer zone.[181]

Wetlands
It was unclear from the agency website whether AR DEQ has developed specific regulatory requirements for construction activities that discharge stormwater to wetlands.

Certification Requirements
AR DEQ does require "qualified inspectors" to perform inspections of the construction site to evaluate the effectiveness of erosion and sedimentation controls and stormwater BMPs.[182]

City of San Diego*
Outstanding Resource Waters
Construction activities that are likely to discharge to coastal lagoons, waterbodies in "Water Quality Sensitive Areas," or 303(d) listed waterbodies that are impaired due to sediment, are required to install special stormwater BMPs. Operators must install "higher performing erosion controls" such as bonded fiber matrices or anchored erosion control blankets on disturbed slopes. Operators must install and maintain vegetated buffers between the boundary of the construction activity and the sensitive water body. If stormwater discharges are directed to one or more inlet structures that convey the discharges to impaired waterbodies, then operators must also install two parallel silt fence barriers directly upstream of the inlet structure. There are additional special stormwater BMPs that operators are required to install if

their proposed construction activities are likely to discharge to impaired waterbodies, and these requirements are outlined in the Stormwater Standards Manual.[183]

If a proposed construction activity is classified as an "exceptional threat to water quality," additional "advanced treatment" BMPs may be required. Construction activities may be classified as "exceptional threats" if the activity is located within 200 feet of a 303(d) listed water body that is impaired due to sedimentation or turbidity. Additional criteria that may warrant an "exceptional threat" classification are outlined in the stormwater standards manual. In the event that a construction activity is identified as an "exceptional threat," an operator may be required to install water retention and treatment systems with enough capacity to treat the stormwater generated by a 2-year, 24 hour storm. Additional "advanced treatment" BMPs are outlined in the stormwater standards manual.[184]

<u>Colorado</u>

Outstanding Resource Waters

There is no information available regarding whether CDPHE has developed special regulatory requirements that pertain to outstanding resource waters (ORWs) or wetlands.

Certification Requirements

CDPHE does not specify any training or certification requirements, but the agency does provide information about training opportunities in storm water management and BMP inspection that BMP inspectors and contractors can pursue at community colleges near the City of Denver.[185]

<u>Connecticut</u>

Outstanding Resource Waters

CT DEP has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed water bodies or ORWs.[186]

Wetlands

CT DEP does not make a distinction in its regulatory approach between wetlands and other waterbodies, and the agency has not developed specific stormwater regulations that only pertain to wetlands.[187]

Certification Requirements

CT DEP does not require contractors, BMP installers, or site inspectors to obtain certification in their respective disciplines.[188] CT DEP performs site inspections to ensure that operators are properly installing and maintaining stormwater BMPs.[189]

<u>Florida</u>

Outstanding Resource Waters

FL DEP has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed water bodies or ORWs.

Wetlands
According to the survey respondent, FL DEP does not make a distinction in its regulatory approach between wetlands and other waterbodies, meaning the agency has not developed specific stormwater regulations that only pertain to wetlands.

Certification Requirements
FL DEP encourages contractors, BMP installers, and inspectors to obtain certification in their respective fields to ensure that BMPs are properly installed and maintained. FL DEP accepts evidence of relevant training and practical experience in the field of stormwater management as alternatives to certification.

<u>Illinois</u>
Outstanding Resource Waters
IL EPA has developed special requirements for construction activities that discharge to 303 (d) listed waterbodies impaired due to excessive turbidity and/or suspended solids. Construction activities discharging to these types of waterbodies are required to design and implement SWPPP that are designed to manage 25-year 24-hour rainfall events.[190]

Wetlands
There is no information available in regards to whether IL EPA makes a distinction in its regulatory approach between wetlands and other waterbodies.

Certification Requirements
IL EPA recommends that only qualified personnel conduct inspections of stormwater and erosion control BMPs. The NPDES permit identifies the following as qualified personnel; Licensed Professional Engineers, Certified Professionals in Erosion and Sediment Control (CPESC), Certified Erosion Sediment and Storm Water Inspectors. IL EPA does not require any specific certifications or training.[191]

<u>Indiana</u>
Outstanding Resource Waters
IN DEM has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed water bodies or ORWs.

Wetlands
IN DEM does not make a distinction in its regulatory approach between wetlands and other waterbodies with regards to construction stormwater, meaning the agency has not developed specific construction stormwater regulations that only pertain to wetlands.

Certification Requirements
IN DEM does not require operators, BMP installers, or inspectors to obtain certification in their respective fields, although the permit does require that a “trained individual” perform the “self-monitoring” required by the construction stormwater permit. The required monitoring involves evaluating the functionality of stormwater control measures over time. The primary objective is to identify any deficiencies in stormwater pollution prevention plans and if necessary recommend solutions for improving control measures thus ensuring permit compliance.

<u>Iowa</u>

Outstanding Resource Waters

There is no information available regarding whether IA DNR has developed specific BMP requirements for construction activities that discharge to 303(d) listed water bodies or ORWs.

Wetlands

There is no information available regarding whether IA DNR makes a distinction in its regulatory approach between wetlands and other waterbodies with regards to construction stormwater.

Certification Requirements

IA DNR's construction stormwater permit does not specify training or certification requirements for contractors, BMP installers, or BMP inspectors.

<u>Kansas</u>

Outstanding Resource Waters

KDHE does not necessarily consider the impacts of stormwater discharges on receiving waterbodies, and has not developed specific BMP requirements for construction activities that discharge storm water to high quality waters and/or outstanding state resource waters.[192]

Wetlands

KDHE does not make a distinction in its regulatory approach between wetlands and other waterbodies, and there are no specific stormwater regulations that only pertain to wetlands.[193]

Certification Requirements

KDHE does not require contractors, BMP installers, and/or those responsible for monitoring BMPs to obtain certification to ensure that BMPs are installed and maintained correctly.[194]

KDHE will perform inspections of construction activities to evaluate the condition and effectiveness of stormwater BMPS, but inspections are only conducted if the agency receives a complaint about noncompliance.[195]

<u>Louisiana</u>

Outstanding Resource Waters

The LA DEQ has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies or outstanding resource waters (ORWs).[196]

Wetlands

LA DEQ does not make a distinction in its regulatory approach between wetlands and other water bodies in regards to stormwater management.[197]

Certification Requirements

LA DEQ does not require contractors, BMP installers, or those responsible for inspecting BMPs to obtain certification. LA DEQ performs site inspections to ensure that stormwater BMPs have been installed correctly and are being maintained.[198]

<u>Massachusetts</u>

Outstanding Resource Waters

MA DEP has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies or outstanding resource waters (ORWs).

Wetlands

According to the survey respondent, MA DEP does not make a distinction in its regulatory approach between wetlands and other waterbodies with regards to stormwater management.

Certification Requirements

MA DEP does not require contractors or BMP installers to obtain certification to ensure that stormwater BMPs are installed correctly. MA DEP investigates complaints to determine whether BMPs have been installed and maintained correctly and whether contractors are complying with the provisions of their stormwater permits.

<u>Michigan</u>

Outstanding Resource Waters

MI DEQ has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies or outstanding ORWs.

Wetlands

MI DEQ does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to stormwater management.

Certification Requirements

MI DEQ requires SWPPP designers and approvers as well as BMP inspectors to obtain specialized training. Furthermore, MI DEQ has developed a “Soil Erosion and Sedimentation Control Training Manual” that is available on its website.[199]

<u>Minnesota</u>

Outstanding Resource Waters

As previously mentioned, Minnesota has developed specific BMP requirements for each type of specially designated waterbody. The specially designated waterbodies include wilderness areas, the Mississippi River, scenic or recreational river segments, Lake Superior, lake trout lakes, trout lakes, scientific and natural areas, trout streams, and impaired waters.[200] Operators can access an electronic mapping tool on the MPCA’s website that identifies all “special” and impaired waterbodies in the vicinity of their construction activity. The program also allows users to retrieve information about the specific BMP requirements that correspond with each special waterbody.[201]

Wetlands

Operators may be required to obtain permit approval from several different agencies, including the United States Army Corps of Engineers, Minnesota Department of Natural Resources, and the Minnesota Wetland Conservation Act, if there is an increased risk that their construction activities may adversely impact wetlands. Adverse impacts may include "excavating the wetland or permanently flooding the wetland to create a stormwater pond."[202]

Certification Requirements
MPCA requires training for employees that develop and oversee implementation of the SWPPP. Employees that build, maintain, and inspect stormwater BMPs must also undergo specialized training. MPCA does not require certifications, but it does require SWPPP designers and BMP inspectors to pursue training at an appropriate local, state, federal, or private institution that demonstrates expertise in erosion prevention and stormwater management.[203]

Montana:
Outstanding Resource Waters
MT DEQ has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) impaired water bodies or outstanding resource waters (ORWs).[204]

Wetlands
MT DEQ does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to stormwater management.[205]

Certification Requirements
MT DEQ does not require contractors, BMP installers, and/or those responsible for inspecting BMPs to obtain certification. MT DEQ responds to reports of BMP failures and permit violations by performing site inspections. Most BMP failures occur as a result of "act of god" precipitation events, and are not necessarily due to ineffective stormwater BMPs.[206]

New York
Outstanding Resource Waters
Construction activities located within three specific watersheds within the State of New York are required to implement erosion and sedimentation controls as well as stormwater BMPs that comply with "enhanced phosphorus removal standards," as outlined in the New York Stormwater Management Design Manual.[207]

Wetlands
Construction activities that disturb state protected freshwater wetlands or the land immediately adjacent to a protected wetland must apply for a New York State Freshwater Wetland permit.[208]

Certification Requirements
In most cases, qualified inspectors must inspect construction activities and evaluate the effectiveness of erosion and sediment controls as well as post-construction stormwater BMPs. Some construction activities however, are exempt from this requirement. NYSDEC provides a specific set of conditions that must be met before a construction activity can be exempted from this requirement. For example, construction activities that involve the building of single family subdivisions with less than 25% impervious cover are exempt from this requirement, unless these construction activities discharge to a

303(d) impaired waterbody or the construction activity is located in a county that has more stringent exemption requirements.[209]

North Carolina

Outstanding Resource Waters

NC DENR has developed specific stormwater regulatory policies that pertain to outstanding resource waters.[210] These regulatory requirements are specified under the Outstanding Resource Waters section of the North Carolina Administrate Code.[211] According to the rule, construction activities that discharge stormwater to ORWs must follow either a low density development scheme or a high density development scheme. The low density option requires that stormwater runoff be transmitted through "vegetated conveyances" thus prohibiting "discrete stormwater collection systems."[212] Furthermore, operators that choose the low density option must maintain at least a 30 foot wide vegetative buffer between the construction activity and a ORW. The high density option requires the installation of detention ponds or a comparable stormwater control BMP. Furthermore, the stormwater collection systems must be designed to control runoff generated by a one inch rainfall event.[213]

Wetlands

NC DENR does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to the management of stormwater discharges.[214]

Certification requirements

NC DENR does not require contractors, BMP installers, or site inspectors to obtain certification. Engineers that participate in the design of SWPPPs must be licensed by the appropriate state licensing board.[215]

North Dakota

Outstanding Resource Waters

ND DoH has not developed specific stormwater regulatory requirements for construction activities that discharge to ORWs.

Wetlands

ND DoH does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to the management of stormwater discharges.

Certification Requirements

ND DoH does not require contractors, BMP installers, or inspectors obtain certification to ensure that BMPs are installed and maintained correctly. The agency relies on its own site inspections to ensure that stormwater BMPs are installed and maintained according to permit standards.

Ohio

Outstanding Resource Waters

OH EPA has not developed specific stormwater BMP requirements for construction activities that discharge storm water to waterbodies that are not meeting water quality standards.[216] OH EPA has developed three different types of construction stormwater permits, including a general construction stormwater permit and two alternative construction stormwater permits that were specifically developed for construction activities located within the Olentangy and Big Darby Watersheds.[217] The alternative construction stormwater permits developed for the Olentangy and the Big Darby Watersheds contain stormwater BMP recommendations that were developed "through the TMDL process." The stormwater BMP recommendations were developed in an effort to protect and restore the exceptional warm-water habitats (EWH) and exceptional cold-water habitats (ECH) that are unique to these two watersheds.[218]. The stormwater BMP requirements specified in the alternative stormwater permits are more stringent than those specified in the general construction stormwater permit.[219]

Wetlands

OH EPA does make a distinction in its regulatory approach between wetlands and other waterbodies. According to the survey respondent, construction stormwater permits have specific restrictions that prohibit stormwater flows from altering the "natural hydrology, hydroperiod, and flora" of wetlands.[220]

Certification Requirements

OH EPA does not require contractors, BMP installers, and/or those responsible for inspecting BMPs to obtain certification to ensure that BMPs are installed and maintained correctly.[221] OH EPA relies on site inspections to evaluate stormwater BMPs that installed as part of a SWPPP.[222]

<u>Oregon</u>

OR DEQ has developed specific requirements for construction activities that discharge stormwater to 303(d) listed waterbodies that have TMDLs.[223] According to the construction stormwater permit, operators have the option of monitoring their stormwater discharge to determine whether supplemental BMPs are even required. If operators choose this option, they are required to monitor stormwater discharges for turbidity. If the turbidity is greater than 160 NTUs, the operators must review their erosion and sedimentation control plan and address any inadequacies. If the supplemental BMPs and other improvements fail to reduce turbidity, the operators must install one or more approved stormwater BMPs.[224]

The second option is to forego the monitoring and install one or more approved stormwater BMPs.[225] The approved stormwater BMPs include: compost berms, erosion control mats, and vegetative buffers. Operators may also choose to install trackifiers, which are used in combination with perimeter sediment control BMPs. Finally, operators may choose to treat stormwater discharges with electro-coagulation.[226]

Outstanding Resource Water

OR DEQ has not developed specific BMP requirements for construction activities that discharge storm water to high quality waters and/or outstanding state resource waters.[227]

Wetlands

OR DEQ does not make a distinction in its regulatory approach between wetlands and other waterbodies, and the agency has not developed specific stormwater regulations that only pertain to wetlands.[228]

Certification Requirements
OR DEQ does not require contractors, BMP installers, and/or those responsible for monitoring BMPs to obtain certification. OR DEQ does require operators and site inspectors to be knowledgeable in the "principles of erosion and sedimentation control." OR DEQ performs site inspections to determine whether stormwater BMPs have been installed correctly and whether BMPs are being properly maintained.[229]

South Carolina
Outstanding Resource Waters
Construction activities discharging stormwater to environmentally sensitive waterbodies such as ORWs or Shellfish Harvesting Waters may be required to inspect stormwater BMPs on a more frequent basis.[230]

Certification Requirements
Inspections must be performed by qualified personnel. Qualified personnel include those that have theoretical and practical knowledge of what is involved in assessing the condition of erosion and sedimentation controls. SWPPP preparers or personnel directly under the supervision of SWPPP preparers may perform inspections. Alternatively, anyone with certification from an agency-approved institution may perform inspections. Currently, only certifications issued by Clemson University are recognized by SC DHEC.

Texas
Outstanding Resource Waters
TCEQ has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies or outstanding water resources (OWR).

Wetlands
TCEQ does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to stormwater management.[231]

Certification Requirements
TCEQ does not require contractors, BMP installers, or those responsible for inspecting BMPs to obtain certification in their respective disciplines. TCEQ performs site inspections to ensure that stormwater BMPs have been installed properly and are performing as intended.[232]

Utah
Outstanding Resource Waters
UT DEQ has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies or outstanding resource waters (ORW).[233]

Wetlands
UT DEQ does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to stormwater management.[234]

Certification Requirements
UT DEQ does not require contractors, BMP installers, and/or those responsible for inspecting BMPs to obtain certification. UT DEQ performs site inspections to assess whether stormwater BMPs have been installed correctly and whether they are being properly maintained.[235]

<u>Vermont</u>
Outstanding Resource Waters
VT DEC has developed specific stormwater BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies. Operators may be required to install these additional BMPs in an effort to preserve a waterbodies “risk category” designation.[236]

Wetlands
VT DEC does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to stormwater management.

Certification Requirements
VT DEC does not require contractors, BMP installers, or those responsible for inspecting BMPs to obtain certification. VT DEC performs site inspections to ensure that stormwater BMPs have been installed correctly and are being maintained.[237]

<u>Virginia</u>
Outstanding Resource Waters
VA DCR has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies or OWRs.[238]

Wetlands
VA DCR does not make a distinction in its regulatory approach between wetlands and other water bodies in regards to stormwater management, and the agency has not developed specific stormwater regulations that only pertain to wetlands.[239]

Certification Requirements
VA DCR does not require contractors, BMP installers, or site inspectors to obtain certification.[240]

<u>Washington:</u>
Outstanding Resource Waters
WA DOE has not developed specific BMP requirements for construction activities that discharge stormwater to 303(d) listed waterbodies or outstanding resource waters.

Wetlands
WA DOE does not make a distinction in its regulatory approach between wetlands and other waterbodies with regards to stormwater management.

Certification Requirements
Personnel that are responsible for inspecting stormwater BMPs at permitted construction sites are required to obtain certification.

Wisconsin
Outstanding Resource Waters
Operators must review WI DNR's list of ORWs and Exception Resource Waters (ERWs), which is published on the agencies website, to determine whether their construction activity will be subject to more stringent BMP requirements. Construction activities that discharge to either ORWs or ERWs must implement SWPPPs designed to prevent the discharge of sediment and other pollutants above the waterbodies demonstrated background levels. Furthermore, operators must maintain "protective areas" of 75 feet between the boundaries of their construction activities and adjacent ORWs or ERWs[241].

Wetlands
There is no information available in regards to whether IL EPA makes a distinction in its regulatory approach between wetlands and other waterbodies.

Certification Requirements
There is no information available in regards to whether IL EPA requires contractors, BMP installers, and/or BMP inspectors to obtain certification or specialized training in their respective disciplines.

3.2.4 Monitoring Requirements

U.S. EPA Region 9
U.S. EPA Region 9 does not require operators to monitor stormwater discharges for specific parameters, such as TSS, oil and grease, and pH.[242]

Arkansas*
According to AR DEQ's construction stormwater permit, there is no indication that operators are required to monitor stormwater discharges for parameters such as TSS, pH, oil and grease.

California*
CSWRCB may require operators to monitor stormwater discharges for "visible pollutants" such as turbidity or sediment, or "non-visible" pollutants such as pH, pesticides, or nutrients. Construction activities that discharge stormwater to 303(d) listed waterbodies that are impaired due to siltation, sediment, or turbidity are required to monitor stormwater for the pollutant(s) that is the cause of impairment.

Construction activities that are likely to produce pollutants in quantities that may lead to non-attainment of water quality standards are required to monitor stormwater discharges for any "non-visible pollutants" such as pesticides, nutrients, and heavy metals that may be produced at on-site.[243]

Parameters Monitored
The parameters that must be monitored are determined on a case-by-case basis.

Monitoring Responsibility
When monitoring is required, the operator is responsible for sampling and analyzing stormwater discharges.

Frequency of Monitoring
The parameters that must be monitored and frequency of monitoring are determined on a case-by-case basis.

<u>Connecticut</u>
CT DEP does not require operators to monitor stormwater discharges for parameters such as TSS, ph, oil and grease.[244]

<u>Florida</u>
FL DEP does not require operators to monitor stormwater discharges for parameters such as TSS, pH, oil and grease, etc.

<u>Illinois</u>
IL EPA does not require operators to monitor stormwater discharges for parameters such as TSS, pH, oil and grease, etc.

<u>Indiana</u>
IN DEM does not require operators to monitor stormwater discharges for parameters such as TSS, pH, oil and grease, etc.

<u>Iowa</u>
IA DNR does not require operators to monitor stormwater discharges for parameters such as TSS. pH, oil and grease, etc.

<u>Kansas</u>
KDHE does not require operators to monitor stormwater discharges for parameters such as TSS, ph, oil and grease, etc.[245]

<u>Louisiana</u>
LA DEQ does not require operators to monitor stormwater discharges for parameters such as TSS, ph, oil and grease.[246]

<u>Massachusetts</u>
The U.S. EPA's general stormwater permit for construction activities does not require operators to sample and analyze stormwater discharges for parameters such as TSS, pH, oil, etc.

<u>Michigan</u>
MI DEQ does not require operators to monitor stormwater discharges for parameters such as TSS, pH, oil, etc.

<u>Minnesota</u>

Operators that choose to install alternative stormwater BMPs, besides those listed in MPCA's construction stormwater permit, are required to monitor stormwater run-off discharged from their construction activity. MPCA requires operators to develop a plan that outlines the frequency with which samples will be analyzed, sampling methods, and the lab(s) that will analyze the samples. Operators must monitor stormwater discharges for a period of two years, and monitoring records must be submitted to MPCA on an annual basis.[247]

<u>Montana</u>

MT DEQ does not require operators to monitor stormwater discharges for specific parameters such as TSS, oil and grease, pH, etc.[248]

<u>New York</u>

NYSDEC's construction stormwater permit not require that operators monitor stormwater discharges for specific parameters such as TSS, oil and grease, pH, etc.[249]

<u>North Carolina</u>

Parameters Monitored

NC DENR does not require operators to analyze stormwater discharges for specific parameters such as oil and grease, TSS, and pH. The construction stormwater general permit does require operators to make "qualitative observations" of stormwater discharges. Operators are required to provide a qualitative description of the stormwater discharge in regards to its clarity, floating solids, suspended solids, oil sheen, and any "other obvious indicators of stormwater pollution."[250] The monitoring requirements were implemented as a means of evaluating the effectiveness of stormwater BMPs.

Monitoring Responsibility

Operators are required to provide qualitative descriptions of stormwater discharges with regard to clarity, floating solids, suspended solids, oil sheen, etc.

Frequency of Monitoring:

Operators are required to perform inspections once every seven days unless the construction activity discharges to a 303(d) listed water body that is impaired due to turbidity or sedimentation, in which case inspections must be performed at least twice every seven days.[251]

<u>North Dakota</u>

ND DoH does not require operators to monitor stormwater discharges for specific parameters such as TSS, oil and grease, etc.

<u>Ohio</u>

Parameters Monitored

OH EPA requires permitted construction activities in the Big Darby Watershed to monitor stormwater discharges for TSS.[252]

<u>Oregon</u>

Parameters Monitored

Under normal circumstances, operators are not required to monitor stormwater discharges for parameters such as TSS, and pH. If a construction activity discharges to an impaired water body with a TMDL for sedimentation or turbidity, the operator of the construction activity may be required to monitor the stormwater discharge for turbidity and compare the turbidity to a benchmark value of 160 NTUs. If the level of turbidity in the stormwater discharge is greater than the benchmark value, then the operator must evaluate the effectiveness of his or her erosion and sedimentation control plan (ESCP) and address any inadequacies.

Monitoring Responsibility

When monitoring is required, the operator is responsible for sampling and analyzing stormwater discharges.

Frequency of Monitoring

The operator must obtain a sample that “represents the flow and characteristics of the stormwater discharge,” and samples must be obtained weekly when “stormwater run-off is detectable.”[253]

<u>South Carolina</u>

SC DHEC may require operators to monitor stormwater discharges for specific parameters, but monitoring requirements are assigned on a case-by-case basis.

<u>Texas</u>

TCEQ does not require operators to monitor stormwater discharges for parameters such as TSS, pH, oil and grease.[254]

<u>Utah</u>

UT DEQ does not require operators to monitor stormwater discharges for specific parameters such as TSS, oil and grease, and pH.[255]

<u>Virginia</u>

VA DCR does not require operators to monitor stormwater discharges for parameters such as TSS, pH, oil and grease.[256]

<u>Vermont</u>

VT DEC may require operators to monitor stormwater discharges for turbidity if the discharge from a BMP outlet structure is visibly discolored.[257]

Parameters Monitored

VT DEC requires operators to monitor for turbidity.

Monitoring Responsibility

When monitoring is required, the operator is responsible for sampling and analyzing stormwater discharges.

Washington

Operators are required to monitor stormwater discharges for pH. In addition, construction activities that disturb more than 1 acre are required to monitor stormwater discharges for turbidity, although the required method of analysis varies according to the number of acres disturbed. Construction activities that disturb more than 1 acre but less than 5 acres are required to monitor turbidity using a transparency tube. Construction activities that disturb more than 5 acres are required to monitor turbidity using a turbidity meter.[258]

Table 3-2. Summary of Monitoring Requirements from Washington Department of Ecology Construction Stormwater General Permit

Size of Soil Disturbance	Weekly Site Inspections	Weekly Sampling w/ Turbidity Meter	Weekly Sampling w/ Transparency Tube	Weekly pH sampling
Sites which disturb less than 1 acre	Required	Not Required	Not Required	Not Required
Sites which disturb 1 acre or more, but less than 5 acres	Required	Sampling Required – either method		Required
Sites which disturb 5 acres or more	Required	Required	Not Required	Required

3.2.5 Compliance and Enforcement

U.S. EPA Region 9

Enforcement

U.S. EPA Region 9 may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. Region 9 may also send violation notice letters to operators that are violating the terms of their stormwater permits.[259]

U.S. EPA Region 9 increases fines and the severity of other enforcement measures with each new permit violation. In other words, operators that repeatedly violate the terms of their stormwater permits will be issued increasingly more severe fines. These measures are designed to discourage repeat violations.[260]

Partnering With Other Agencies

The Region 9 Office has not delegated storm water program responsibilities to other state departments or sub-state jurisdictions. The Region 9 Office does partner with both city and country governments to increase the effectiveness of its stormwater permitting program.[261]

Arkansas

Enforcement

AR DEQ may enforce compliance by issuing fines or citations. AR DEQ may rely on additional enforcement measures, but there is limited enforcement information available in the construction stormwater permit.[262]

Connecticut

Enforcement

CT DEP may enforce compliance by exercising its authority to issue fines or citations, consent decrees or judgments, or consent orders. CT DEP may also send violation notice letters. In order to discourage operators from repeatedly violating the terms of their stormwater permits, CT DEP may deny stormwater permits to operators that have history of violations.[263]

Partnering With Other Agencies

CT DEP is the primary authority that administers the stormwater permitting program, and although municipalities are not directly involved in administering this program, they are required to regulate erosion and sedimentation generated by construction activities that disturb more than ½ acre. Stormwater permits require the installation of erosion and sedimentation control BMPs, and the stormwater permitting program supports the efforts of municipalities seeking to reduce erosion and sedimentation associated with construction activities.[264] In order to increase the overall effectiveness of the stormwater permitting program, CT DEP partners with town wetland and conservation offices and soil conservation districts.[265]

Florida

Enforcement

FL DEP enforces permit compliance through the issuance of fines or citations, violation notice letters, consent decrees or judgments, or consent orders. FL DEP does not have a well-defined policy regarding repeat violators, and these violations are handled on a case-by-case basis

Partnering With Other Agencies

FL DEP has an "unofficial" partnership with MS4s, which conduct inspections at construction activities that discharge to their stormwater systems. MS4s may report their findings relating to permit compliance to FL DEP.

Illinois

Enforcement

Operators are required to notify the IL EPA Field Operations Section office in the event that their construction activity fails to comply with one or more permit conditions. Operators must notify the office of such an incidence within 24 hours and then prepare and submit an "Incidence of Noncompliance" report within 5 days. There is no additional information available regarding enforcement measures employed by IL EPA.[266]

Partnering With Other Agencies

IL EPA is the primary permitting authority that administers the construction stormwater permitting program.

Indiana

Enforcement

IN DEM enforces permit compliance through the issuance of fines or citations and violation notice letters. IN DEM does not have a formal policy regarding repeat violators, and the agency address these violations on a case-by-case basis.

Partnering With Other Agencies

IN DEM has delegated permitting authority to 152 city and county MS4s. In addition, IN DEM partners with Soil and Water Conservation Districts (SWCDs) throughout the state to increase the overall effectiveness of the construction stormwater program.

Iowa

Enforcement

There is no information provided in the IA DNR's construction stormwater permit regarding the measures that may be employed to enforce permit compliance.

Partnering With Other Agencies

IA DNR is the primary authority that administers the construction stormwater permitting program in the state of Iowa. IA DNR partners with MS4s across the state in order to monitor BMP effectiveness and ensure permit compliance among construction activities that discharge to MS4s.[267]

Kansas

Enforcement

KDHE enforces compliance with the NPDES construction stormwater general permit by sending violation notice letter. KDHE may also enforce compliance by exercising its authority to issue fines, citations, or consent orders.[268] KDHE discourages operators/permittees from repeatedly violating the terms of their stormwater permits by increasing an individual operator's fines with each new permit violation.[269]

Partnering With Other Agencies

KDHE has not given permitting authority to other state departments or sub-state jurisdictions such as cities, counties, or commissions.[270]

Federal/State Agencies

KDHE does partner with municipal separate stormwater systems (MS4s) to increase the overall effectiveness of the stormwater permitting program.[271]

Louisiana

Enforcement

LA DEQ may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. LA DEQ may also send violation notice letters to operators that are violating the terms of their stormwater permits. The fines or citations for repeated violations are determined on a case-by-case basis by the enforcement office and legal staff. The enforcement office has the authority to issue larger fines to operators that repeatedly violate the terms of their stormwater permits, but again, the specific enforcement strategy and severity differs from case to case.[272]

Partnering With Other Agencies

LA DEQ has not delegated stormwater program responsibilities to other state departments or sub-state jurisdictions. In addition, LA DEQ does not partner or network with other agencies or programs to increase the overall effectiveness of its storm water program.[273]

<u>Massachusetts</u>

Enforcement

The U.S. EPA administers the NPDES stormwater permitting program in the State of Massachusetts. According to the survey respondent, permit compliance is enforced through fines, citations, or consent orders. Although the EPA administers the stormwater permitting program, Town Conservation Commissions are involved in administering the "Massachusetts Wetlands Protection Act." Conservation Commissions issue "order of conditions" to contractors, which outline requirements specified in the wetlands protection act.[274]

In an effort to increase the overall effectiveness of the stormwater permitting program, MA DEP partners with watershed councils, watershed associations, sister state agencies, and lake associations.

<u>Michigan</u>

Enforcement

MI DEQ may enforce permit compliance by issuing consent decrees or judgments, consent orders, or fines or citations. MI DEQ may also send violation notice letters to permittees that fail to comply with the terms of their construction stormwater permits.

MI DEQ may escalate enforcement action in response to repeat violations. Enforcement actions are usually directed towards permittees, but the agency may also directly fine contractors.

Partnering With Other Agencies

MI DEQ's stormwater program is tie-barred to the agency's Soil Erosion and Sedimentation Control (SESC) program. The SESC program is administered by state, county, and municipal agencies. MI DEQ performs periodic audits of state, county, and municipal agencies that administer SESC programs.

<u>Minnesota</u>

Enforcement

Local government agencies that enforce the general stormwater permits can issue citations, administrative penalty orders, and stop-work orders. Under state law, a permittee can incur a maximum fine of $10,000 for each NPDES permit violation per day. Although enforcement mechanisms are in place, MPCA puts greater emphasis on prevention, and is mainly concerned with helping operators develop and implement effective SWPPPs.[275]

Partnering With Other Agencies

There is no information available in regards to whether MPCA partners with other agencies to increase the overall effectiveness of its stormwater permitting program.

<u>Montana</u>

Enforcement

MT DEQ may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. MT DEQ may also send violation notice letters to operators that are in violation of the terms of their stormwater permit.[276]

MT DEQ does not have an official policy for dealing with repeat violators. Each stormwater permit application is considered in isolation. If an operator has a history of permit violations, this would have no bearing on the amount of a fine or citation issued to an operator for a permit violation.[277].

Partnering With Other Agencies
MT DEQ is the primary permitting authority that administers the stormwater permitting program, and MT DEQ has not delegated stormwater program responsibilities to other state agencies or sub-state jurisdictions. MT DEQ does not partner with other state agencies to increase the effectiveness of the stormwater permitting program.[278]

<u>New York</u>

Enforcement
NYSDEC may enforce permit compliance by issuing fines of up to $37,500 per day. The agency may also issue stop work orders or revoke permits in response to permit violations.[279]

Partnering With Other Agencies
NYSDEC partners with the Division of Fish, Wildlife and Marine Resources and the Tidal Wetland Regulatory Program among others to increase the overall effectiveness of the construction stormwater permitting program.

<u>North Carolina</u>

Enforcement
NC DENR may enforce compliance by exercising its authority to issue fines or citations. NC DENR may also send out violation notice letters and issue injunctions.[280] NC DENR has an "escalating fine structure" that increases the amount of an operator's fine with each new permit violation. This fine structure discourages operators/permittees from repeatedly violating the terms of their stormwater permits.[281]

Partnering With Other Agencies
NC DENR is the primary permitting authority for the state of North Carolina, and NC DENR has not delegated permitting authority to other state departments or sub-state jurisdictions. In an effort to increase the effectiveness of the stormwater permitting program, NC DENR partners with both state and local agencies, including the Sediment Control Program at the Division of Land Resources, the Division of Soil and Water Conservation, the Division of Coastal Management, local governments, universities, and cooperative extension offices.[282]

<u>North Dakota</u>

Enforcement
ND DoH enforces permit compliance through the issuance of fines or citations, violation notice letters, consent decrees or judgments, or consent orders. Operators that repeatedly violate the terms of their permits must undergo more frequent inspections by ND DoH and they may be subject to "escalating" fines and enforcement measures.

Partnering With Other Agencies
According to the survey respondent, ND DoH is the only state agency that directly regulates stormwater discharges in the state of North Dakota. Furthermore, ND DoH does not partner with other state or local agencies to increase the effectiveness of the stormwater program.

Ohio
Enforcement
OH EPA may enforce compliance by exercising its authority to issue fines, citations, consent decrees or judgments, or consent orders. OH EPA also sends violation notice letters to operators that are not in compliance with the terms of the construction stormwater permit.[283]

Federal/State Agencies
OH EPA partners with the Ohio Department of Natural Resources (OH DNR) in an effort to increase the overall effectiveness of the stormwater permitting program. OH EPA does not however delegate permitting authority to the OH DNR or any other state agencies.

Oregon
Enforcement
OR DEQ may enforce compliance by exercising its authority to issue fines, citations, consent decrees or judgments. OR DEQ also sends violation notice letters to operators that violate the terms of the construction stormwater permit.[284]

Partnering With Other Agencies
OR DEQ has delegated permitting authority to local agencies. Local agencies review SWPPPs, conduct site inspections, investigate complaints, and identify construction activities that are violating the terms of the NPDES construction permit. OR DEQ is responsible for enforcing permit compliance and for issuing civil penalties to operators that are in violation of stormwater permits.[285]

OR DEQ partners with local cities in an effort to increase the overall effectiveness of the stormwater permitting program.[286]

South Carolina
Enforcement
Permittees that have a history of noncompliance may be required to carry out site inspections more frequently. There is no additional information available regarding the measures SC DHEC uses to enforce permit compliance

Partnering With Other Agencies
SC DHEC partners with the Office of Ocean Coastal Resource Management (OCRM) in administering the stormwater permitting program in eight coastal counties. OCRM reviews all construction stormwater permit applications to determine whether the proposed activities comply with the State's Coastal Zone Management Plan.

Texas

Enforcement

TCEQ may enforce compliance by issuing fines or citations or by sending violation notice letters to operators that are in violation of the terms of their stormwater permit.[287]

Partnering With Other Agencies

Not all construction activities are permitted under the construction stormwater permitting program; certain municipal construction activities may be permitted under the general permit for Phase II (small) MS4s.[288] [289] The general permit for Phase II MS4s is administered by the MS4 permitting program.

Federal/State Agencies

TCEQ does not partner with other agencies or programs to increase the overall effectiveness of the stormwater program.[290]

Utah

Enforcement

UT DEQ may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. UT DEQ may also send violation notice letters to operators that are violating the terms of their stormwater permits.[291] UT DEQ discourages operators from repeatedly violating the terms of their stormwater permits by increasing an operator's penalty with each new permit violation.[292]

Partnering With Other Agencies

UT DEQ is the primary permitting authority, and UT DEQ has not delegated permitting responsibilities to other state or substate agencies. UT DEQ partners with municipalities to increase the effectiveness of the stormwater permitting program.[293]

Vermont

Enforcement

VT DEC may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. VT DEC may also send violation notice letters to operators that are violating the terms of their stormwater permits. VT DEC may issue a "formal enforcement action" to any operator that repeatedly violates the conditions of his or her stormwater permit.[294]

Partnering With Other Agencies

VT DEC is the primary permitting authority in the state of Vermont, and VT DEC has not delegated program responsibilities to other state or sub-state agencies.

Federal/State Agencies

VT DEC does partner with the U.S. EPA, COE, and the Natural Resources Conservation Service.[295]

Virginia

Enforcement

VA DCR may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. VA DCR may also send violation notice letters to operators that are violating the terms of the stormwater permit.[296]

Partnering With Other Agencies
VA DCR is the primary permitting authority and administrator of the stormwater permitting program, and the agency has not delegated stormwater program responsibilities to other state departments or sub-state jurisdictions. VA DCR does partner with the Virginia Department of Environmental Quality (VA DEQ) to increase the overall effectiveness of the stormwater permitting program.[297]

Washington
Enforcement
Permit compliance is enforced through fines or citations, consent decrees or judgments, or consent orders. WA DOE may also send violation notice letters to operators that are not complying with permit requirements. WA DOE may issue administrative penalties to operators/contractors that repeatedly violate the terms of their permits.

Wisconsin
Enforcement
Three agencies are involved in regulating stormwater discharges in the state of Wisconsin, including WI DNR, the Department of Transportation, and the Department of Commerce. In regards to enforcement, IL DNR may issue notification letters to operators that are failing to comply with the terms of their construction stormwater permits. The agency will create a time frame during which the operator must address any deficiencies in the SWPPP. If sufficient changes are not implemented with the time allotted, construction stormwater permits may be revoked. There is not information available regarding fines or citations[298].

3.3 Construction Nonpoint Source Pollution

An "earth change" is a human-made change in the natural cover or topography of land that may result in soil erosion or sedimentation of surface waters. Earth change activities include construction activities in urban and agricultural settings. Earth change activities do not include the practice of plowing and tilling soil.

3.3.1 BMP Requirements and Recommendations

U.S. EPA Region 3
Specific BMP Recommendations
The U.S. EPA Region 3 has developed specific BMP requirements for controlling NPS pollution associated with urban earth change activities, agricultural earth change activities, and forestry-related change activities.[299]

BMP Selection Process
The U.S. EPA Region 3 utilizes several models to evaluate the effectiveness of NPS BMPs and to determine which BMPs to recommend. The STEPL (Spreadsheet Tool for Estimating Pollutant Load) model is used to calculate the nutrient and sediment loads that may be generated by different land use activities. The model is also used to estimate the pollutant load reductions that may result from the implementation of particular BMPs.[300] The U.S. EPA Region 3 also uses the AVGWLF (Generalized Watershed Loading Function with an ArcView (AV) geographic information systems (GIS) interface)

model. The AVGWLF model is a nonpoint source pollution model that can be used to evaluate the effectiveness of different NPS BMPs and other NPS mitigation strategies.[301] In addition, the U.S. EPA Region 3 uses the HSPF (Hydrologic Simulation Program Fortran) model, which can be used to estimate the "time history of the quantity and quality of runoff" that may result from changes in a watershed's land-use patterns and/or changes that may result from the implementation of certain land management practices.[302] The U.S. EPA Region 3 also uses the Region 5 Model, which is an excel workbook that provides estimates of sediment and nutrient load reductions that may result from the installation of particular agricultural and urban BMPs.[303]

Evaluating BMP Effectiveness
The U.S. EPA Region 3 relies on agency studies to evaluate the effectiveness of specific NPS BMPs. The Regional Office also conducts site inspections to assess the performance and effectiveness of NPS BMPs.[304]

<u>U.S. EPA Region 9</u>
Specific BMP Recommendations
U.S. EPA Region 9 has developed specific BMP recommendations/requirements for controlling NPS pollution associated with urban earth change activities, agricultural earth change activities, and forestry-related earth change activities**.**

Evaluating BMP Effectiveness
U.S. EPA Region 9 relies on agency studies and industry research to evaluate the effectiveness of BMPs and to determine which BMPs to recommend.[305] The agency also performs site inspections and monitors water quality to evaluate Evaluating BMP Effectiveness.[306]

<u>Indiana</u>
Specific BMP Recommendations
The Indiana Department of Environmental Management (IDEM) recommends specific best management practices (BMPs) for controlling nonpoint source pollution associated with agricultural earth change activities and urban earth change activities. IDEM does not recommend specific BMPs for managing NPS pollution associated with forestry earth change activities.[307]

BMP Selection Process
According to the survey respondent, IDEM utilizes models and other assessment tools to determine which BMPs should be implemented or to evaluate the effectiveness of proposed BMPs.[308]

Evaluating BMP Effectiveness
IDEM does not conduct its own studies to evaluate the effectiveness of NPS BMPs.[309]

<u>Iowa</u>
Specific Best Management Practice (BMP) Recommendations
Several state agencies administer nonpoint source pollution programs in the State of Iowa, including the Iowa Natural Resources Conservation Service (IA NRCS) and the Iowa Department of Agriculture. Both agencies recommend specific best management practices (BMPs) for controlling nonpoint source

pollution associated with earth change activities in agricultural settings and earth change activities in urban settings.[310]

IA NRCS is developing watershed management plans that will include specific BMP recommendations for addressing nonpoint source pollution that discharges to waterbodies that are on the 303 (d) impaired list.[311] Currently, there are only plans to develop specific NPS pollution BMP recommendations for urban settings and not agricultural settings.[312]

Evaluating BMP Effectiveness

In order to assess the effectiveness of nonpoint source (NPS) pollution BMPs, IA NRCS uses agency studies and conducts "water monitoring." IA NRCS also relies upon modeling and a "sediment delivery calculator" to estimate the performance and effectiveness of NPS pollution BMPS.[313]

IA NRCS uses a variety of assessment tools to determine which NPS BMPs to recommend, including GIS land use assessments, GIS stream bank assessments, and GIS gully assessments for determining sediment delivery. IA NRCS also relies upon GIS urban assessments to determine impervious surface area.[314]

<u>Kansas</u>

Specific BMP Recommendations

The Kansas Department of Health and Environment (KDHEKS) has not developed specific recommendations/requirements for controlling nonpoint source (NPS) pollution associated with "earth change" activities.[315]

<u>Louisiana</u>

Specific BMP Recommendations

The Louisiana Department of Environmental Quality (LA DEQ) has developed specific BMP recommendations/requirements for controlling nonpoint source pollution associated with urban earth change activities. LA DEQ has not developed NPS BMP recommendations/requirements for agricultural and forestry-related earth change activities.[316]

BMP Selection Process

LA DEQ uses models and other assessment tools to evaluate the effectiveness of NPS BMPs and to determine which BMPs to recommend. The AAGNPS (Annualized Agricultural Nonpoint Source) Pollutant Loading Model is used to evaluate the effectiveness of NPS pollution and watershed management practices.[317] The SWAT Model is a "river basin scale model" that can be used to estimate the watershed-level impacts that may result from the use of various land management practices.[318] LA DEQ also utilizes GIS modeling, TMDL modeling, and field investigations to evaluate NPS BMPs.[319]

Evaluating BMP Effectiveness

LA DEQ relies on agency studies, industry research and site inspections to evaluate the effectiveness of NPS BMPs.[320]

<u>Maine</u>

Specific BMP Recommendations

The Maine Department of Environmental Protection (ME DEP) has developed specific recommendations/requirements for controlling nonpoint source (NPS) pollution associated with urban earth change activities, agricultural earth change activities, and forestry-related earth change activities.[321] The "Maine Erosion and Sediment control BMPs" manual contains pertinent information about erosion and sedimentation control BMPs, including BMP design specifications and information about installation and maintenance.[322] The "Manual of Best Management Practices (BMP) For Maine Agriculture" contains information about BMPs that are best suited to control NPS pollution and stormwater associated with agricultural earth change activities.[323] This manual contains detailed technical information about individual BMPs, a BMP selection matrix, and BMP guidelines for protecting sensitive waterbodies.[324] In addition, ME DEP has developed a BMP manual specifically for forestry-related activities, "Best Management Practices for Forestry: Protecting Maine's Water Quality."[325]

BMP Selection Process

ME DEP relies on the ME DEP Lakes Phosphorus Control Method.[326]

Evaluating BMP Effectiveness

ME DEP relies on agency studies, and site inspections to evaluate the effectiveness of NPS BMPs and to determine which BMPs to recommend. Both agency studies and site inspections are performed infrequently.[327]

<u>Michigan</u>

Specific BMP Recommendations

MI DEQ has not developed specific NPS BMP recommendations for agricultural earth change activities, urban earth change activities, and forestry-related earth change activities.[328] MI DEQ's NPS management plant does recommend general NPS BMPs and if references NPS BMP manuals.

BMP Selection Process

MI DEQ relies on the methods outlined in the "Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual."[329] The manual includes instructions for calculating and documenting pollutant reductions for a variety of pollutant sources, including sediment, sediment-borne phosphorus and nitrogen, feedlot runoff, and commercial fertilizer, pesticides, and manure. In addition, MI DEQ relies on the STEPL (Spreadsheet Tool for Estimating Pollutant Load) model, which is used to calculate nutrient and sediment loads that may be generated by different land use activities. The model is also used to estimate the pollutant load reductions that may result from the implementation of particular BMPs.[330]

Evaluating BMP Effectiveness

MI DEQ performs sites inspections to evaluate the effectiveness of NPS BMPs installed at construction activities.

Minnesota

There are several Minnesota Pollution Control Agency (MN MPCA) programs that address NPS pollution management, including the Minnesota Clean Water Partnership, the Minnesota Clean Water Legacy, the Impaired Waters Program and Section 319 Programs.[331] [332]

Specific BMP Recommendations

MN MPCA has not developed specific recommendations or requirements for controlling NPS pollution associated with earth change activities, because MN MPCA regulates all applicable earth change activities as point sources. MN MPCA has developed extensive guidance for controlling point source pollution associated with earth change activities, and this guidance may be applied to non-point sources when necessary. The agency has also developed laws that prohibit the creation of "nuisance conditions," and these laws may be applied to NPS pollution, as well.[333]

Operators that apply for financial assistance through one of the MN MPCA programs that addresses NPS pollution are provided with specific guidance regarding which BMPs will "effectively address specific source(s) of NPS pollution". Specific BMP recommendations are developed for each individual operator applying for financial assistance to implement NPS BMPs.[334]

Most agricultural earth change activities are regulated under the stormwater permitting program. For those earth change activities that are not regulated under the stormwater permitting program, MN MPCA is relying on the TMDL program to implement BMPs for the purpose of NPS pollution management.[335]

BMP Selection Process

MN MPCA relies on the SWAT Model, the BASINS model, and the HSPF model to estimate the effectiveness of BMPs. SWAT (Soil and Water Assessment Tool) is a "river basin scale model" that can be used to estimate the watershed-level impacts that may result from the use of various land management practices.[336] HSPF (Hydrologic Simulation Program Fortran) model, which can be used to estimate the "time history of the quantity and quality of runoff" that may result from changes in a watershed's land-use patterns and/or changes that may result from the implementation of certain land management practices.[337] The BASIN (Better Assessment Science Integrating Point and Nonpoint Sources) model has been designed to "support environmental and ecological studies in a watershed context."[338]

Evaluating BMP Effectiveness

The Impaired Waters Program may monitor the water quality of receiving waters that are under TMDLs in order to evaluate the effectiveness of BMPs. In addition, MN MPCA and other agencies may utilize the "eLink computer system" to estimate sedimentation and phosphorus load reductions that may result from the implementation of certain BMPs.[339] [340]

Missouri

Specific BMP Recommendations

The Missouri Department of Natural Resources (MO DNR) recommends specific best management practices for the purpose of managing nonpoint source (NPS) pollution associated with earth change activities[341]. MO DNR's NPS regulations do not specify numeric limitations, design standards, or performance standards.

BMP Selection Process
The MO DNR recommends the same preferred NPS BMPs that are identified by the U.S. EPA and the Natural Resources Conservation Service (MO NRCS). MO DNR does not use models or other assessment tools to determine which BMPs should be implemented or to evaluate the effectiveness of proposed BMPs.[342]

Application Form
Recommended NPS BMPs are listed in NPDES stormwater permits.[343]

Evaluating BMP Effectiveness
The MO DNR does not determine the effectiveness of NPS pollution BMPs.[344]

<u>Nevada</u>

Specific BMP Recommendations
The Nevada Department of Environmental Protection (NV DEP) has developed specific nonpoint source (NPS) pollution BMP recommendations for agricultural earth change activities, urban earth change activities, and forestry-related earth change activities.[345] NV DEP's NPS Pollution Management Program played an important role in developing the state's Best Management Practices Handbook and it continues to update the document.[346] The BMP handbook provides detailed information regarding the installation and maintenance of stormwater and NPS pollution BMPs. The manual provides photographs and diagrams showing BMPs that have been installed correctly and BMPs that were not installed correctly. The manual has an appendix devoted to "re-vegetation seed mixes" that includes information about the composition of seed mixes that may be used for stabilizing disturbed soil.[347]

BMP Selection Process
NV DEP does not use models to determine which NPS BMPs to recommend or to evaluate the effectiveness of NPS BMPs.[348]

Evaluating BMP Effectiveness
NV DEP relies on product specifications and site inspections to evaluate the effectiveness of NPS pollution BMPs.[349]

<u>New Jersey</u>

Specific BMP Recommendations
The New Jersey Department of Environment Protection (NJ DEP) has developed NPS BMP recommendations/requirements for controlling NPS pollution associated with urban earth change activities and agricultural earth change activities.[350]

BMP Selection Process
NJ DEP does not use models or other assessment tools to evaluate the effectiveness of NPS BMPs or to determine which BMPs to recommend[351].

Evaluating BMP Effectiveness
NJ DEP relies on industry research, product specifications, site inspections, and NJCAT (New Jersey Corporation for Advanced Technology) to evaluate the effectiveness of NPS BMPs. NJCAT represents a public/private partnership, and the corporation provides "technology innovators with the technical, commercial, and regulatory assistance required" to deliver new technologies to the marketplace. NJCAT has developed a technology verification and certification program to evaluate new environmental technologies, including NPS BMPs, and NJ DEP relies upon NJCAT's assessments as part of its review of BMPs[352]. NJ DEP relies on the New Jersey Stormwater BMP Manual, which contains technical standards for soil erosion and sediment control BMPs.[353]

<u>New Mexico</u>
Specific BMP Recommendations
The New Mexico Environment Department (NM ED) recommends specific NPS pollution BMPs for the purpose of managing NPS pollution associated with earth change activities.[354]

BMP Selection Process
NM ED utilizes several models to evaluate the effectiveness of NPS BMPs and to determine which BMPs to recommend for NPS pollution management. The STEPL (Spreadsheet Tool for Estimating Pollutant Load) model is used to calculate the nutrient and sediment loads that may be generated by different land use activities. The model is also used to estimate the pollutant load reductions that may result from the implementation of particular BMPs.[355] The SSTEMP (Stream Segment Temperature Model) is used to evaluate the potential impacts of stream withdrawals and returns on instream temperature.[356] The Region 5 model is an excel workbook that provides estimates of sediment and nutrient load reductions that may result from the installation of particular agricultural and urban BMPs.[357] Finally, NM ED utilizes the WEPP: Road computer program, which is based on the Agricultural Research Service's WEPP (Water Erosion Prediction Project) model. The WEPP:Road program can be used to estimate runoff and sediment yield that may be generated by roads, compacted landings, compacted skid trails, compacted foot, cattle, or off-road vehicle trails.[358]

Evaluating BMP Effectiveness
NM ED relies on agency studies and industry research to evaluate the effectiveness of NPS BMPs and to determine which BMPS to recommend.[359]

<u>North Carolina</u>
The North Carolina Division of Water Quality's (NC DWQ) NPS pollution regulations specify design standards, performance standards and best management practices (BMPs).

Specific BMP Recommendations
The NC DWQ has developed specific NPS BMP recommendations for agricultural earth change activities, urban earth change activities, and forestry-related earth change activities.[360]

BMP Selection Process
NC DWQ utilizes the "Modified Schueler's Simple Method for Urban Stormwater Nutrient Loading" to determine which NPS pollution BMPs to recommend for urban earth change activities. In addition, the

NC DWQ relies upon a "state-developed nitrogen loss estimation worksheet for agricultural Nitrogen loading" to determine which NPS pollution BMPs to recommend for agricultural settings.[361]

Evaluating BMP Effectiveness
The NC DWQ relies upon agency studies, industry research, and site inspections to assess the effectiveness and performance of NPS BMPs. NC DWQ is also able to gather information about Evaluating BMP Effectiveness through compliance oversight of local governments that implement NPS pollution regulatory requirements.[362]

North Dakota
Specific BMP Recommendations
Although the North Dakota Department of Health (ND DOH) has developed specific NPS pollution recommendations for agricultural run-off, the agency has not developed specific recommendations for NPS pollution associated with earth change activities.[363]

Oregon
One of the strategies that the ORDEQ NPS program has adopted in its effort to improve state water quality is to coordinate efforts on a watershed basis. Oregon has 21 watershed basins and 91 sub-basins, and ORDEQ's NPDES permitting and TMDL programs are administered at the sub-basin level. ORDEQ is in the process of developing 1,153 federally approved TMDLs by the end of 2010, and these TMDLs will aid DEQ in setting priorities with regards to 319 NPS management program grants.[364]

Specific BMP Recommendations
The Oregon Department of Environmental Quality (ODEQ) has developed specific recommendations/requirements for managing NPS pollution associated with earth change activities in urban settings.[365] Although ODEQ has developed recommendations for managing NPS pollution associated with earth change activities, the agency does not recommend specific NPS BMPs.[366]

In addition to the NPS program administered by ODEQ, Oregon has a Coastal Nonpoint Pollution Control Program (CNPCP), which was developed in response to requirements set forth in Section 6217 of the Coastal Zone Management Act Reauthorization Amendments of 1990 [CZARA]. The CNPCP provides guidance for managing NPS pollution associated with agricultural activities, forestry activities, urban areas, marinas, hydro-modification activities that fall within the coastal zone.[367]

Furthermore, NPS pollution is managed under the TMDL program, which requires municipalities to implement "TMDL Implementation Plans" in an effort to address NPS pollution. In agricultural settings, NPS pollution is addressed by "Agricultural Water Quality Management Plans." The United States Forest Service (USFS) and the Bureau of Land Management (BLM) have developed "Water Quality Restoration Plans" that address NPS pollution. Earth change activities that are conducted on privately owned forests are required under the Oregon Forest Practices Act to install BMPs for the purpose of NPS pollution management.

BMP Selection Process
ORDEQ does not utilize models or other assessment tools to evaluate NPS BMPs or to determine which BMPs to recommend.[368]

Vermont

Specific BMP Recommendations
The Vermont Department of Environmental Conservation (VT DEC) has developed specific NPS BMP recommendations that can be implemented to control NPS pollution associated with both earth change activities and agricultural earth change activities.[369]

BMP Selection Process
VT DEQ does not use models to evaluate BMPs or to determine which BMPs to recommend.[370]

Evaluating BMP Effectiveness
VT DEC relies on industry research, product specifications, and site inspections to evaluate the effectiveness of BMPs. VT DEC also relies on academic research to evaluate Evaluating BMP Effectiveness.

Virginia

Specific BMP Recommendations
The VA DCR recommends specific best management practices (BMPs) for controlling nonpoint source (NPS) pollution associated with urban earth change activities. VA DCR does not recommend specific BMPs for managing NPS pollution associated with agricultural and forestry-related earth change activities. VA DCR's NPS regulations specify design standards, performance standards, and specific best management practices (BMPs).[371]

BMP Selection Process
VA DCR does not use models or other assessment tools to determine which BMPs to recommend or to evaluate the effectiveness of NPS BMPs.[372]

Evaluating BMP Effectiveness
VA DCR relies on agency studies, industry research, product specifications and site inspections to evaluate the effectiveness of NPS BMPs.[373] In addition, VA DCR monitors the effectiveness of "proprietary manufactured BMPs."[374]

3.3.2 Additional Permit Requirements

U.S. EPA Region 3

Outstanding Resource Waters
U.S. EPA Region 3 has not developed specific NPS BMP requirements for earth change activities that discharge to 303(d) listed waterbodies or outstanding resource waters (ORWs).[375]

Wetlands
U.S. EPA Region 3 does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to NPS pollution management.

Certification Requirements
U.S. EPA Region 3 requires BMP installers and BMP inspectors to obtain specialized training in their respective disciplines. Certifications are not required. U.S. EPA Region 3 relies on site inspections to verify that NPS BMPs are being installed and maintained properly.[376]

Indiana
Outstanding Resource Waters
IDEM's regulatory approach towards urban NPS pollution and agricultural NPS does not directly account for impacts to receiving waterbodies, and IDEM does not develop specific NPS BMP requirements for earth change activities discharging to 303(d) list waterbodies that have TMDLs.[377]

Wetlands
IDEM does not make a distinction in its regulatory approach between wetlands and other water bodies, and IDEM has not developed specific NPS regulations that only pertain to wetlands.[378]

Certification Requirements
IDEM does not require contractors, BMP installers, or those responsible for inspecting BMPs to receive specialized training. IDEM conducts random site inspections at earth change activities to ensure that NPS BMPs are installed and maintained correctly. NPS BMPS that are installed as part of a grant-funded effort to control NPS pollution must be inspected on a regular basis. Grant-funded NPS pollution control projects are also subject to random inspections by IDEM.[379]

Iowa
Wetlands
In regards to the management of NPS pollution, IA NRCS does not make a distinction in its regulatory approach between wetlands and other waterbodies.[380]

Certification Requirements:
Although IA NRCS BMP installers and BMP inspectors are not required to obtain certification, contractors must obtain approval from the local soil and water conservation district in order to install BMPs for the purpose of managing NPS pollution associated with agricultural earth change activities[381]. IA NRCS is able to ensure that NPS pollution BMPs are installed and maintained correctly by requiring that municipalities monitor BMP installation and perform BMP inspections in urban areas. In agricultural settings, soil and water conservation districts are responsible for inspecting NPS pollution BMPs.[382]

Kansas
Wetlands
KDHEKS does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to NPS pollution management.[383]

Certification Requirements
Operators, BMP installers, and BMP inspectors are not required to obtain certifications or specialized training in their respective disciplines. KDHEKS provides technical assistance to help ensure that NPS BMPs are installed and maintained correctly.[384] According to the Kansas Nonpoint Source Pollution Management Plan, KDHEKS "will use some portion of 319 Section grant funds to support technical assistance activities of partner organizations," including the Kansas Rural Center Clean Water Farms Program, the River Friendly Farm Program, and the Kansas Wetlands and Riparian Areas Alliance.[385]

Louisiana
The LA DEQ may require operators to install special NPS BMPs at construction activities that discharge to 303(d) listed waterbodies that have TMDLs.[386]

Wetlands
The LA DEQ does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to NPS pollution management.[387]

Certification Requirements
The LA DEQ does not require contractors, BMP installers, or those responsible for inspecting BMPs to obtain specialized training in their respective disciplines. LA DEQ relies on site inspections to determine whether NPS BMPs are being installed and maintained correctly.[388]

Maine
Outstanding Resource Waters
ME DEP has developed special nonpoint source BMP requirements for urban earth change activities discharging to 303(d) impaired water bodies and outstanding resource waters (ORWs). Urban Earth change activities that discharge to impaired waterbodies and "waters at risk" are required to adhere to more stringent erosion and sedimentation control requirements, which are specified in ME DEP's stormwater rules.[389]
In addition, "residual designation authority was invoked" in the Long Creek watershed, and as a result, nonpoint source stormwater runoff is now directly regulated under the NPDES permitting program. According to the residual designation authority, which is supported by the Federal Clean Water Act, "a federal NPDES permit can be required for an otherwise unregulated stormwater discharge" if the Environmental Protection Agency (EPA) concludes that the discharge contributes to non-attainment of water quality standards.[390] The Long Creek watershed has experienced widespread land-use changes and an increase in impervious surface area in the past few decades. In 1998, Long Creek was identified as a "NPS priority watershed" because of its "potential high value in an urban setting," and funding was allocated for restoration. In hopes of accelerating the restoration effort, and in response to a petition by the Conservation Law Foundation, the EPA Region 1 Office invoked residual designation authority in 2008.[391]

ME DEP has not developed BMP recommendations/requirements for agricultural earth change activities.[392]

Wetlands
ME DEP does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to NPS pollution management.[393]

Certification Requirements
Operators, BMP installers, and BMP inspectors are not required to obtain certifications or specialized training in their respective disciplines. ME DEP conducts site inspections to determine whether BMPs are performing as intended.[394]

<u>Michigan</u>
Outstanding Resource Waters
MI DEQ has not developed specific NPS pollution recommendations or requirements for earth change activities that discharge to 303(d) listed waterbodies or ORWs.

Wetlands
MI DEQ does not make a distinction in its regulatory approach between wetlands and other water bodies in regards to NPS pollution management.

Certification Requirements
MI DEQ requires BMP inspectors to demonstrate their qualifications and expertise by obtaining certification in BMP inspection.[395] MI DEQ also performs site inspections to ensure that NPS BMPs are installed and maintained correctly.

<u>Minnesota</u>
Outstanding Resource Waters
When an earth change activity discharges to a 303(d) listed water body, appropriate MN MPCA programs may recommend BMPs that specifically target the pollutants for which TMDL(s) have been developed. Thus, BMP recommendations vary depending on the TMDL(s) that has developed for a water body.[396]

Currently, most NPS pollution associated with agricultural earth change activities is exempt from regulation under MN MPCA regulatory programs. MN MPCA is in the process of assigning responsibility for agricultural NPS pollution to the TMDL program. The TMDL program is likely to concentrate on agricultural run-off that is produced as a result of “plowing and tilling,” which MN MPCA considers an earth change activity.[397]

Wetlands
MN MPCA requires the installation of additional BMPs, including settling basins, at earth change activities that discharge to wetlands. In 2008, three wetland complexes were included on the 303(d) list of Impaired Waters.[398]

Certification Requirements
Operators, BMP installers, and BMP inspectors are not required to obtain certifications or specialized training in their respective disciplines. ME DEP conducts site inspections to determine whether BMPs are performing as intended.

Missouri

Outstanding Resource Waters

MO DNR's approach towards NPS pollution associated with urban earth change activities does account for impacts to receiving waterbodies. The agency's stormwater permitting authority may add specific NPS BMP requirements to stormwater permits that are issued to urban earth change activities discharging to 303(d) listed waterbodies that have TMDLs.[399]

MO DNR's approach towards NPS pollution associated with agricultural earth change activities does not account for impacts to receiving waterbodies. Thus, MO DNR will unlikely add specific NPS BMP requirements to stormwater permits issued to agricultural earth change activities.[400]

Wetlands

In regards to the management of NPS pollution, MO DNR does not make a distinction in its regulatory approach between wetlands and other waterbodies.[401]

Certification Requirements

MO DNR does not require that contractors, BMP installers, or those responsible for inspecting BMPs receive specialized training to ensure that BMPs are installed and maintained correctly.[402] MO DNR may perform inspections to ensure that NPS BMPs are being adequately maintained and are performing effectively.[403]

Nevada

Outstanding Resource Waters

NV DEP has not developed specific NPS pollution recommendations or requirements for earth change activities that discharge to 303(d) listed waterbodies or ORWs.[404]

Wetlands

NV DEP does not make a distinction in its regulatory approach between wetlands and other water bodies in regards to NPS pollution management.[405]

Certification Requirements

NV DEP does not require contractors, BMP installers, or those responsible for inspecting BMPs to obtain specialized training in their respective disciplines. NV DEP conducts site inspections to determine whether NPS pollution BMPs have been installed properly and are performing as intended.

New Jersey

Outstanding Resource Waters

NJ DEP does not require operators to install special BMPs to control NPS pollution originating from earth change activities that discharge to 303(d) listed waterbodies or outstanding resource waters (ORWs).[406]

Wetlands

NJ DEP does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to NPS pollution management.[407]

Certification Requirements
NJ DEP does not require contractors, BMP installers, or those responsible for inspecting BMPs to obtain specialized training in their respective disciplines. Compliance oversight is provided by local Soil Conservation Districts, which review and certify erosion and sedimentation control plans for earth change activities that disturb 5000 sq. feet or more.[408]

<u>New Mexico</u>
The U.S. EPA administers the NPDES permitting program in the state of New Mexico, and the EPA is primarily responsible for developing NPS pollution requirements. NM ED does have authority under Section 401 of the CWA to inspect NPS BMPs that have been installed at earth change activities and to "assess compliance with conditional certifications."[409]

Outstanding Resource Waters
NM ED has not developed specific NPS pollution BMP recommendations for earth change activities that discharge to 303(d) listed waterbodies or ORWs.[410]

Wetlands
NM ED does not make a distinction in its regulatory approach between wetlands and other water bodies in regards to NPS pollution management.[411]

Certification Requirements
NM ED does not require contractors, BMP installers, or those responsible for inspecting BMPs to obtain specialized training in their respective disciplines. NV DEP conducts site inspections to determine whether NPS pollution BMPs have been installed properly and are performing as intended.
New Mexico does not have NPDES primacy. Several of the above questions are answered in the negative because EPA has authority to set those requirements. Our agency does have authority under Section 401 of the CWA, and conducts implementation monitoring to assess compliance with conditional certifications.

<u>North Carolina</u>
Outstanding Resource Waters
The NC WQD has developed special regulatory requirements for earth change activities that discharge to 303(d) listed waterbodies that are impaired due to nutrients. These regulatory requirements are implemented to reduce nutrient loads, and the requirements apply to NPS pollution associated with urban earth change activities and agricultural earth change activities.[412]

Wetlands
The NC WQD does make a distinction in its regulatory approach between wetlands and other waterbodies in regards to NPS pollution management. NC WQD's regulatory requirements parallel the federal regulations, which require operators of earth change activities to avoid, minimize, and mitigate adverse impacts to wetlands as a result of NPS pollution.[413]

Certification Requirements
NC WQD does not require contractors, BMP installers, or those responsible for inspecting BMPs to receive specialized training. NC WQD conducts site inspections at permitted earth change activities to ensure that NPS BMPs are installed and maintained correctly. NC WQD conducts compliance oversights of local government agencies that implement NPS pollution regulatory requirements, which helps to ensure that these sub-state agencies and the construction activities that fall under their jurisdiction are operating as intended.[414]

North Dakota
Outstanding Resource Waters
The NC DOH has not developed specific recommendations for the purpose of managing NPS pollution associated with earth change activities.

Wetlands
The NC DOH does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to NPS pollution management.[415]

Certification Requirements
The NC DOH does not require contractors, BMP installers, or those responsible for inspecting BMPs to receive specialized training in their respective disciplines. The DOH may perform inspections at earth change activities and offer "technical support" in order to ensure that NPS BMPs are installed properly and are performing as intended.[416]

Oregon
Outstanding Resource Waters
OR DEQ has not developed specific NPS BMP requirements for earth change activities that discharge to 303(d) listed waterbodies or outstanding resource waters (ORWs).[417]

Wetlands
OR DEQ does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to NPS pollution management.[418]

Certification Requirements
OR DEQ does not require contractors, BMP installers, or those responsible for inspecting BMPs to obtain specialized training. In an effort to ensure that NPS BMPs are installed and maintained correctly, OR DEQ inspects stormwater and NPS BMPs that are installed to meet a "TMDL NPS pollutant-specific load allocation".[419]

Vermont
Outstanding Resource Waters
VT DEQ has developed specific NPS BMP requirements that must be adopted at earth change activities that discharge to 303(d) listed waterbodies. NPS BMP requirements are developed and implemented so that the "risk category" of the 303(d) listed water body is not affected.[420]
If a project discharges to a stormwater-impaired water it affects its risk category.

Wetlands

VT DEQ does not make a distinction in its regulatory approach between wetlands and other waterbodies in regards to NPS pollution management.[421]

Certification Requirements

Operators, BMP installers, and BMP inspectors are not required to obtain certifications or specialized training in their respective disciplines. VT DEQ relies on site inspections to ensure that BMPs have been installed and are being maintained correctly.[422]

<u>Virginia</u>

Outstanding Resource Waters

Urban earth change activities that discharge to 303(d) listed waterbodies with TMDLs must install additional stormwater BMPs and erosion and sedimentation control BMPs to meet the applicable loading reductions specified by the TMDL. Although VA DCR does not specify which stormwater BMPs or NPS BMPs operators must install in these instances, VA DCR may increase the frequency of inspections at construction activities that discharge to impaired waterbodies and outstanding resource waters (ORWs).[423] VA DCR has not developed specific NPS pollution recommendations or requirements for agricultural earth change activities that discharge to 303(d) listed waterbodies or outstanding resource waters (ORWs).[424]

Wetlands

VA DCR does make a distinction in its approach between wetlands and other waterbodies in regards to NPS pollution management. VA DCR may designate protected areas upstream of wetlands where certain earth change activities are prohibited.[425]

Certification Requirements

Personnel that inspect NPS BMPs are required to obtain certification in BMP inspection. In addition, there must be one designated "responsible land disturber" for each construction activity. The responsible land disturber is ultimately responsible for the earth change activities that occur at a site, and this individual must be certified with VA DCR.[426]

VA DCR also seeks to ensure that NPS BMPs are installed and maintained properly by requiring inspections of construction activities immediately following BMP installation. Both local governmental agencies and state agencies perform site inspections. In addition, VA DCR requires operators to submit plans for maintaining NPS BMPs, which must be approved before stormwater permits can be issued. These are two methods that VA DCR relies upon to ensure that NPS BMPs are installed and maintained properly.[427]

3.3.3 Monitoring Requirements

<u>U.S. EPA Region 3</u>

U.S. EPA Region 3 recommends that operators monitor NPS pollution originating from urban earth change activities. The regional office does not however, recommend monitoring of NPS pollution associated with agricultural earth change activities.[428]

U.S. EPA Region 9

U.S. Region 9 recommends monitoring of NPS pollution associated with urban earth change activities. Monitoring is recommended in an effort to evaluate the effectiveness of BMPs, and operators are encouraged to monitor NPS pollution immediately before and after the installation of BMPs.[429] U.S. Region 9 does not recommend or require monitoring of NPS pollution associated with agricultural earth change activities.

Indiana

IDEM recommends that operators monitor NPS pollution associated with urban earth change activities. The survey respondent did not indicate which parameters the agency recommends operators monitor in NPS pollution.[430] IDEM recommends monitoring of on a monthly basis.[431]

IDEM does not recommend parameter-specific monitoring of NPS pollution associated with agricultural earth change activities.[432]

Iowa

The IA NRCS may require monitoring of NPS run-off associated with urban earth change activities that are regulated under the NPDES permitting program, but monitoring requirements are determined on a case-by-case basis. Otherwise, IA NRCS may require monitoring of NPS run-off for investigative purposes. Earth change activities that serve as "demonstration projects," may also be required to monitor NPS run-off.[433] Monitoring requirements are determined on an individual basis, and there is no standard set of parameters that operators may be required to monitor.[434] IA NRCS does not recommend or require monitoring of NPS pollution associated with agricultural earth change activities.[435]

Louisiana

The LA DEQ recommends that operators monitor NPS pollution associated with urban earth change activities, although LA DEQ does not specify the parameters that should be monitored. LA DEQ does not recommend/require monitoring of NPS pollution associated with agricultural earth change activities or forestry-related earth change activities.[436]

Maine

ME DEP does not require monitoring of NPS pollution associated with urban earth change activities or agricultural earth change activities.[437]

Michigan

MI DEQ does not require monitoring of NPS pollution associated with urban earth change activities or agricultural earth change activities.

Minnesota

Generally speaking, MN MPCA does not require operators to monitor NPS pollution for specific parameters. Construction activities that are awarded grants or loans for the purpose of NPS pollution management may be required to monitor NPS pollution. Furthermore, plans implemented to meet the load reductions specified by a TMDL may include monitoring of NPS pollution. In this instance, NPS pollution monitoring is performed in order to quantify the amount of "NPS pollution not covered under the construction stormwater permit."[438] Although individual operators are not normally required to monitor NPS pollution, the Impaired Waters Program may monitor the water quality of receiving waters that are under TMDLs in order to evaluate the effectiveness of BMPs.[439]

Parameters That Must be Monitored

The parameters that must be monitored will depend on the TMDL(s) that has been developed for a particular receiving water body. Normally, the responsible party must monitor NPS pollution for fecal coliform, total suspended solids (TSS), pH, total phosphorus (TP), dissolved oxygen (DO), and one or more nitrogen parameters (ammonia, nitrate, nitrite, total nitrogen, etc.)[440] Depending on the circumstances, either the operator or the regulatory agency will be required to conduct monitoring.[441]

<u>Missouri</u>

MO DNR recommends that operators monitor NPS pollution associated with urban earth change activities. Monitoring for specific parameters is only recommended when there is an increased risk of a construction activity generating excessive NPS pollution. If the stormwater permitting authority recommends monitoring of NPS pollution associated with an urban earth change activity, the operator of the earth change activity may be asked to monitor water quality downstream of the construction activity.[442] Monitoring of NPS pollution is generally not required, but when it is required, the permitting authority will select the parameters to be monitored on a case-by-case basis.[443] In addition, the permitting authority will determine the frequency of monitoring, and whether the permitting authority or the operator of a construction activity will be responsible for monitoring NPS pollution.[444]

MO DNR does not recommend that operators monitor NPS pollution associated with agricultural earth change activities.[445]

<u>Nevada</u>

NV DEP does not require operators to monitor NPS pollution for specific parameters such as TSS, pH, oil and grease, etc.

<u>New Jersey</u>

NJ DEP requires the operators of remediation projects to monitor NPS pollution for specific parameters including TSS, pH, oil and grease, dissolved oxygen, "hazardous material," heavy metals, and hydrocarbons. The monitoring frequency is determined on a case-by-case basis, but operators are normally required to monitor NPS pollution every month or every four months (quarterly).[446]
NJ DEP does not recommend or require monitoring of NPS pollution associated with agricultural earth change activities.[447]

Parameters That Must be Monitored

TSS, pH, oil and grease, dissolved oxygen, "hazardous material," heavy metals, and hydrocarbons. Operators are required to monitor NPS pollution associated with earth change activities.

<u>New Mexico</u>
NM ED does not require or recommend that operators monitor NPS pollution for specific parameters such as TSS, pH, oil and grease, etc.[448] Parameter-specific monitoring of NPS pollution is not required in either agricultural or urban settings.

<u>North Carolina</u>
The NC DWQ does not require operators to monitor NPS pollution associated with urban earth change activities.

The NC DWQ does not require operators to monitor NPS pollution associated with agricultural earth change activities.[449]

<u>North Dakota</u>
The ND DOH does not require operators to monitor NPS pollution for parameters such as TSS, pH, oil and grease, etc.

<u>Oregon</u>
OR DEQ may recommend that operators monitor NPS pollution associated with earth change activities as part of their TMDL Implementation Plan.[450] Unless the operator of an earth change activity is implementing a TMDL Implementation Plan, monitoring of NPS pollution is not normally recommended.

<u>Vermont</u>
VT DEQ requires operators to monitor NPS pollution if the runoff is "visibly discolored." VT DEQ may require operators of both urban earth change and agricultural earth change activities to monitor NPS pollution if the runoff is discolored. Operators that observe discolored stormwater run-off are required to monitor NPS pollution for turbidity.[451]

Parameters That Must be Monitored
Turbidity
Operators are given the responsibility of monitoring NPS pollution.

Frequency of Monitoring
When monitoring is required, samples must be collected and analyzed after each storm event.

<u>Virginia</u>
When approved NPS BMPs are installed to control NPS pollution, VA DCR does not require parameter-specific monitoring of NPS pollution. When operators install alternative NPS BMPs that have not been proven effective in the state of Virginia, VA DCR may require those operators to monitor NPS pollution for total suspended solids (TSS) and total phosphorus. If VA DCR requires an operator to sample and analyze NPS pollution for TSS and total phosphorus, the sampling must occur after each storm event.[452]

VA DCR does not recommend or require that operators monitor NPS pollution associated with agricultural earth change activities.[453]

3.3.4 Compliance and Enforcement

U.S. EPA Region 3

Partnering With Other Agencies

U.S. EPA Region 3 delegates NPS program responsibilities to other state agencies and/or sub state agencies. U.S. EPA Region 3 is able to regulate these other agencies by conducting compliance oversight of their NPS pollution programs.[454]

Federal/State agencies

U.S. EPA Region 3 partners with many state and federal agencies in an effort to increase the effectiveness of the NPS program.

Indiana

Enforcement

The IDEM has the authority to issue fines or citations, violation notice letters, consent decrees or judgments, or consent orders in order to enforce compliance with nonpoint source pollution regulatory requirements.[455]

Partnering With Other Agencies

The IDEM is the primary state agency that administers the NPS pollution program, although IDEM does coordinate with sub-state agencies and “local programs” that enforce similar regulations. IDEM also works with sub-state agencies that have adopted “limited aspects” of the state’s NPS regulations.[456]

Federal/State Agencies

In an effort to increase the effectiveness of the NPS pollution program, IDEM partners with the Natural Resources Conservation Service, Indiana Association of Soil and Water Conservation Districts, the Indiana Department of Natural Resources, and the Indiana Department of Agriculture.[457]

Iowa

Enforcement

The IA NRCS has the authority to issue fines or citations, violation notice letters, consent decrees or judgments, or consent orders in order to enforce compliance with nonpoint source pollution regulatory requirements.[458]

Partnering With Other Agencies

Three state and federal agencies help to administer the NPS pollution program including the Iowa IA NRCS, the Iowa Department of Agriculture, and the Environmental Protection Agency (EPA).[459]

Kansas

Enforcement

KDHEKS does have a NPS pollution management plan, but the agency does not have regulatory policies or requirements that pertain to NPS pollution management. Thus, KDHEKS does not necessarily issue fines or citations to enforce compliance with recommendations outlined in the NPS pollution management plan.[460]

Partnering With Other Agencies
KDHEKS has not delegated program responsibilities to other state agencies or sub-state jurisdictions. KDHEKs does however partner with many agencies to increase the overall effectiveness of the NPS pollution management plan. KDHEKs partners with the State Conservation Commission, the Natural Resources Conservation Service, University Research and Extension Programs, Conservation Districts, Resource Conservation Districts, Nonprofit Organizations, Watershed Districts, the Kansas Water Office.[461]

Louisiana

Enforcement
LA DEQ may enforce compliance by issuing fines or citations or by sending violation notice letters to operators that are not complying with the recommendations/requirements of the NPS pollution program.[462]

Partnering With Other Agencies
LA DEQ delegates program responsibilities to other state and sub-state agencies including city and county governments. LA DEQ provides training to personnel that are involved in administering the program, and also performs inspections to ensure that these agencies are fulfilling their responsibilities.[463]

Federal/State agencies
LA DEQ partners with many state and sub-state agencies to increase the effectiveness of the NPS management program. LA DEQ partners with the Louisiana Department of Agriculture and Forestry, the Louisiana Department of Natural Resources, the Louisiana Department of Wildlife and Fisheries, the Louisiana Department of Health and Hospitals, and many local governmental agencies.[464]

Michigan

Enforcement
MI DEQ may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. MI DEQ may also send violation notice letters to permittees that are not complying with the requirements of the agency's NPS pollution program.

Partnering With Other Agencies
MI DEQ delegates program responsibilities to other state and sub-state jurisdictions, which MI DEQ regulates through periodic audits. In addition, MI DEQ partners with the U.S. Geological Survey, the United States Department of Agriculture Natural Resources Conservation Service, the Michigan Department of Natural Resources, and various other MI DEQ programs to increase the effectiveness of the NPS program.[465]

Minnesota

Enforcement
Enforcement measures may be employed when NPS pollution contributes to violation of certain "environmental rules" such as the "nuisance conditions" rule. MN MPCA may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. MN MPCA may also send violation notice letters to operators that are in violation of one or more "environmental rules." [466]

Partnering With Other Agencies
There are several MN MPCA programs that address NPS pollution management, including the Minnesota Clean Water Partnership, the Minnesota Clean Water Legacy, the Impaired Waters Program and Section 319 Programs Yes.[467 468] MN MPCA has not delegated program responsibilities to other state agencies or sub-state jurisdictions. Many state agencies and sub state jurisdictions, including county governments, soil and water conservation districts, watershed organizations, private citizens, and private organizations, may apply for grants or loans to implement NPS pollution management plans.[469]

Federal/State agencies
MN MPCA works with agricultural agencies such as the Minnesota Department of Agriculture, the United States Department of Agriculture (USDA), and the Natural Resources Conservation Council to increase the effectiveness of the NPS program. MN MPCA also works with the non-governmental organizations such as the Corn Growers Association to evaluate the effectiveness of BMPs.[470]

Missouri
Enforcement
The MO DNR has the authority to issue fines or citations, violation notice letters, consent decrees or judgments, or consent orders in order to enforce compliance with nonpoint source pollution regulatory requirements. MO DNR will only enforce compliance with NPS pollution regulatory requirements at earth change activities that are permitted under the NPDES permitting program or a related permitting program.[471]

Partnering With Other Agencies
MO DNR is the primary state agency that administers the NPS pollution program. MO DNR does however partner with many other agencies to increase the effectiveness of the NPS program, including the U.S. EPA, the Natural Resources Conservation Service (IA NRCS), University Extension Offices, Local watershed groups, the Missouri Department of Health, the Missouri Department of Conservation, and local government agencies.[472]

New Jersey
Enforcement
NJ DEP may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. NJ DEP may also send violation notice letters or issue stop work orders to operators that are not complying with the recommendations/requirements of the NPS pollution plan.[473]

Partnering With Other Agencies
NJ DEP has delegated program responsibilities to the State Soil Conservation Committee, which is composed of representatives from the New Jersey Department of Transportation, the New Jersey Department of Agriculture, and the New Jersey Department of Environmental Protection.[474]

Federal/State agencies
NJ DEP partners with many state and sub-state agencies to increase the effectiveness of the NPS pollution program, including the New Jersey Department of Agriculture, the New Jersey Department of

Transportation, the League of Municipalities, the New Jersey Builders Association, the Farm Bureau, and the New Jersey Department of Community Affairs.[475]

New Mexico

Enforcement

The U.S. EPA administers the NPDES program in New Mexico, and NM ED reports problems of non-compliance to the U.S. EPA or the United States Army Corps of Engineers.[476]

Partnering With Other Agencies

NM ED partners with many state and sub-state agencies to increase the effectiveness of the NPS pollution program including the United States Forest Service, USDI Bureau of Land Management, the New Mexico Energy Minerals and Natural Resources Department, Soil and Water Conservation Districts, Resource Conservation and Development Councils, local governments, non-profit organizations, and other state agencies.[477]

Nevada

Enforcement

NV DEP may enforce compliance by issuing fines or citations. NV DEP may also send violation notice letters to operators that are not complying with NPS pollution recommendations/requirements.[478]

Partnering With Other Agencies

NV DEP has delegated NPS program responsibilities to other state and sub-state agencies including city and county governments. NV DEP regulates these agencies through bi-yearly oversights of their NPS pollution programs and activities.[479]

Federal/State agencies

NV DEP partners with many organizations to increase the effectiveness of the NPS pollution program.

North Carolina

Enforcement

The NC WQD may enforce compliance by issuing fines or citations, consent decrees or judgments, or consent orders. NC WQD also sends violation letters to operators that are in violation of the NPS pollution regulatory requirements.[480]

Partnering With Other Agencies

The Division of Land Resources, Land Quality Section is primarily responsible for the management of erosion and sedimentation associated with urban earth change activities. The Division of Forest Resources is primarily responsible for implementing NPS pollution regulatory requirements that pertain to forestry-related earth change activities. The Division of Water Quality is responsible for managing post-construction NPS pollution.[481]

NC WQD has delegated responsibility to both county governments and municipalities to administer the NPS pollution program. NC WQD has statutory authority and can require both municipalities and counties to implement post-construction stormwater programs. Municipalities and cities can choose to implement erosion and sedimentation BMPs on a voluntary basis.[482]

Federal/State agencies
The NC WQD partners with many agencies to increase the effectiveness of the NPS pollution program. NC WQD partners with the Division of Soil and Water Conservation, the Division of Forest Resources, the Division of Land Resources, Land Quality Section, the Division of Environmental Health, the Division of Waste Management, the Ecosystem Enhancement Program, the Office of Environmental Education, and the Department of Agriculture and Consumer Services.[483]

<u>North Dakota</u>
Enforcement
The ND DOH is the only agency that directly administers the NPS pollution program.

Partnering With Other Agencies
The ND DOH does partner with many agencies to increase the effectiveness of the NPS pollution program including Soil Conservation Districts, Water Resource Districts, the NDSU Extension Service, the Natural Resources Conservation Service (IA NRCS), the North Dakota Department of Agriculture, and Resource Conservation & Development Councils.[484]

<u>Oregon</u>
Enforcement
OR DEQ is able to "indirectly" enforce compliance with NPS requirements/recommendations through enforcement of in-stream water quality standards.[485]

Partnering With Other Agencies
OR DEQ has delegated program responsibilities to other state agencies and sub-state agencies.

Federal/State agencies
Many federal and state rules, regulations, and programs support OR DEQ's NPS program. Some of the supporting rules and programs include the CZARA (Coastal Zone Management Act Reauthorization Amendments of 1990) Section 6217 Costal NPS Control Program, the TMDL rule, the National Estuary Program, the Forest Practices ACT, the Oregon Plan for Salmon and Watersheds, the Agricultural Water Quality Act, the State Land Use Planning Program, and drinking water and groundwater protection programs.[486]
The OR DEQ NPS program was designed to "coordinate with or provide direct assistance to other water quality protection or natural resource management programs at OR DEQ and in other local, state, and federal agencies." Some of the programs that the OR DEQ NPS program partners with include programs involved in the "management or regulation of forestry, agriculture, grazing, transportation, recreation, hydro-modification, marinas, urban development, land use planning, fish and wildlife habitat, riparian and wetlands protection/restorat6ion, public education, water resources, and other activities that affect the quality of the state's waters."[487]

Virginia

Enforcement

VA DCR may enforce permit compliance by issuing fines or citations, consent decrees or judgments, or stop work orders. In addition, VA DCR may send violation notice letters to operators that violate the regulatory requirements specified in the NPS pollution plan.[488]

Partnering With Other Agencies

VA DCR has delegated NPS pollution program responsibilities to other state agencies and sub-state jurisdictions. VA DCR regulates these other agencies through "periodic reviews of locally run programs." If a locally-run program is failing to uphold the regulatory requirements specified in the state-wide NPS pollution plan, VA DCR may require the locally-run program to sign a "corrective action agreement," which is enforced by the "authority to issue fines."[489]

Federal/State agencies

VA DCR does not partner with other agencies to increase the overall effectiveness of the NPS pollution program.[490]

Vermont

Enforcement

VT DEQ may enforce compliance by issuing fines or citations, consent degrees or judgments, or consent orders. DEQ may also send violation notice letters to operators that are not complying with the recommendations/requirements of the NPS pollution program.[491]

Partnering With Other Agencies

DEQ does not delegate NPS program responsibilities to other agencies, but DEQ does partner with the U.S. EPA and the Natural Resources Conservation Service to increase the effectiveness of the NPS program.[492]

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Chapter 4 : Ambient Wet Weather Monitoring

4.1 Introduction & Trends

To benchmark wet weather monitoring practices, state water monitoring personnel were surveyed on their ambient water monitoring programs including methods used and program organization.

The following 22 agencies responded to one or more questions in the Wet Weather Monitoring Survey: ORSANCO (Ohio River Valley Water Sanitation Association), CA, CT, FL, GA, ID, IN, KS, MA, MI, MO, MN, NH, NJ, NM, NC, ND, OH, UT, WA, WI, WY. In most cases, the survey responses were supplemented with internet based research. Information for agencies not listed above is based solely on internet research and indicated by an asterisk.

According to the survey participants, the pollutants most observed to exceed water quality standards during wet weather events are bacteria (fecal coliform, *E. coli*, *Enterococcus*) and sediment/turbidity. 37% of respondents (7 of 19 agencies) require one or more regulated parties to monitor the impacts of their wet weather discharges on ambient surface waters, while 61% of respondents (11 of 18 agencies) conduct internal monitoring of the impacts of wet weather discharges on ambient surface waters. Of the 11 agencies with internal monitoring practices, 17% (2 agencies) and 9% (1 agency) have increased personnel and acquired additional equipment, respectively, in order to conduct more effective ambient wet weather monitoring. 36% of respondents (4 agencies) devote one or fewer full time employees (FTEs) to wet weather monitoring activities; 18% of respondents (2 agencies) devote between one and five FTEs, while the remaining respondents were unable to quantify the FTEs devoted specifically to wet weather monitoring. 53% of respondents (8 of 15 agencies) use surrogate or indicator measurements to simplify wet weather monitoring, with the dominant examples including total suspended solids (TSS) for sediment, and *E. coli* or fecal coliform for pathogenic bacteria. 36% of respondents (5 of 11 agencies) employ contractors and 71% (10 agencies) use in-house staff. 59% of respondents (10 of 17 agencies) are monitoring the effects of wet weather discharges on concentrations of emerging contaminants. 44% of respondents (7 of 16 agencies) monitor wet weather pollutant loads and 31% (5 of 16 agencies) conduct aquatic toxicity tests on wet weather discharges. 50% of respondents (6 of 12 agencies) conduct some degree of continuous monitoring with sondes, or electronic water quality monitoring devices.

4.2 Monitoring By Agency & Regulated Parties

4.2.1 Monitoring Party

Both Montana Department of Environmental Quality (MT DEQ) and New York Department of Environmental Conservation (NYSDEC) do not conduct any ambient wet weather monitoring.

<u>Ohio River Valley Water Sanitation Association (ORSANCO)</u>
ORSANCO has 8 member states (Illinois, Indiana, Ohio, Pennsylvania, New York, Kentucky, West Virginia, Virginia). From May to October, ORSANCO conducts weekly monitoring for bacteria in the Ohio River near major combined sewer overflow (CSO) outfalls.[1]

<u>California</u>
California Environmental Protection Agency (Cal/EPA) requires permitted municipalities to monitor ambient water quality near their stormwater outfalls.[2] Cal/EPA also monitors ambient surface waters for the impacts of wet weather discharges.

Connecticut
Connecticut Department of Environmental Protection (CT DEP) requires regulated parties to monitor the impacts of their wet weather discharges on ambient surface waters, but does not conduct any such ambient wet weather monitoring itself.[3]

Florida
Florida Department of Environmental Protection (FL DEP) does monitor the impacts of wet weather discharges on ambient surface waters, but does not require any of its stormwater permit holders to monitor the impacts their wet weather discharges have on ambient surface waters.[4]

Georgia
Georgia Department of Natural Resources (GA DNR) requires some industrial stormwater permit holders to monitor the impacts their wet weather discharges have on ambient surface waters, if they are suspected to contribute to a violation of state water quality standards. [5] GA DNR does not conduct wet weather specific monitoring.

Idaho
Idaho Department of Environmental Quality (ID DEQ) requires regulated parties to monitor the impacts of their wet weather discharges on ambient surface waters.[6] Responses to the remaining 21 questions were not provided.

Illinois*
According to the Illinois Water Monitoring Strategy for 2007-2012, Illinois' Ambient Water Quality Monitoring Network consists of 217 stations. However, no wet weather focused monitoring efforts are specified.[7]

Indiana
Indiana Department of Environmental Management (IDEM) does conduct ambient monitoring of *E. coli* and, when resources are available, seasonal ambient monitoring of pesticides.[8]

Kansas
Kansas Department of Health & Environment (KDHE) does require a few permitted industrial facilities and municipalities to monitor the impacts of their wet weather discharges on ambient surface water quality, but this is not generally required. In addition, KDHE's ambient stream chemistry monitoring program conducts "year-round, bimonthly surface water quality monitoring, regardless of prevailing weather conditions, from specific monitoring locations dispersed throughout Kansas. Many sites are located immediately above or immediately below major urban settings"[9] and the monitoring schedule is typically developed four years in advance of bimonthly monitoring activities. "On average, approximately seventeen to twenty-five percent of the samples are obtained during runoff episodes or during conditions of elevated stream flow."[10]

Massachusetts
"Massachusetts does not administer a monitoring program element specifically designed to evaluate the effects of wet-weather on our surface waters." [11] Wet-weather data is incidentally obtained as part of the ambient water monitoring program, which relies on the results of pre-scheduled stream surveys to support water use assessments and impaired water listing decisions under sections 305(b) and 303(d) of the Clean Water Act. Municipalities also collect wet weather data to assess and manage CSOs. Approximately twenty cities in

Massachusetts maintain combined sewer systems that overflow into receiving waters during storm events, the monitoring of which is carried out as part of the development of municipal CSO Control Plans.

Michigan

Michigan Department of Environmental Quality (MI DEQ) does not require regulated parties to monitor the impacts their wet weather discharges have on ambient surface waters.[12] MI DEQ conducts wet weather sampling according to various needs, such as flow stratified sampling of Great Lakes tributaries and monitoring to support enforcement and TMDL development.

Minnesota

Minnesota Pollution Control Agency (MPCA) requires Phase I municipal separate storm sewers (MS4s) to conduct a variety of monitoring, in order to satisfy the following:

1) Characterize pollutant event mean concentrations
2) Estimate total annual pollutant load to receiving bodies of water
3) Estimate total annual stormwater volume to receiving bodies of water
4) Estimate effectiveness of stormwater system management devices and practices
5) Calibrate stormwater models[13]

In addition, "MPCA currently has an extensive monitoring effort underway that consists of many partners (watershed districts, regional and local governments). Ambient river monitoring programs within or funded by the MPCA that specifically capture all, including wet weather, discharges include: the Major Watershed Load Monitoring Network (pollutant loads are calculated at the 8 digit and larger scale); Clean Water Partnership (CWP) Projects encompassing8 digit hydrologic unit codes (HUC) and smaller; and some total maximum daily load (TMDL) projects (8 digit HUC and smaller). MPCA also uses satellite and plane-based remote sensing."[14]

There are also several in-house ambient monitoring programs, such as the "biologically based Intensive Watershed Monitoring effort (IWM) and stream assessment focused Milestone Monitoring, that do not specifically target but may capture wet weather discharges. The IWM, while biologically focused, also collects water quality samples on a temporal schedule."[15] The MPCA also provides Surface Water Assessment Grants to local organizations and local units of government to assess surface waters. This sampling is also temporally based but may capture periodic wet weather discharges.

Various parties are also developing stormwater assessment techniques for future use, including assessment of thermal loading in trout streams (Minnesota Urban Heat Export Tool), best management practices (BMPs) effectiveness, urban runoff models, and underground proprietary devices.[16] See http://www.pca.state.mn.us/water/stormwater/stormwater-research.html for more details and project reports.

Missouri

Missouri DNR (MO DNR) monitors the impacts of wet weather discharges on ambient surface waters only during the development of a TMDL or if there is a specific concern associated with stormwater and the state requires additional data. MO DNR does not require regulated parties to assess the impacts of their stormwater discharges on ambient surface waters.[17]

New Hampshire

New Hampshire Department of Environmental Services (NH DES) does not monitor wet weather impacts on ambient surface waters, nor are regulated parties required to monitor the impacts of their stormwater discharges on ambient surface waters.[18]

New Jersey

New Jersey Department of Environmental Protection (NJ DEP) does not require regulated parties to monitor the impacts of their discharges on ambient surface waters, nor does NJ DEP conduct wet weather specific ambient monitoring. There are a few exceptions to the latter, in which wet weather events are targeted if they are suspected to contribute to an impaired area.[19]

New Mexico

New Mexico Environment Department (NMED) does not intentionally conduct wet weather specific ambient monitoring, with the exception of a study of water quality sampling during storm events related to Los Alamos National Laboratory. Regulated parties in New Mexico are not required to monitor the impacts of their stormwater discharges on ambient surface waters.[20]

North Carolina

North Carolina Department of Environment & Natural Resources (NC DENR) does not require regulated parties to assess the impacts of their stormwater discharges on ambient surface waters. NC DENR may monitor the impacts of wet weather discharges in specific circumstances. Examples of such specific circumstances include: "suspected or observed water quality standard violations from industrial or construction activity stormwater discharges, scheduled ambient monitoring at NC stations that fall during a wet weather event, individual stormwater permit requires permittee to sample upstream and downstream (this is not routine), some Phase I MS4 communities have developed ambient monitoring programs that include wet weather monitoring (e.g., Charlotte) and/or sample during suspected water quality standard violations, Regional Offices may initiate an effort to determine causes of impairments in regional water bodies that are potentially affected by wet weather discharges."[21]

North Dakota

North Dakota Department of Health (ND DoH) does not require regulated parties to monitor the impacts of their stormwater discharges on ambient surface waters, and only conducts wet weather specific monitoring on a case-by-case basis, during the development of TMDLs.[22]

Ohio

If Ohio Environmental Protection Agency (OH EPA) has reason to believe there is reasonable potential for water quality violations, industrial stormwater dischargers may and have been required to sample both their effluent and in-stream.[23] Communities with sanitary sewer overflows (SSOs) and CSOs have been required to sample both their overflows and in-stream, but MS4s are not required to conduct ambient monitoring as part of the general MS4 permit. Using water body biosurveys, OH EPA monitors the impacts of wet weather discharges on aquatic life within ambient surface waters.

Utah
Utah Department of Environmental Quality (UT DEQ) does not require any regulated parties to monitor ambient surface water quality near their stormwater outfalls, and does not conduct ambient wet weather monitoring.[24]

Washington
Washington Department of Ecology (WA DOE) does not require any regulated parties to monitor the impacts of their stormwater discharges on ambient surface waters. WA DOE conducts ambient wet weather monitoring as part of TMDL studies and commercial shellfish growing area evaluations, and in response to citizen complaints and fish kills.[25] WA DOE will also conduct ambient monitoring in wet weather conditions if scheduled sampling event occurs during wet weather.[26]

Wisconsin
Regulated parties are not required to monitor the impacts their wet weather discharges have on ambient surface waters, but the Wisconsin Department of Natural Resources (WI DNR) conducts wet weather monitoring, although a systematic wet weather monitoring program has not been developed.[27]

Wyoming
Wyoming Department of Environmental Quality (WY DEQ) does not require any regulated parties to monitor the impacts of their wet weather discharges on ambient surface waters, and only conducts wet weather specific monitoring on a case-by-case basis, if wet weather is suspected to be contributing to a water quality standard violation or if a scheduled ambient monitoring event coincides with wet weather.[28]

4.2.2 Frequent Exceedance of Water Quality Standards

The following lists include pollutants that have been observed to frequently exceed water quality standards during wet weather events.

ORSANCO
Fecal coliform, *E. coli*, *Enterococcus*.

California
The following pollutants frequently exceed California's water quality standards during wet weather: TSS, specific conductance, total dissolved solids (TDS), zinc, copper, chromium, selenium, nitrate as nitrogen, Total Kjeldahl nitrogen (TKN), total phosphorus, bacteria (total and fecal coliform), diazinon, and polycyclic aromatic hydrocarbons (PAHs).

Connecticut: No response.

Florida
Nutrients, biochemical oxygen demand (BOD), fecal coliform, copper

Georgia
Fecal coliform, TSS.[29]

Idaho: No response.

<u>Indiana</u>
Pesticides (e.g. atrazine) during application season, *E. coli*.

<u>Kansas</u>
Ammonia, arsenic, atrazine, cadmium, chromium, copper, lead, nickel, selenium, zinc, *E. coli*, fecal coliform frequently exceed Kansas' water quality standards during wet weather. KDHE has not established specific numeric surface water quality standards addressing total nitrogen, total phosphorus, and TSS, but these parameters are also a concern during high stream flow events.

<u>Massachusetts</u>
Fecal coliform, *E. coli*, *Enterococcus*, nutrients, suspended solids, and trace metals (in older industrial watersheds).

<u>Michigan</u>
E. coli, mercury and PCBs are elevated in wet weather samples, but also are frequently elevated in dry weather. TSS, TDS, and phosphorus have been found at high levels in wet weather, although no numeric water quality standards exist for these parameters.

<u>Minnesota</u>
E. coli & other pathogens, turbidity (as TSS), nutrients, chloride.

<u>Missouri</u>
Missouri does not have wet weather water quality standards, but wet weather situations are investigated for the impact they have on non-wet weather conditions. For example, *E. coli* washing in during wet weather can cause dry weather impacts.

<u>New Hampshire</u>
E.coli, fecal coliform, *Enterococcus,* chlorophyll-a, pH, aluminum, zinc, turbidity, dissolved oxygen.[30]

<u>New Jersey</u>
Unknown; however, significant amounts of TSS are found in stormwater from permitted sites.

<u>New Mexico</u>
Dissolved oxygen, *E. coli*.[31]

<u>North Carolina</u>
Turbidity, fecal coliform, flow volume (evidenced by incised stream channels and subsequent impacts to biological integrity).

<u>North Dakota</u>
Fecal coliform, sediment.

<u>Ohio</u>
E. coli, fecal coliform, dissolved oxygen.

Utah
UT DEQ does note weather conditions during ambient sampling events, but it does not otherwise differentiate between wet and dry weather water quality standards exceedances.

Washington
Fecal coliform, turbidity, suspended solids, organochlorine pesticides, peptide nucleic acids (PNAs), polychlorinated biphenyls (PCBs), and various metals.

Wisconsin
Phosphorus, pH, and ammonia as nitrogen are found to frequently exceed Wisconsin's water quality standards during wet weather events. Other pollutants, such as nitrates, TSS, and chlorides, are also found in high concentrations during wet weather, but Wisconsin does not have standards for these pollutants.

Wyoming
Sediment is the only pollutant known to exceed water quality standards during wet weather, but little research has been done on the topic.

4.2.3 Monitoring of Water Quantity Impacts

ORSANCO
ORSANCO does not monitor the water quantity impacts of wet weather discharges.

California
California monitors wet weather impacts on stream flashiness (streamflow response to storm events), channel morphology, and in-stream habitat.

Connecticut: Not applicable.

Florida
Specific wet weather water quantity impacts (on stream flashiness, channel morphology, in-stream habitats) are not monitored, but biological health monitoring is included in FL DEP's monitoring program. Biological health monitoring includes a detailed habitat assessment as well as sediment characteristics monitoring.

Georgia: No response.

Idaho: No response.

Indiana:
IDEM does not monitor the water quantity impacts of wet weather discharges.

Kansas
Kansas conducts assessments of wet weather impacts on stream channel stability using Kansas Watershed Restoration and Protection Strategy (WRAPS) Grant Funds.

Massachusetts: Not applicable.

Michigan
MI DEQ monitors wet weather impacts on stream flashiness, channel morphology, and in-stream habitat.

Minnesota
Minnesota monitors wet weather impacts on stream flashiness, channel morphology, in-stream habitat, nutrients, and sediment.

Missouri: None.

New Hampshire: Not applicable.

New Jersey: No response.

New Mexico: Not applicable.

North Carolina
NC DENR has a "robust biological monitoring program that assesses the biological integrity of streams throughout the state and suspected stressors often include stormwater impacts."[32] In this way, the impacts of stormwater quantity on in-stream habitat are monitored. The agency may also consider potential stormwater impacts on any parameters routinely monitored.

North Dakota
ND DoH does not monitor water quantity impacts of wet weather discharges.

Ohio
As part of the biosurvey, the impacts of wet weather on stream flashiness, channel morphology, and in-stream habitat are evaluated.

Utah: Not applicable.

Washington
Some studies have examined in-stream habitat and channel morphology in forest areas under forest practice rules, but this is rare in other settings.

Wisconsin
Wisconsin has not developed a systematic process to "evaluate wet weather flow impacts on physical stream features, but individual biologists trying to quantify factors degrading streams or limiting biological quality will measure" stream flashiness, channel morphology, and in-stream habitat.

Wyoming: Not applicable.

4.2.4 Organization

ORSANCO
ORSANCO has increased personnel in order to effectively monitor wet weather discharges and/or the impacts of wet weather discharges on ambient surface waters. Its wet weather monitoring costs are increasing.

Approximately 5% of ORSANCO's water quality budget and 1 full time equivalent (FTE) is devoted to ambient wet weather monitoring.

California

California has not made any organizational changes to monitor wet weather discharges or the impact those discharges have on ambient surface waters. The percentage of the state's water quality budget devoted to wet weather monitoring is unknown, and approximately 1 FTE is devoted to wet weather monitoring. Cal/EPA's annual wet weather monitoring costs are decreasing.

Connecticut: Not applicable.

Florida

Wet weather monitoring has been a part of FL DEP's ambient monitoring program for over 20 years. It is incorporated into the ambient monitoring program, so it is not feasible to determine the portion of the water quality budget and number of FTEs devoted to wet weather monitoring. FL DEP's annual wet weather monitoring costs remain the same.

Georgia: No response.

Idaho: No response.

Indiana

IDEM has not made any organizational changes to monitor wet weather discharges or the impact those discharges have on ambient surface waters. No FTEs are devoted to wet weather monitoring and annual wet weather monitoring costs remain the same.

Kansas

KDHE has not made any organizational changes to monitor wet weather discharges or the impact those discharges have on ambient surface waters. No FTEs or percentage of KDHE's budget is devoted specifically to ambient wet weather monitoring.

Massachusetts

Massachusetts Department of Environmental Protection (MA DEP) maintains one multi-purpose, truck-mounted, mobile laboratory that can respond to emergencies such as hazardous chemical spills, sewer by-passes, etc., but it has never been utilized for routine surface-water monitoring or wet-weather sampling purposes. Each of MA DEP's four regional offices maintains a small field laboratory equipped with the Colilert rapid bacteria detection system that is used for bacterial source tracking.

Michigan

MI DEQ has provided funding for to USGS and other consultants to monitor specific parameters (e.g. Cryptosporidium, nutrients, metals, PCBs, and *E. coli*) during wet weather events. Approximately 25% of MI DEQ's water quality monitoring budget is applied to wet weather monitoring and these costs are increasing. Less than 5 FTEs are devoted to wet weather monitoring activities, as the majority of the wet weather sampling is conducted by contractors rather than Department staff.

Minnesota

MPCA has made the following organizational changes to monitor wet weather discharges: expanded monitoring efforts (increased personnel), equipment upgrades, improved data management system, and web based data access. In 2007, the MPCA and the Minnesota Department of Natural Resources (DNR) initiated the Major Watershed Load Monitoring Network (MWLMN), for which staff were hired to monitor water quality at locations along Minnesota's major rivers as well as from the outlets of major tributaries draining to these rivers. "State-of-the-art equipment and data management software were purchased to help ensure the success of this program."[33] Real-time and archived discharge and water quality data will be made available to the public through a developing website that will be cooperatively shared among state agencies.

Approximately 15-20% of the MPCA's condition/trend monitoring budget is "spent on the grab sampling and load calculation components of the Major Watershed Load Monitoring Network"[34], and the DNR also contributes a significant amount of staff time and operating expenses to establishing and maintaining the flow stations. MPCA's wet weather monitoring costs are increasing. The MPCA devotes 7.5 FTEs to the MWLMN, and numerous additional staff also support the Clean Water Partnership (CWP) and TMDL projects that collect wet-weather monitoring data. The DNR also employs about 9 FTEs to install and maintain the permanent gaging stations of the network; this includes data management. MPCA does use mobile labs for wet weather monitoring.

Missouri

MO DNR has not made any organizational changes to effectively monitor wet weather discharges or the impacts wet weather discharges have on ambient surface waters. Annual wet weather monitoring costs are decreasing. The percentage of water quality budget devoted to wet weather monitoring is unknown and less than 1 FTE is devoted to wet weather monitoring.

New Hampshire

No organizational changes have been made.

New Jersey: No response.

New Mexico: Not applicable.

North Carolina: Not applicable.

North Dakota

No organizational changes have been made.

Ohio

Ohio has not made any organizational changes to effectively monitor wet weather discharges or to effectively monitor the impacts those wet weather discharges have on ambient surface waters. The percentage of the state's water quality monitoring budget and FTEs devoted to wet weather monitoring is unknown, as this is a part of the entire program and difficult to disaggregate.

Utah: Not applicable.

Washington
The number of Phase I and Phase II stormwater permit staff has increased, and some construction stormwater inspectors have been hired. As a result, annual wet weather monitoring costs are increasing. The percentage of the state's water quality monitoring budget and FTEs devoted to wet weather monitoring is unknown.

Wisconsin
Wisconsin has not made any organizational changes to effectively monitor wet weather discharges or to effectively monitor the impacts those wet weather discharges have on ambient surface waters. Less than 5% of the state's water quality monitoring budget and approximately 2 FTEs are devoted to wet weather monitoring, and those costs are increasing.

Wyoming
No FTEs are devoted to wet weather monitoring, no organizational changes have been made, and annual wet weather costs remain the same.

4.2.5 Indicator measurements

ORSANCO
Fecal coliform, *E. coli*, and *Enterococcus* are used as indicators for bacteria.

California
Fecal coliform.

Connecticut: None.

Florida: None.

Georgia: No response.

Idaho: No response.

Illinois
Chlorophyll-a and total phosphorus are used as a surrogate for algal biomass, and turbidity is used as a surrogate for sediment.[35]

Indiana
IDEM uses *E. coli* as an indicator of fecal matter.

Kansas: None.

Massachusetts: Not applicable.

Michigan
The only surrogate measurements used are *E. coli* for pathogens and TSS for sediment.

Minnesota
TSS is used as a surrogate for turbidity and "biology is used as an indicator of the overall or cumulative effects of frequency, duration, and magnitude of runoff events and other stressors."[36]

Missouri: None.

New Hampshire: Not applicable.

New Jersey: None.

New Mexico: Not applicable.

North Carolina: None.

North Dakota: None.

Ohio
Ohio uses aquatic life attainment of fish and macro-invertebrates as a surrogate measurement for wet weather monitoring.

Utah: None.

Washington
Turbidity for TSS, fish tissue burdens for polybrominated diphenyl ethers (PBDEs) and pesticides, rainfall rate to indicate shellfish bed closures.

Wisconsin
In urbanized watersheds, Wisconsin examines morphological features (percentage eroded banks, base flow vs. bank full) to understand event flow impacts on in-stream habitat.

Wyoming: No response.

4.2.6 Monitoring Design: timing of sample collection, toxicity testing, continuous monitoring, contractor/in-house staff, pollutant loads

ORSANCO
ORSANCO uses contractors and in-house staff to collect wet weather samples. Daily flow estimates from the Corps of Engineers or National Weather Service are used to match the timing of sampling collection to the hydrograph. There is no monitoring of wet weather pollutant loads and no aquatic toxicity tests conducted on wet weather discharges. ORSANCO uses continuous monitoring with sondes to collect data on dissolved oxygen levels.

California
Cal/EPA employs contractors to collect wet weather samples. Municipal employees also conduct wet weather monitoring, as specified in Section 4.1.1 above. The timing of sample collection is matched to the hydrograph

by collecting samples during the first flush (first 30 minutes) and compositing the samples up to the next 8 hours to determine event mean concentrations.

Emerging contaminants monitored during wet weather events include chloropyrifos and pyrethroids. Wet weather pollutant loads are determined using pollutant concentration and flow data, both of which are collected at the monitoring station during storm events.

Aquatic toxicity tests are conducted on several NPDES permitted stormwater discharges, the terms of which vary throughout the state. Aquatic toxicity test methods used are EPA 821-R-02-012 (Acute) and EPA 821-R-02-013 (Chronic). The San Diego County MS4 permit requires toxicity tests using the above methods with the following species': 7-day chronic test with the cladoceran *Ceriodaphnia dubia*, chronic test with the freshwater algae *Selenastrum capricornutum*, acute survival test with amphipod *Hyalella azteca*.[37] California has no continuous monitoring with sondes.

Connecticut

CT DEP requires industrial stormwater permit holders to conduct LC50 aquatic toxicity tests on wet weather discharges and does not use continuous monitoring with sondes.[38] No monitoring of wet weather pollutant loads or emerging contaminants during or after wet weather.

Florida

FL DEP uses in-house staff to collect wet weather samples, but much of the ambient monitoring is done by local governments and regional water management districts. Florida has no ambient wet weather monitoring of emerging contaminants or pollutant loads and no aquatic toxicity tests are conducted on wet weather discharges. Continuous monitoring with sondes is used as needed for the purpose of better characterizing ambient conditions over time.

Georgia: No response.

Idaho: No response.

Indiana

IDEM uses in-house staff to collect wet weather samples and does not conduct ambient wet weather monitoring of emerging contaminants or pollutant loads. IDEM does not currently conduct aquatic toxicity tests on wet weather discharges, but they have in the past. IDEM does not have continuous monitoring.

Kansas

KDHE staff, permitted MS4s, and participants in urban stormwater programs collect wet weather samples. Isco automatic samplers are used to match sample collection to the hydrograph; typically, samples are collected during the rise, fall, and near the peak of the storm event. KDHE does not have ambient wet weather monitoring of emerging contaminants. Wet weather pollutant loads are monitored by combining the statewide ambient stream chemistry monitoring program's water quality data with available United States Geological Survey (USGS) flow data and supplementing that with any locally collected flow data. KDHE does not currently conduct or require stormwater permit holders to conduct aquatic toxicity tests on their discharges, but MS4 permits up for renewal in 2010 may contain new requirements for aquatic toxicity testing on wet weather discharges. KDHE does a limited amount of continuous monitoring with sondes, but it is normally controlled by USGS under a state contract.

<u>Massachusetts</u>

To date, specific wet-weather sampling to evaluate stormwater pollutant loadings has been primarily limited to site-specific projects aimed at the calculation of TMDLs, load allocations (LAs) and WLAs. These efforts are typically contracted out, rather than conducted by MA DEP staff. MA DEP deploys unattended dissolved oxygen, pH, and temperature sondes for up to a week at a time as part of its revolving intensive watershed surveys. Thermistors are also deployed to record temperature for 2-3 months at a time. However, only approximately one-fifth of the state is monitored in any given year, as MA DEP moves through a five-year rotating monitoring schedule so these probes do not continuously monitor the same sites over an extended period of time. Massachusetts Coastal Zone Management (CZM) deploys a state-of-the-art monitoring buoy in Mount Hope Bay to continuously monitor dissolved oxygen levels.

<u>Michigan</u>

MI DEQ uses contractors and in-house staff to collect wet weather samples. Matching of sample collection to the hydrograph is accomplished with the aid of USGS, who collects flow stratified samples from Great Lakes tributaries at its stream gages. Automated samplers also help match samples with peak flows. There are no monitoring efforts targeting emerging contaminant concentrations during wet weather. Wet weather pollutant loads are monitored using flow stratified sampling and automated sampling equipment. Aquatic toxicity tests are conducted on wet weather discharges as needed. Toxicity test methods employed include acute and chronic tests on *Cerodaphnia dubia*, *Daphnia magna*, and/or fathead minnow. Continuous monitoring with sondes is not conducted on a routine basis, but sondes are occasionally deployed to achieve specific study objectives.

<u>Minnesota</u>

MPCA uses in-house staff to collect wet weather samples, but local organizations, universities, local units of government also contribute to wet weather sampling collection efforts.

The following describes how sample collection is timed to the hydrograph: "programs focused on calculating pollutant loads (CWP, TMDL, MWLMN) are biased towards sampling during storm events. 60 - 80% percent of annual samples are targeted to periods of wet weather discharge."[39] Sample collection frequency along storm hydrographs is proportional to flow and sampling is most intense during periods of greatest flow.

Emerging contaminants monitored during wet weather events include PAHs and Perfluorocarbons (PFCs). Aquatic toxicity tests are not generally conducted on wet weather discharges. "The MPCA's Intensive Watershed Monitoring effort deploys sondes for limited time periods when sampling watersheds, primarily for dissolved oxygen monitoring. Although regional variability exists, several Clean Water Partnerships collect continuous data from sondes. The MWLMN will be deploying continuous turbidity sensors at several watershed outlets throughout the state in 2010."[40]

Wet weather pollutant loads are monitored in the Clean Water Partnership (seasonally) and MWLMN (annually) efforts; some TMDL projects also compute pollutant loads. MPCA's approach to monitoring wet weather pollutant loads:

1) River stage is accurately tracked
2) Discharge measurements are collected and ratings developed according to USGS protocols
3) Stage is converted to discharge

4) Approximately 35 samples per site are collected annually, with sample collection strongly biased to "wet weather" periods
5) "Flux", an interactive software program originally developed by Dr. Bill Walker and the US Army Corps of Engineers and recently upgraded by the Corps and the MPCA, is used to calculate annual pollutant loads from annual discharge and water chemistry data

Missouri

Contractors and in-house staff collect wet weather samples. Matching of sample collection with the hydrograph is dependent upon the question/issue being considered.

No ambient wet weather monitoring of emerging contaminants or pollutant loads.
One of Missouri's MS4 permits included whole effluent toxicity (WET) tests such as Acute *Cerio daphnia dubia*, Acute *Pimephales promelus*, because toxicity in the receiving stream appeared to be attributable to the city's stormwater. There is no continuous monitoring with sondes.

New Hampshire: Not applicable.

New Jersey

No response regarding how timing of sample collection is achieved.

NJ DEP uses in-house staff to collect wet weather samples and does not do ambient wet weather monitoring of emerging contaminants. NJ DEP does not monitor wet weather pollutant loads or conduct aquatic toxicity tests on wet weather discharges. There is no continuous monitoring using sondes.

New Mexico: Not applicable.

North Carolina

No ambient wet weather monitoring of emerging contaminants or wet weather pollutant loads.
The only wet weather specific aquatic toxicity testing is in large airport permits, on discharges associated with de-icing activities. These permits might be in the NPDES Storm Water program, but more commonly are part of the NPDES Wastewater program.

North Dakota

Contractors and ND DoH staff collect in-stream samples. There is no ambient wet weather monitoring of emerging contaminants or wet weather pollutant loads. Aquatic toxicity tests are not conducted on wet weather discharges.

Ohio

No response regarding who conducts wet weather sampling or how timing of sample collection is achieved.
There is no monitoring of the effects wet weather discharges have on the concentrations of emerging contaminants (e.g., pharmaceuticals, PBDEs) in Ohio's ambient surface waters. Wet weather pollutant loads are monitored only as part of Ohio's CSO Long Term Control Plan (LTCP) characterization process. Ohio does not conduct aquatic toxicity tests on wet weather discharges.

Utah

Permitted Phase I facilities match the timing of sample collection to the hydrograph and describe how this is achieved in a questionnaire that is submitted to UT DEQ. There is no ambient wet weather monitoring of emerging contaminants, aquatic toxicity tests conducted on wet weather discharges, or continuous monitoring with sondes. Phase I MS4s are required to calculate loading from each of their monitoring sites.

Washington

WA DOE staff primarily collects wet weather samples, but some grants are provided to conservation districts, counties, and municipalities to collect samples under an approved quality assurance plan. If possible, samples are collected during rising, peak and falling periods on the hydrograph. Otherwise, composite samples or grab samples are taken, and are matched to their position on the hydrograph.

Emerging contaminants monitored during wet weather events include: PBDEs, acetaminophen, caffeine, carbamazepine, cimetidine, codeine, cotinine, diltiazem, hydrocodone, ketoprofen, metformin, nicotine, paraxanthine, salbutamol, sulfamethoxazole, trimethoprim, and estrone.

WA DOE monitors wet weather pollutant loads using multiple regression analysis, if enough samples are collected. Otherwise simple averaging techniques are applied. Aquatic toxicity tests are conducted only on POTW effluent, as specified in permit requirements. Test methods include whole effluent toxicity on rainbow trout; *Ceriodaphnia*; fathead minnow; *Selenastrum*; topsmelt; herring; mysid shrimp, oyster, urchin, and mussel larvae. Sondes are used throughout the state to monitor pH, dissolved oxygen, and conductivity on 2-5 day deployments. Since 2001, approximately 70 stations have been continuously monitoring temperature and a pilot program of continuous oxygen (LDO) monitoring at a few select stations is in the early stages of implementation.[41] A rhodamine probe is used for dye detection for time-of-travel studies and some long-term deployments of temperature, turbidity, and dissolved oxygen are evaluated.

Wisconsin

Wisconsin DNR employs in-house staff to collect wet weather samples. The timing of sample collection is achieved with flow activated automated water sampling devices. There is currently no monitoring of the effects wet weather discharges have on the concentrations of 'emerging contaminants' in Wisconsin’s ambient surface waters. Wet weather pollutant loads are monitored by the USGS, Regional Planning Commissions, wastewater treatment plants, and WI DNR due to CSO issues, urban flooding and stream erosion problems, and for the evaluation of increasing imperviousness in watersheds. Because of the varied nature of the issues, the methods for determining pollutant loads are determined on a site or issue specific basis.

Wisconsin DNR conducts aquatic toxicity tests on wet weather discharges in limited cases of airport snowmelt (de-icer solution runoff), CSOs, and parking lot run-off studies. The aquatic toxicity test methods include lab tests with *Ceriodaphnia* and fathead minnows, as well as in-situ studies with caged fish.

Wyoming

There is no ambient wet weather monitoring of emerging contaminants and aquatic toxicity tests are not conducted on wet weather discharges.

4.2.7 Source Identification Methods

ORSANCO
Bacteriodales were used in a special study to distinguish between human and animal sources of contamination.

California
Bacteriophages are used for source identification, but other source identification methods are dependent on the geographical region.

Connecticut
Connecticut uses chemical methods and fecal coliform to fecal streptococci ratios as wet weather source identification methods.

Florida: None.

Georgia: No response.

Idaho: No response.

Indiana
Through the Surface Water Quality Assessment Program, IDEM groundwater monitoring and surface water monitoring staff collaborate to determine ground and surface water interactions and the age of groundwater.

Kansas
KDHE uses sediment fingerprinting and geochemical tracing as source identification methods.

Maryland
Maryland Department of Environment (MDE) uses antibiotic resistance analysis to determine bacteria sources.[42]

Massachusetts: Not applicable.

Michigan
MI DEQ uses genetic bacteria fingerprinting, chemical methods, fecal coliform to fecal streptococci ratios, and toxicity reduction evaluation studies as source identification methods.

Minnesota
Minnesota has not adopted any source identification methods for determining nonpoint pollutant sources and source contributions. "However, the MPCA has funded small scale studies to determine the effectiveness and accuracy of genetic fingerprinting of bacteria, sediment fingerprinting, and geochemical tracing."[43]

Missouri
Genetic fingerprinting with bacteria.

New Hampshire: Not applicable.

New Jersey
Site specific studies use a variety of source identification methods.

New Mexico: Not applicable.

North Carolina: None

North Dakota: None.

Ohio: None.

Utah
Genetic fingerprinting of bacteria.

Washington
Genetic fingerprinting of bacteria, bacteriophages, chemical methods.

Wisconsin
Genetic fingerprinting of bacteria, fecal coliform to fecal streptococci ratios.

Wyoming: None.

4.3 Monitoring by External Organizations

International Stormwater BMP Database* is a cooperative project between the U.S. EPA and the American Society of Civil Engineers (ASCE). Information is available at http://www.bmpdatabase.org/.

California*
In 2001, the Phase I municipal stormwater NPDES lead permittees, the NPDES regulatory agencies in Southern California and the Southern California Coastal Water Research Project united to form the Southern California Stormwater Monitoring Coalition (SMC), with the goal of understanding stormwater runoff processes. In 2008, three new members signed the agreement. See Table 4-1 for a list of all current members of the SMC.[44]

Table 4-1. Stormwater Monitoring Coalition Member Agencies

California Regional Water Quality Control Board, Los Angeles Region
California Regional Water Quality Control Board, San Diego Region
California Regional Water Quality Control Board, Santa Ana Region
California Department of Transportation, Caltrans
City of Long Beach
City of Los Angeles, Watershed Protection Division
County of Orange, Public Facilities and Resources Dept.
County of San Diego Stormwater Management Program
Los Angeles County Department of Public Works
Riverside County Flood Control and Water Conservation District
San Bernardino County Flood Control District
Southern California Coastal Water Research Project
State Water Resources Control Board
US Environmental Protection Agency, Office of Research and Development
Ventura County Watershed Protection District

The SMC conducted a study of the effect of increases in peak flows and total impervious area on channel morphology, with the goal of determining the relationship between urbanization and stream erosion. The research revealed a direct correlation between increased peak flow and increased erosion, but also indicated that a natural background level of channel degradation that occurs in all stream channels studied, even in the absence of development within the drainage area.[45] Other complete or nearly complete SMC efforts include stream bioassessment monitoring and a study to determine a watershed's natural bacteria level. SMC efforts that have been initiated but are less than 75% complete are looking at hydromodification and low impact development (LID).[46]

The San Francisco Estuary Institute (SFEI) is a non-profit organization that conducts wet weather monitoring as part of several of its projects, including research into the connection between PCBs and Mercury and stormwater. This project is funded by the Proposition 13 Coastal Nonpoint Source Grant Program.[47] SEFI's projects are research based. Cal/EPA's Water Resources Control Board created the Wetland Monitoring Work Group, but this is still in the early stage of development and a monitoring plan is currently being developed.[48]

The Urban Pesticide Monitoring Project, initiated by the California Department of Pesticide Regulation in 2008, began monitoring for pesticides in both storm drain outfalls and ambient surface waters, taking three initial base flow samples and continuously sampling during storm events to determine the effects of wet weather. This effort tests 4 different sites (in Sacramento, San Francisco Bay area, Orange County, and San Diego County) for 15 organophosphates, 11 pyrethroids, 9 carbamates, 6 fipronils, 11 photosynthetic herbicides, 6 dinitroaniline herbicides, 4 auxin herbicides, and 2 other herbicides.[49]

Southern California Coastal Water Research Project (SCCWRP), a research institute created in 1969, conducted a BMP effectiveness study throughout Southern California. They analyzed the samples for toxicity and pollutant concentrations before and after installment of wetlands (wetCAT), continuous deflection separation units, screening, and microfiltration.[50] The Orange County Watersheds Program has conducted studies to monitor or assess BMP performance and effectiveness.[51] Cal/EPA also requires some permitted MS4s to conduct BMP effectiveness studies.[52]

Georgia*

The USGS has done some ambient monitoring of fecal coliform, *E. coli*, and *Enterococci* under low flow and higher storm flow conditions to investigate the extent of microbial contamination in the Chattahoochee River; all indicator bacteria concentrations were one to two times lower during low flow conditions than during storm flows.[53]

Massachusetts

Historically, wet-weather sampling has been incorporated into comprehensive, multi-agency watershed monitoring projects. For example, in the early 1990s, MA DEP partnered with EPA, Rhode Island DEM, USGS and the University of Rhode Island to perform comprehensive wet-weather monitoring of the Blackstone River, an interstate watershed featuring old industrial urban centers and draining to Narragansett Sound. Study objectives were to determine spatial and temporal changes in water quality due to wet weather, identify and rank wet-weather pollutant sources, forecast annual wet-weather loading rates, and compare dry- vs. wet-weather pollutant loads.

The Massachusetts Water Resources Authority (MWRA) conducts a variety of ambient monitoring, including monitoring the impacts of nonpoint source pollution and CSOs. Results from a study of CSO receiving areas of the Charles River Basin show higher *Enterococcus* and *E. coli* counts during wet weather than in dry weather.[54] Massachusetts also has various citizen monitoring groups who may also be conducting wet weather and BMP effectiveness/performance monitoring. A list of Massachusetts' citizen monitoring groups (by watershed) can be found at http://www.umass.edu/tei/mwwp/groups.html.

Minnesota

Minnesota has partnered with USGS. Also, several other entities are also conducting wet weather sampling in Minnesota, including the University of Minnesota, Minnesota Department of Agriculture, Metropolitan Council Environmental Services (MCES, see Page 4-1), and the nonprofit organization Minnesota Waters. The Minnesota Department of Agriculture also has a water quality monitoring program, which uses continuous monitoring stations that automatically begin collecting composite samples when stream flow increases from rainfall. Samples are analyzed for herbicides, insecticides, and a small number of pesticide breakdown products.[55]

MCES monitors 27 streams in 7 counties in the Minneapolis-St Paul area to develop target pollutant loads and evaluate BMPs during base flow and significant runoff events. There are 31 stream sampling stations and 3 sampling stations on the Minnesota River. Automated measurements of water stage and rating curves are used to estimate flow rates in all streams. During runoff events, automated water samples and occasional grab samples are obtained for analysis of a wide variety of nonpoint source pollutants. Automatic samplers collect composite samples during the event hydrograph; grab samples are also collected during base flow and runoff events and analyzed in the MCES laboratory.[56]

Other external organizations in Minnesota include The River Network (RN), The Rivers Council of Minnesota (RCM) and the Minnesota Lake Association (MLA), the latter of which became Minnesota Waters in 2005.

Missouri*

MO DNR and USGS have been collaborating on the Ambient Water Quality Monitoring Network, which consists of fixed monitoring stations. MO DNR uses the sampling results to "characterize diurnal, seasonal, and flow-related effects on water quality and to characterize water quality effects of specific point or nonpoint source areas."[57]

North Carolina*

The North Carolina District of USGS, through an agreement with Buncombe County Soil and Water Conservation District (SWCD), assessed bacterial contamination in the Newfound Creek Watershed. Samples were collected during low flow and high flow and analyzed for E. coli, and bacteriophages were serotyped to identify the source of the bacteria.[58]

North Carolina State University's Stormwater Engineering Group studies the pollutant removal effectiveness of several BMPs, including stormwater wetlands, sand filters, bioretention, wet detention ponds, and dry retention basins.[59] A list of reports is available at http://www.bae.ncsu.edu/stormwater/pubs.htm#reports.

Ohio

Ohio State University, in cooperation with the Great Lakes Regional Water Program, is creating a database of innovative BMPs in the Great Lakes region.[60] ORSANCO has also conducted wet weather specific monitoring of ambient surface waters (see Section 4-2).

Pennsylvania*

The Susquehanna River Basin Commission (SRBC), consisting of New York, Pennsylvania, and Maryland, is attempting to monitor effects of storm events over the entire Paxton Creek Watershed.[61] Data collection has focused on determining nitrogen, phosphorus, and sediment loads, as well as analytical sampling (dissolved oxygen, pH, turbidity) and geomorphological conditions.

Wisconsin*

USGS conducts ambient wet weather monitoring in Wisconsin. For example, USGS is studying the effectiveness of BMPs in controlling nonpoint source pollution by comparing pre-BMP in-stream storm pollutant loads to post-BMP instream storm pollutant loads in the Sheboygan River and Black Earth Creek Priority Watersheds. In the same reports, the USGS monitored the pre-BMP in-stream pollutant concentrations and the post-BMP in-stream pollutant concentrations.[62, 63]

In the Sheboygan River study, automatic samplers triggered by an increase in flow stage collected in-stream samples that were analyzed for TSS, total phosphorus, dissolved ammonia nitrogen, BOD_5, and fecal coliform.[64] Overall concentrations (all seasons combined) of TSS, ammonia nitrogen, and BOD_5 decreased, while overall concentrations of total phosphorus and fecal coliform increased.[65] Overall (combined season) loads of all pollutants decreased, but this can be attributed to different hydrologic conditions during pre- and post-BMP periods monitored.[66] Examining the results on a seasonal basis shows that BMPs are effective at reducing pollutant loads during the non-vegetative season, but no such conclusion can be made about the vegetative season.

In the Black Earth Creek study, automatically collected samples were analyzed for suspended sediment, total phosphorus, and ammonia nitrogen.[67] Ammonia, nitrogen, and total phosphorus storm loads were found to decrease after BMPs were installed.[68]

** Indicates information obtained solely from the Internet.*

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[3] Wet Weather Monitoring Survey. CT DEP Response. 30 July 2009. Unless otherwise indicated, this reference applies to all information regarding Connecticut's wet weather monitoring practices.
[4] Wet Weather Monitoring Survey. FL DEP Response. 28 July 2009. Unless otherwise indicated, this reference applies to all information regarding Florida's wet weather monitoring practices.
[5] Wet Weather Monitoring Survey. GA DNR Response. 24 July 2009.
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Chapter 5 : Combined Sewer Overflows (CSOs)
5.1 Introduction & Trends

To benchmark wet weather regulations related to CSOs, U.S. Environmental Protection Agency (EPA) Headquarters (HQ) and Regional contacts, as well as State CSO personnel were surveyed on their CSO programs, including control methods and funding sources.

The following 32 agencies responded to one or more questions in the CSO survey: U.S. EPA Region 1, U.S. EPA Region 9, AZ, CA, CT, FL, GA, IN, IA, KY, LA, MD, ME, MA, MI, MN, MO, MT, NV, NH, NJ, NY, ND, OH, OR, RI, TX, VA, WA, WV, WI, WY. In some cases, the survey responses were supplemented with internet based research. Information for agencies not listed above is based solely on internet research and indicated with an asterisk. Of the agencies listed above, Arizona, California, Florida, Louisiana, North Carolina, Texas, and Wyoming stated that they do not have CSOs.

Both Montana and North Dakota have eliminated all their CSOs. Of the remaining states with CSOs, 27% (8 of 30 agencies) have eliminated more than half and 59% (17 of 29 agencies) have eliminated less than half. Common CSO control methods include full sewer separation, chlorine disinfection, storage basins, and additional treatment plant capacity. 44% of respondents (12 of 27 agencies) indicated the existence of green infrastructure practices in their state or region, the most common examples are: green roofs, rain gardens, bioswales, permeable pavement and rain barrels. 92%, 65%, and 12% of the respondents identified State Revolving Fund (SRF) loans, federal grants, and CSO bonds from the permitting agency as CSO funding sources, respectively.

5.2 CSO Control Methods

<u>U.S. EPA HQ</u>*
U.S. EPA's 1994 CSO Control Policy requires the permittee to develop a comprehensive monitoring program that measures "frequency, duration, flow rate, volume and pollutant concentration of CSO discharges and assesses the impact of the CSOs on the receiving waters."[1] The monitoring program must include effluent and ambient monitoring and must address abatement alternatives such as sewer separation, storage & pump back, and treatment at satellite facilities.[2]

<u>U.S. EPA Region 1</u>
U.S. EPA Region 1 has used the following CSO control methods: full sewer separation, additional treatment plant capacity, treatment, and storage basins with pump back to treatment plant.[3] Where disinfection is used, very high chlorine doses are used in combination with at least 15 minutes detention, and dechlorination before discharge. Storage basin design varies widely, with a volume designed to capture a particular storm, typically a 3-month storm. Region 1 has also implemented screening to capture floatables and total solids, typically of one quarter inch in diameter.

<u>U.S. EPA Region 9</u>
U.S. EPA Region 9 has implemented treatment, skimming, storage basins, and disinfection to control CSOs.[4] For example, 50 foot deep underground storage basins in San Francisco have a 200 million gallon storage capacity; primary treatment (settling of solids and screening of floatables) also occurs in

these storage basins. When the storage basins fill to capacity during intense and prolonged storm events, there are 36 different discharge points through which the overflow of combined stormwater and sewage is discharged.[5]

Connecticut

Connecticut follows the U.S. EPA's standards for control of CSOs.[6] Methods employed include full sewer separation, additional treatment plant capacity, and treatment. Treatment methods include storage basin for primary clarification and chlorine disinfection. The chlorine concentration is required to meet water quality standards after blending with the secondary treatment process.

Georgia

Georgia Department of Natural Resources (GA DNR) follows U.S. EPA's model for control of CSOs.[7] Control methods include treatment, storage basins, and additional treatment plant capacity. Treatment methods include UV disinfection, chlorine disinfection, and primary treatment.

Indiana

CSO control methods endorsed by Indiana Department of Environmental Management (IDEM) include full sewer separation, additional treatment plant capacity, storage basins (30 minute detention time), and treatment to meet water quality standards (including dechlorination, if chlorine is used for disinfection).[8]

Iowa

Iowa Department of Natural Resources (IA DNR) does not follow U.S. EPA's model for control of CSOs.[9] Control methods include full sewer separation, additional treatment plant capacity, overflow temporary storage basins (that feed into treatment plants when flows become lower), and treatment by disinfection (system to be installed in 2009).

Kentucky

Kentucky Department of Environmental Protection (KY DEP) follows U.S. EPA's model for control of CSOs.[10] Control methods used by some communities are sewer separation and additional treatment plant capacity. KY DEQ has consent agreements with Kentucky's 17 CSO communities. There is also pilot testing occurring with various disinfection agents (e.g., paracetic acid).

Maine

Maine Department of Environmental Protection (ME DEP) follows U.S. EPA's model for control of CSOs.[11] Control methods employed include full sewer separation, additional treatment plant capacity, treatment, and wet weather storage basin (with solids settling and floatables captured) followed by treatment. Disinfection is the primary treatment method, and the following bacteria limits exist: 200 colony forming units (CFU) fecal coliform/100 ml for coastal waters; *E. coli* maximum daily limit of 236 CFU/100 ml & geometric mean of 64 CFU/100ml for Class B Freshwater; *E. coli* maximum daily 236 CFU/100 ml & geometric mean of 126 CFU/100 ml for Class C Freshwater.
Total residual concentrations range from 0.1 mg/L to 1.0 mg/L depending on dilution, with 1.0 mg/L permitted for dilutions greater than 100.

Maryland

Maryland Department of Environment (MDE) follows U.S. EPA's model for control of CSOs.[12] Control methods include additional treatment plant capacity and full sewer separation

Massachusetts

Massachusetts Department of Environmental Protection (MA DEP) follows U.S. EPA's model for control of CSOs.[13] Control methods include: full sewer separation; additional treatment plant capacity (Deer Island Wastewater Treatment Plant); treatment (with a 15 minute contact time and residual concentration of 0.02 mg/L at peak flow); storage basin with screening, disinfection, and return to a publicly owned treatment work (POTW) for treatment. At one Massachusetts' facility, retention time for a one year storm is 60 minutes in two 1.25 million gallon per day (MGD) storage basins. Massachusetts Water Resources Authority (MWRA) operates the Cottage Farm CSO facility, which screens, disinfects, and chlorinates the flow before discharging into the Charles River.[14]

Michigan

Michigan Department of Environmental Quality (MI DEQ) does not follow U.S. EPA's model for control of CSOs.[15] Instead, the use of an adequate treatment definition has been used to control the State's CSOs. Adequate treatment is defined as follows: retention (for full treatment at the treatment plant) of combined sewage flows for the 1 year, 1 hour storm; primary treatment (30 minutes of detention time or the equivalent if settling, skimming, and disinfection are used) of flows for the 10 year, 1 hour storm; treatment to the maximum possible extent for storms greater than the 10 year, 1 hour storm. Where disinfection is used, a dose of 10 to 15 mg/L is required, and the residual disinfectant goal is 1 mg/L. MI DEQ has also implemented full sewer separation, and additional treatment plant capacity to control CSOs.

Minnesota

Minnesota Pollution Control Agency (MPCA) follows U.S. EPA's model for control of CSOs.[16] Minnesota's initial CSO permits were issued in the 1970s and have requirements similar to U.S. EPA's nine minimum controls. The primary control method has been full sewer separation, which began in the Twin Cities area (Minneapolis-St. Paul) in the 1960s. Over 98% of the State's sewers have been separated, and only 8 potential discharge points remain out of a total of 85 in 1984. No overflows have occurred in over 2 years.

Missouri

Missouri Department of Natural Resources (MO DNR) follows U.S. EPA's model for control of CSOs.[17] Control methods include full sewer separation, additional treatment plant capacity, treatment, and solids skimming.

Montana

Montana Department of Environmental Quality (MT DEQ) follows U.S. EPA's model for control of CSOs and has eliminated all CSOs using full sewer separation.[18]

Nevada

Nevada Department of Environmental Protection (NV DEP) follows U.S. EPA's model for control of CSOs.[19] NV DEP has utilized full sewer separation to control CSOs and requires that all WWTP influent be treated as sewage.

New Hampshire

New Hampshire Department of Health & Environmental Services (NH DES) follows U.S. EPA's model for control of CSOs.[20] Control methods include full sewer separation, storage basin (at Nashua Wastewater Treatment Facility), disinfection, as needed to meet 1000 CFU *E.coli*/100ml and as required by U.S. EPA to meet 9 minimum controls. As New Hampshire does not have NPDES primacy, CSO treatment requirements are dictated by U.S. EPA with State input.

New Jersey

New Jersey Department of Environmental Protection (NJDEP) requires all CSO points to have Solids/Floatables Control, with no bypassing of facilities, and 20% of New Jersey's CSO points have been eliminated to date.[21] NJDEP follows U.S. EPA's model for control of CSOs.

New York

Less than half of New York's CSOs have been eliminated. New York State Department of Environmental Conservation (NYSDEC) follows U.S. EPA's model for control of CSOs.[22] Methods employed include full sewer separation, additional treatment plant capacity, skimming, swirl concentrator to remove floatables (in New York City and Onondaga County), in-stream aeration to increase dissolved oxygen levels, deep tunnel for temporary storage, and treatment. Treatment methods include chlorine disinfection based on use of the specific water body and off-line storage basins used in New York City programs. Storage basins are completed in Flushing Bay and Paerdegat, and the Alley Creek CSO tank is currently under construction.

North Dakota

All North Dakota's CSOs have been eliminated using full sewer separation.[23]

Ohio

Ohio EPA follows the U.S. EPA's model for control of CSOs.[24] Control methods include full sewer separation, additional treatment plant capacity, treatment, and storage within collection system and at publicly owned treatment works, or POTWs (detention time is site specific with a target of 4 or fewer events per year). Treatment methods include ultraviolet (UV) or chlorine disinfection and ballasted flocculation processes (minimum treatment requirement is 80% solids removal).

Oregon

Oregon Department of Environmental Quality (OR DEQ) follows the U.S. EPA's model for control of CSOs.[25] In order to control CSOs, Oregon uses full sewer separation, additional treatment plant capacity, reduced inflow and infiltration, and treatment. Treatment methods include chlorine disinfection and use of a storage basin as a primary clarifier. Ferric chloride or another coagulant is added to encourage clarification, or settling of solids. Specifically, the Columbia Boulevard Wastewater Treatment Plant added treatment capacity to reduce CSOs.

Pennsylvania*
Pennsylvania Department of Environmental Protection (PA DEP) has developed a general permit for wet weather overflows from municipal combined sewer systems that serve fewer than 75,000 people.[26] CSOs that occur when the design capacity of the pipe system or treatment facilities of the system is not exceeded are not permitted.[27] The requirements of the permit vary for each community or CSO location, but may include effluent limitations and some type of acute whole effluent toxicity testing on the overflows.[28]

Rhode Island
Rhode Island Department of Environmental Management (RI DEM) follows U.S. EPA's model for CSO control, using treatment, temporary storage, and eventual return to the treatment facility.[29]

Vermont*
Vermont does have CSOs, and control methods employed include full sewer separation (St. Johnsbury) and additional treatment plant capacity (several municipalities).[30]

Virginia
Virginia Department of Environmental Quality (VA DEQ) follows U.S. EPA's model for CSO control.[31] Most municipalities in Virginia eliminated CSOs independent of VA DEQ intervention, and there are just 3 localities with CSOs remaining. These 3 localities are permitted and have implemented and are executing their long term control plans (LTCPs).

Washington
Washington has 11 municipalities with CSOs. Washington Department of Ecology (WA DOE) follows U.S. EPA's model for CSO control, using full sewer separation, additional treatment plant capacity, and treatment (sedimentation followed by disinfection) as control methods.[32] King County has installed 2 CSO treatment facilities that operate only during high intensity storm events and provide primary treatment, disinfection, and dechlorination of CSOs. King County has also partially separated its combined sewer system.[33]

West Virginia
West Virginia Department of Environmental Protection (WV DEP) follows the U.S. EPA's model for control of CSOs.[34] Control methods include: Full sewer separation, additional treatment plant capacity, disinfection treatment, skimming.

Wisconsin
Wisconsin Department of Natural Resources (WI DNR) follows the U.S. EPA's 1994 CSO policy.[35] Wisconsin only has two communities with CSOs, Milwaukee Metropolitan Sewerage District (MMSD) and the City of Superior. Since 1994, MMSD has used deep tunnel storage to control CSOs. MMSD has considered full sewer separation, but analysis indicates that the cost of sewer separation would be greater than $3 billion and would result in little to no improvement in water quality, as over 90% of stormwater is currently treated at MMSD's treatment plants. MMSD's storage tunnel has been expanded twice since 1994. Before tunnel construction, there were 50 to 60 overflows per year; since 1994, there has been an average of less than 3 overflows per year. Water quality monitoring in Milwaukee's CSO affected areas

indicates that the primary cause of non-attainment of water quality standards is nonpoint source pollution and that CSOs account for less than 10% of non-attainment.

Wyoming
Wyoming Department of Environmental Quality (WY DEQ) has eliminated all CSOs through full sewer separation.[36]

5.3 Green Infrastructure

U.S. EPA Region 1: None.

U.S. EPA Region 9
San Francisco has implemented green infrastructure including bioswales, green roofs, bioretention, and pervious pavement.[37] The San Francisco Public Utilities Commission also encourages rain barrels and provides relevant educational materials.[38]

Connecticut
Hartford Metropolitan District Green Capitols Project will reduce the amount of stormwater entering combined sewers by implementing various green infrastructure projects in the Hartford area.[39]

Georgia: None

Indiana: None

Iowa: None

Kentucky
Two of Kentucky's CSO communities, Louisville and Northern Kentucky Sanitation District #1 (Counties of Boone, Campbell, Kenton) are employing significant green infrastructure. In addition, Louisville Metropolitan Sewer District is encouraging the use of rain barrels.

Maine: None

Maryland: None

Massachusetts
"Recent construction projects include power shaving for pumps, lighting, and the use of green materials for buildings, retro-fits, and glass. Heating and cooling evaluations include analysis for maximum efficiency, and suggested vegetation requires less water and maintenance.[40] In addition, design of parking areas maximizes the implementation of green infrastructure.

Michigan: None

Minnesota: None

Missouri
Green infrastructure is being utilized in Missouri. Details were not provided, but an internet based search yielded the following information: Kansas City, Missouri included green infrastructure in its Overflow Control Plan, with a 100 acre distributed storage area in the Middle Blue River Basin planned as a pilot project. [41]

Montana: None

Nevada: None

New Hampshire
The City of Portsmouth will implement best management practice (BMP) retrofits over time for new construction and redevelopment as well as for some sewer separation projects.

New Jersey: None

New York
In Syracuse, green infrastructure is currently proposed for the Metro wastewater treatment plant (WWTP) drainage basin.[42]

North Dakota: None

Ohio
Green infrastructure is used in the Metropolitan Sewer District of Greater Cincinnati (MSDGC). The initial demonstration project was planned for Lick Run in the Mill Creek Watershed, a representative CSO tributary with a variety of soil and land use types.[43]

Oregon
Green infrastructure techniques include: bioswales, green roofs, permeable pavement, enhanced runoff capture and infiltration to groundwater.[44] Specifically, the City of Portland's Sustainable Stormwater Program, implemented through the Bureau of Environmental Services, has replaced impervious surfaces in parking lots with porous underlying soils with pervious pavement in several different locations.[45]

In East Holladay Park, the city of Portland replaced impervious pavement in parking lots whose underlying soils are porous, with pervious pavers to allow stormwater to infiltrate and recharge groundwater. In the absence of an underlying layer of porous soil, a gravel base below the pervious pavers would be required.[46]

Four different blocks in North Portland have been reconstructed, using both pervious asphalt and pervious concrete (North Gay Avenue). With pervious concrete, the mixing process appears to be significant, as some reports indicate that incorrect construction techniques can cause a denser product than desired, leading rainfall to gather on the surface rather than infiltrate. In another area of Portland (Westmoreland), pervious concrete paving blocks were also used.[47]

Rhode Island
Low Impact Development (LID) construction and design has been implemented to control Rhode Island's CSOs.

Virginia: None.

Washington
A city in Washington State has used a local initiative to encourage the use of green roofs to reduce the volume of runoff entering its combined sewer system. Seattle Public Utilities also promotes the use of rain barrels, and has them available for sale to the public, along with free educational materials on their website.[48] Seattle has an impervious surface reduction credit, for NPDES stormwater dischargers that install porous pavement, green roofs, or otherwise reduce the impervious surface area.[49] The Flow Control Technical Requirements Manual (reference 49) describes the specific requirements needed to receive the credit.

West Virginia
West Virginia has used green roofs, rain gardens, vegetated swales, permeable pavement and rain barrels to reduce the quantity of stormwater entering its sewage collection systems.

Wisconsin
Milwaukee, Wisconsin has implemented and promoted green infrastructure, including downspout disconnection, rain gardens, and rain barrels.[50]

5.4 Other Innovative Control Practices

U.S. EPA Region 1: None

U.S. EPA Region 9
San Francisco has implemented innovative CSO control practices, mostly in the form of LID.[51]

Connecticut: None

Georgia
The City of Atlanta, under a consent decree from GA DNR and U.S. EPA, is required to implement different control and treatment methods, including sewer separation of two basins and one sub basin, deep rock tunnel storage, and "near secondary treatment". Full details of Atlanta's required CSO controls can be found at http://cleanwateratlanta.org/ConsentDecree/Elements/Plan.pdf.

Indiana: None

Iowa: None

Kentucky: None

Maine: None

Maryland: None

Massachusetts: None

Michigan
MI DEQ has encouraged innovative approaches to CSO control by applying a statewide stringent standard and time frame for all CSOs. The development of the Rouge River Wet Weather Demonstration Project, which included comprehensive field studies on wet weather impacts in the River, has also served as an innovative model for other CSO areas.[52]

Minnesota: None

Missouri: None

Montana: None

Nevada: None

New Hampshire: None

New Jersey: None

New York:
New York City installed in-stream aeration in Newtown Creek to bring dissolved oxygen up to water quality standard levels. The City of Rochester constructed a deep tunnel to capture all CSOs.[53]

North Dakota: None

Ohio: None

Oregon
The City of Portland implemented the Big Pipe Project to replace the previous pipe system with pipes that are 22 feet in diameter on the east side of the Willamette River to 14 feet in diameter on the west side of the River, allowing the sewer system to accommodate a larger quantity of water.[54]

The City of Portland has also implemented innovative conveyance systems that direct water from rooftop downspouts away from impervious surfaces in multiple commercial locations, including the Mississippi Commons and New Seasons Market.[55, 56]

Pennsylvania*
The City of Philadelphia, as part of its LTCP, has installed a 13.5 foot inflatable rubber dam in the Schuylkill River that is connected to the main relief and interceptor sewers of the city's primary wastewater treatment plant.[57] The dam is capable of retaining 4 million gallons of water.[58]

Rhode Island: None, other than LID mentioned in the previous section.

Virginia: None

Washington: No response.

West Virginia
The City of Pennsboro has implemented innovative control practices including additional influent pump capacity, UV disinfection, a metering flume, and an outfall structure.[59]

5.5 CSO Funding Sources

U.S. EPA Region 1
Federal grants, SRF loans.

U.S. EPA Region 9
Federal grants, SRF loans, wastewater service charges, and city bonds.[60]

Connecticut
Connecticut funds CSO projects with the Clean Water Fund, "which contains a small EPA grant and the remainder of the funds are from the State of Connecticut. CSO projects receive a 50% grant and a 50% loan at 2% over 20 years." [61]

Georgia
State and city bonds fund CSOs.

Indiana
Federal grants, SRF loans.

Iowa
Federal grants, SRF loans.

Kentucky
Federal grants, SRF loans, federal stimulus funds consisting of low interest loans and grants, and a range of financing by the sewer utilities, including sewer service fees.

Maine
Federal grants, SRF loans, and CSO bonds from ME DEP.

Maryland
Federal grants, SRF loans, Chesapeake Bay Restoration Fund grants & loans.

Massachusetts
Federal grants, SRF loans, and special state legislation provide funding for Massachusetts' CSOs.

Michigan
SRF loans, CSO bonds from MI DEQ.

Minnesota
Currently, only SRF loans exist. In 1984, the Minnesota State Legislature enacted a program to separate the remaining sewers in 10 years, providing more than $100 million in grants. The Federal grants program was still active at this time and provided more than $30 million for CSO programs.

Missouri
Federal grants, SRF loans.

Montana
Federal grants, SRF loans.

Nevada
SRF loans.

New Hampshire
SRF loans.

New Jersey
Federal grants, state grants, SRF loans.

New York
SRF loans are used to fund CSOs in NY.[62]

North Dakota
Federal grants, SRF loans.

Ohio
Federal grants, SRF loans, and any funds available for other wastewater infrastructure projects. Wastewater infrastructure funds include: municipal bonds from the Ohio Water Development Authority (OWDA), Ohio Public Works Commission loans, Community Development Block Grants (CDBGs).[63]

Oregon
CSOs in Oregon are funded using SRF loans, federal grants, and CSO bonds from OR DEQ.[64]

Rhode Island
SRF loans.

Virginia
SRF loans.

Washington
Federal grants, SRF loans.

West Virginia
Federal grants, SRF loans, Small Cities Grants & Loans.

* *Indicates information obtained solely from the Internet.*

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Chapter 6 : Sanitary Sewer Overflows (SSOs)
6.1 Introduction & Trends

To benchmark wet weather regulations related to SSOs, U.S. Environmental Protection Agency (EPA) Headquarters (HQ) and Regional personnel, as well as State SSO personnel were surveyed on their SSO programs including enforcement standards, elimination requirements, and funding sources, as well as stormwater and wastewater blending policies.

The following 34 agencies responded to one or more questions in the SSO Survey: U.S. EPA HQ, U.S. EPA Region 1, U.S. EPA Region 4, U.S. EPA Region 5, U.S. EPA Region 6, AZ, CO, CT, FL, GA, IN, IA, KS, KY, LA, MA, MI, MN, MO, MT, NV, NJ, NY, NC, ND, OH, OK, OR, RI, TX, VA, WA, WI, WY. In some cases, the survey responses were supplemented with internet based research. Out of the 34 agencies that responded, only VA and WY stated that their jurisdictions do not contain any SSOs.

9% of respondents (3 agencies) stated that their agency issues permits allowing SSOs. 42% of respondents (14 agencies) exercise enforcement discretion for SSOs above a set size or level. Of the 31 agencies with SSOs, only 9% (3 agencies) do not require SSOs to be eliminated. Only 37% of respondents (11 of 30 agencies) have established standards for identifying excessive inflow and infiltration (I/I). 32% of respondents (10 of 31 agencies) allow the blending of treated wastewater with a mixture of stormwater and untreated sewage in one or more of their wastewater treatment plant permits. In addition, California (CSWRCB) responded after the survey collection period and added that they have a statewide program devoted to sanitary sewer overflows which may be accessed at http://www.waterboards.ca.gov/water_issues/programs/sso/.[1]

6.2 SSO Permits

<u>U.S. EPA HQ</u>
All publicly owned treatment works (POTW) permits issued by the EPA prohibit SSOs to waters of the US.[2]

<u>U.S. EPA Region 1</u>
EPA Region 1 does not issue permits for SSOs.[3]

<u>U.S. EPA Region 4</u>
EPA Region 4 does not issue permits for SSOs.[4]

<u>U.S. EPA Region 5</u>
EPA Region 5 does not issue permits for SSOs.[5]

<u>U.S. EPA Region 6</u>
EPA Region 6 does not issue permits for SSOs.[6]

<u>Arizona</u>
Arizona Department of Environmental Quality (AZ DEQ) does not issue permits for SSOs.[7]

<u>Colorado</u>
Colorado Department of Public Health & Environment (CDPHE) does not issue permits for SSOs.[8]

Connecticut
Connecticut Department of Environmental Protection (CT DEP) does not issue permits for SSOs.[9]

Florida
Florida Department of Environmental Protection (FL DEP) does not issue permits for SSOs.[10]

Georgia
Georgia Department of Natural Resources (GA DNR) does not issue permits for SSOs.[11]

Indiana
Indiana Department of Environmental Management (IDEM) does not issue permits for SSOs.[12]

Iowa
Iowa Department of Natural Resources (IA DNR) does not issue permits for SSOs.[13]

Kansas
Kansas Department of Health & Environment (KDHE) does not issue permits for SSOs.[14]

Kentucky
Kentucky Department of Environmental Protection (KY DEP) does not issue permits for SSOs.[15]

Louisiana
Louisiana Department of Environmental Quality (LA DEQ) does not issue permits for SSOs.[16]

Massachusetts
Massachusetts Department of Environmental Protection (MA DEP) does not issue permits for SSOs.[17]

Michigan
Michigan Department of Environmental Quality (MI DEQ) does not issue permits for SSOs.[18]

Minnesota
Minnesota Pollution Control Agency (MPCA) does not issue permits for SSOs.[19]

Missouri
Missouri Department of Natural Resources (MO DNR) does not issue permits for SSOs.[20]

Montana
Montana Department of Environmental Quality (MT DEQ) does not issue permits for SSOs.[21]

Nevada
Nevada Department of Environmental Protection (NV DEP) does not issue permits for SSOs.[22]

New Hampshire: See U.S. EPA Region 1.

New Jersey

New Jersey Department of Environmental Protection (NJDEP) does not issue permits for SSOs.[23]

New York

The New York State Department of Environmental Conservation (NYSDEC) has developed three different classifications for SSOs:

- Type I: Approved emergency bypass to protect treatment work or pump station from damage. Bypass reporting is required and approval is listed in a facility's permit.
- Type II: Overflow Retention Facilities. Specified in a facility's permit with specific limits and monitoring requirements.
- Type III: All other SSOs. Type III SSOs are illegal and subject to enforcement. [24]

North Carolina

North Carolina Department of Environment and Natural Resources (NCDENR) does not issue permits for SSOs. [25] All SSOs are violations.

North Dakota

North Dakota Department of Health (ND DoH) does not issue permits for SSOs.[26]

Ohio

Ohio Environmental Protection Agency (OH EPA) does not issue permits for SSOs.[27]

Oklahoma

Oklahoma Department of Environmental Quality (OK DEQ) does not issue permits for SSOs.[28]

Oregon[29]

Oregon Department of Environmental Quality (OR DEQ) stopped issuing permits for SSOs in the fall of 2007, due to objections from the U.S. EPA. As a result, Oregon's SSO policies are currently in transition, as OR DEQ and U.S. EPA work together to devise a feasible solution. Prior to 2008, there were no treatment requirements for SSOs, as SSOs were simply prohibited, except in response to storm events greater than the 5 year, 24 hour duration winter storm or 10 year, 24 hour duration summer storm.

Rhode Island

Rhode Island Department of Environmental Management (RI DEM) does not issue permits for SSOs.[30]

Texas

Texas Commission on Environmental Quality (TCEQ) does not issue permits for SSOs.[31]

Virginia

Virginia Department of Environmental Quality (VA DEQ) has not identified any SSOs and SSOs are not permitted.[32]

Washington

Washington Department of Ecology (WA DOE) does not issue permits for SSOs.[33]

Wisconsin

Wisconsin Department of Natural Resources (WI DNR) does issue permits for SSOs. All individual Wisconsin Pollutant Discharge Elimination System (WPDES) permits, as well as general permits issued to satellite sewage collection systems, contain SSO reporting requirements.[34]

Wyoming

Wyoming has not identified any SSOs. Violations identified to date have been operation and maintenance or construction based. SSOs are "addressed as unpermitted discharges through the Wyoming Enforcement Management System (EMS)."[35]

6.3 SSO Enforcement: Discretion, Standards, Requirements

U.S. EPA HQ

U.S. EPA does not exercise enforcement discretion for SSOs associated with a certain size storm. There are no written enforcement standards, but EPA has issued guidance on setting priorities for the enforcement of SSOs in Chapter 10 of "The Enforcement Management System: Setting Priorities for Addressing SSOs". See pages 372 to 381 of http://www.epa.gov/compliance/resources/policies/civil/cwa/emscwa-jensen-rpt.pdf for a chart detailing circumstances and recommended responses. In 1995, the SSO Federal Advisory Subcommittee was created to further develop EPA's SSO policies. The Subcommittee has since been focusing on the following issues: compliance costs, enforcement consistency between state and federal authorities, feasibility of zero wet weather SSOs, watershed scale SSO impacts.[36]

U.S. EPA Region 1

EPA Region 1 does not exercise SSO enforcement discretion. A community with a significant number of overflows that "does not respond appropriately by immediately addressing ongoing overflows and implementing a strategy to prevent future overflows could be subject to enforcement."[37]

U.S. EPA Region 4

EPA Region 4 does not exercise SSO enforcement discretion.

U.S. EPA Region 5

EPA Region 5 does not exercise SSO enforcement discretion.

U.S. EPA Region 6

EPA Region 6 does exercise SSO enforcement discretion, but conditions under which enforcement discretion is permitted are unknown.

Arizona

AZ DEQ does exercise enforcement discretion, but the associated storm size which allows for discretion is dependent on the history of noncompliance, the volume of the SSO, and the proximity to waters of the U.S. AZ DEQ does not have specific standards or requirements for enforcement of SSOs.

Colorado

CDPHE does not exercise enforcement discretion with SSOs.

Connecticut
CT DEP does not exercise enforcement discretion. If an SSO is discovered and cannot be quickly and easily eliminated, then CT DEP issues an administrative order to the municipality.

Florida
FL DEP does not exercise enforcement discretion and enforcement standards & requirements are specified in the Guidelines for Characterizing Wastewater Violations of FL DEP's Enforcement Manual.[38]

Georgia
GA DNR does exercise enforcement discretion, but it is independent of storm size. The State of Georgia has spills requirements which include: immediate verbal notification and written notification within 5 days to the State; postage of signs at the location of the spill and point of the entrance to the waterways which includes the volume, date, and a contact phone number; reporting to audio and video broadcasts. For a major spill, greater than 10,000 gallons, monitoring of dissolved oxygen, fecal coliform, pH, and temperature is required for one year. For a major spill less than or equal to 10,000, the following is required: public notice to the county, including, date, location, estimated volume, and corrective actions; downstream user notice within 20 miles, and local health department notification.

Indiana
IDEM does exercise enforcement discretion, but it is not based on an individual storm event. Enforcement is based on the history of overflows in each system. SSOs are considered non-permitted discharges and, "once a threshold is crossed for excessive number of SSO events in a calendar year, we pursue formal enforcement,"[39] which requires a plan to eliminate SSOs.

Iowa
IA DNR does not exercise enforcement discretion and requires cities and communities to address all SSOs. IA DNR has issued some Administrative Orders with a schedule to require cities to move forward, while some cities have elected to address their SSO problems without requiring enforcement action. If a city refuses to address its SSOs, IA DNR will take enforcement action, including penalties.

Kansas
KDHE does not exercise enforcement discretion and does not have specific enforcement standards or requirements for SSOs. KDHE takes "enforcement based upon the permittee's SSO record, circumstances surrounding the SSO event, and the permittee's response or lack thereof to SSO events in general and/or SSO events at particular locations."[40]

Kentucky
KY DEP does exercise enforcement discretion, but it is associated with frequency, duration, volume, and number of overflows rather than a storm event of a certain magnitude. SSOs are illegal under the Clean Water Act; any SSO constitutes an illegal discharge. Enforcement standards are determined on a case by case basis. Communities with a small number of less voluminous SSOs will be addressed with less stringent enforcement than communities with a large number of recurring wet weather SSOs.

Louisiana: No response.

Massachusetts
MA DEP does not exercise enforcement discretion, and considers all SSOs to be a permit violation. In some cases, the facility must pay a penalty.

Michigan
MI DEQ does exercise enforcement discretion for a 25 year, 24 hour storm (3.9 inches of precipitation or equivalent during a 24 hour period) during the growing season (April1 thru October31) and under normal soil moisture conditions. Enforcement discretion is also exercised for outfalls with an average frequency of one discharge per ten year period during the growing season.

MI DEQ requires the elimination of SSOs that occur during storms less than the remedial design standard or in some cases equivalent storm, with a goal of one or fewer overflow events every ten year period, on average. For any overflows that result from a storm that is believed to be in excess of remedial design standard, it is the onus of the collection system owner to demonstrate that the storm experienced was in excess of the design storm. Under these conditions, case enforcement discretion is considered.

Minnesota
MPCA does exercise enforcement discretion. The sanitary sewer system design capacity standard is a 25 year, 1 hour storm; this design standard is used in combination with consideration of whether a SSO was preventable to determine if enforcement is necessary.

All SSOs in Minnesota are unauthorized, unless the following state and federal rule conditions are met: "Does not exceed limits; is necessary for essential maintenance; the regulatory authority is notified at least 10 days before the date or as soon as possible under the circumstances."[41] Permittees are required to report, minimize, and recover, if possible. Reported SSOs are entered into an MPCA database and those that are preventable and repeated or significant are included in MPCA's Enforcement Response Plans. Response Plans can include Schedules of Compliance to be included in a NPDES permit or, "formal enforcement actions requiring evaluation of the collection system and corrective action plans to eliminate SSO problem areas. Most actions requiring elimination are negotiated settlement agreements between MPCA and the regulated party."[42]

Missouri
MO DNR does exercise enforcement discretion when floods occur.

Montana
MT DEQ does not exercise enforcement discretion. There exists statutory prohibitions against violations of permit condition and discharging without a permit; MT DEQ has statutory authority to issue notice of violation, administrative orders and penalties, and order corrective action, as well as statutory authority to initiate civil and criminal penalties.

Nevada
NV DEP does exercise enforcement discretion, with candidates for enforcement action determined if the SSO, "appreciably affects human health or the environment."[43] NV DEP's enforcement standards are as follows: SSOs must be eliminated in a "timely fashion", the SSO affected area must be sanitized, and "all sewage that is practical to capture must be captured and returned to the collection system." [44]

New Hampshire: See EPA Region 1.

New Jersey

NJDEP does not exercise enforcement discretion. All SSOs are prohibited and enforceable commitments to correct and/or eliminate SSOs are required.

New York

Enforcement discretion is not exercised, other than specified above for the different SSO types. NYSDEC has developed a draft enforcement response and penalty guideline for all State Pollutant Discharge Elimination System (SPDES) priority violations. Enforcement standards are difficult to generalize, but NYSDEC takes enforcement actions for all SSOs, with few exceptions.

North Carolina

NC DENR does not exercise enforcement discretion. North Carolina state statute requires consideration of the following when determining enforcement actions: harm to natural resources, duration/gravity, effect on receiving water quantity and quality, cost of rectifying damage, money saved by non-compliance, willful/intentional violation, prior record of violator, and enforcement costs to the State. In March 2009, NC DENR issued guidelines for SSO enforcement and compliance, which can be found at http://h2o.enr.state.nc.us/percs/Collection%20Systems/documents/07-24-2009.pdf.

North Dakota

ND DoH does exercise enforcement discretion on a case by case basis; enforcement discretion is not exercised for a storm of a certain magnitude.

Ohio

OH EPA's enforcement standards and requirements vary among communities; each community's Capacity Assurance, Management, Operations & Maintenance Program (CMOM) and System Evaluation Capacity Assurance Program (SECAP) are evaluated to determine whether the SSO is capacity related or due to operation and maintenance (O&M).

Oklahoma

SSOs are required to be reported to OK DEQ, and OK DEQ has identified significant noncompliance (SNC) for chronic SSOs when more than one SSO is reported from the same location in the same 12 month period. SNC facilities are reviewed periodically and issued formal enforcement actions requiring correction as needed.

Oregon

OR DEQ does exercise enforcement discretion for storm events greater than the 5 year, 24 hour winter storm or the 10 year, 24 hour summer storm. SSOs that occur in response to such storm events are not prohibited.

Rhode Island

RI DEM does exercise enforcement discretion with SSOs, but there is no set level which warrants enforcement discretion; enforcement determination is made on a case by cases basis. The general rule is that enforcement discretion is used if a storm event causes flooding. RI DEM also does not pursue enforcement when the SSO is "accidental." An accidental release is "a non-routine release of pollutants that (1) was caused by a mechanical failure which is not the result of inadequate maintenance, human error, or caused by failure to comply with regulations; and (2) was not foreseeable and/or was a force majeure. The following criteria must also be met: (1) remediation of the site will not exceed three months (if applicable); (2) the person took appropriate steps in response to the SSO (i.e. did a plan exist and was it followed); and (3) the person notified appropriate personnel and DEM in a timely manner of the release."[45] Even if all the above requirements are met, RI DEM may choose to pursue enforcement action if the SSO resulted in significant environmental harm such as causing closure of shellfishing areas.

Texas

TCEQ does not exercise enforcement discretion with SSOs. Enforcement standards and requirements are complex and vary depending on the characteristics of the SSO, including how long it will take to be corrected and whether it is an "unauthorized or noncompliant discharge, release, spill, or emission which results in a documented effect on human health or safety or a documented serious impact to the environment."[46] There are two main categories of violations. Category A violations require an automatic initiation of formal enforcement action as soon as they are discovered. Parties responsible for Category B violations are given an opportunity for compliance by a Notice of Violation, which specifies a compliance due date, but allows the responsible party to determine a compliance schedule. See reference 46 for details on TCEQ's enforcement criteria.

Washington

WA DOE does exercise enforcement discretion, but the conditions are unknown.

Wisconsin

WI DNR does exercise enforcement discretion, on a case by case basis; enforcement guidance/criteria exist for case specific SSO enforcement actions. Also, if an overflow occurs as a result of a precipitation event with "a probable frequency of once in 5 years or less,"[47] WI DNR can impose a ban on any expansion or extension (additional hookups) of the sewer system until the problem is corrected. See Wisconsin Administrative Code NR 110.05 (2) (c) at http://www.legis.state.wi.us/rsb/code/nr/nr110.pdf. Each SSO enforcement action may consist of different requirements (including studies, evaluations, I/I removal, upgrades) depending on each community's situation, with the ultimate goal being the "reduction and elimination of SSOs and basement backups."[48]

6.4 SSO Elimination

U.S. EPA HQ

Elimination is required, but the specific storm event which requires elimination is determined on a case specific basis. If SSOs occur as the result of a storm event greater than the specified magnitude, clean up and public notice are required. Schedule of SSO elimination is also determined on a case specific basis.

U.S. EPA Region 1

Region 1 requires SSO elimination, and it is not associated with a specific storm event. SSO elimination schedule varies by community; there is no overall schedule.

U.S. EPA Region 4

Region 4 requires SSO elimination, and it is not associated with a specific storm event.

U.S. EPA Region 5

Region 5 requires SSO elimination, and it is not associated with a specific storm event.

U.S. EPA Region 6: No response.

Arizona
AZ DEQ requires elimination of SSOs, but there is no discrete schedule for SSO elimination.

Colorado
CDPHE requires elimination of SSOs, and it is not associated with a specific storm event.

Connecticut
CT DEP requires SSO elimination, and it is not associated with a specific storm event. There remains just one district with SSOs in the state, and they are under order to eliminate them.

Florida
FL DEP requires SSO elimination, and it is not associated with a specific storm event. All SSOs must be eliminated as soon as possible.

Georgia
GA DNR requires SSO elimination, and it is not associated with a specific storm event. SSO elimination schedule varies, as it is typically achieved through a consent order.

Indiana
SSO elimination is required and is not tied to a specific storm event. The schedule for elimination is determined on a case specific basis, as described in Section 6.2.

Iowa
IA DNR requires elimination of SSOs, except for storm events with an intensity greater than 2 inches per hour, for which SSOs are not prohibited. There are no specific requirements for SSOs due to storm events greater than 2 inches per hour. SSOs must be eliminated as soon as possible, and the case specific elimination schedule is determined by assessment of fees and available financing for cities to determine what time frame would be appropriate for corrective action.

Kansas
KDHE does require elimination of SSOs and it is not tied to a specific storm event. The elimination schedule varies by community.

Kentucky
KY DEP requires elimination of SSOs and it is not associated with a specific storm event. SSO elimination schedule varies by community and is based on several factors, including “frequency, duration, volume, human health and environmental impacts.”[49]

Louisiana
LA DEQ does not require elimination of SSOs.

Massachusetts
Elimination is required and is not tied to a specific storm event. The schedule for elimination is dependent on the cause of the SSO.

Michigan
Elimination of SSOs is expected to occur within 10 years of identification of such overflows, with a maximum of 20 years for communities with funding shortages. The schedule for corrective action is dependent on the extent of the problem and the ability of the community to quickly address them.

Minnesota
Elimination of SSOs is required and is not tied to a specific storm event. The elimination schedule is determined on a case by case basis, according to causes and negotiated settlements between MPCA and the regulated party.

Missouri
Elimination of SSOs is required and is not associated with a specific storm event.

Montana
Elimination of SSOs is required and is not associated with a specific storm event. There is no discrete schedule for elimination of SSOs.

Nevada
Elimination is required and is not tied to a specific storm event. The schedule for elimination varies.

New Hampshire: See EPA Region 1.

New Jersey
NJDEP does require elimination of SSOs and this elimination is not tied to a storm event. The SSO elimination schedule is case specific, dependent on a variety of factors, such as affordability, complexity of infrastructure deficiencies, and inter-municipal relationships.

New York
Elimination of SSOs is required, and it is not tied to a specific storm event. The elimination schedule follows an internal guideline created for review and approval of SSO abatement plans. For large severe SSOs, "NYSDEC recognizes that abatement measures need to be prioritized and the SSO will take longer to eliminate."[50]

North Carolina
All SSOs are prohibited, regardless of the magnitude of the corresponding storm event. There is no schedule for elimination of SSOs. [51]

North Dakota
ND DoH does require elimination of SSOs, and it is not associated with a specific storm event.

Ohio
OH EPA does require elimination of SSOs, and it is not tied to a specific storm event. The elimination schedule varies by community.

Oklahoma
OK DEQ does require elimination of SSOs, and it is not tied to a specific storm event. SSO elimination schedule varies by community, as defined in a consent order or other formal enforcement action schedule.

Oregon
OR DEQ requires elimination of SSOs below the design storm event by January 1, 2010. From November 1 through May 21, the design storm event is a 5 year frequency, 24 hour duration storm. From May 22 through October 31, the design storm event is a 10 year frequency, 24 hour duration storm. The Oregon Environmental Quality Commission (EQC) may approve a bacteria control management plan prepared by the permit holder, which specifies specific hydrologic conditions under which numeric bacteria criteria would be waived, as well as public notification practices and the water quality assessment conducted to determine bacteria sources. OR DEQ may also require a more aggressive schedule for elimination of SSOs that discharge to a stream with sensitive beneficial uses.[52]

The EQC is "a five-member citizen panel appointed by the governor for four-year terms to serve as DEQ's policy and rulemaking board. In addition to adopting rules, the EQC also establishes policies, issues orders, judges appeals of fines or other department actions, and appoints the DEQ director."[53]

Rhode Island
RI DEM requires elimination of SSOs regardless of the storm event magnitude. There is no set schedule for SSO elimination, but some individual communities have specific schedules to reduce I/I in order to eliminate wet weather SSOs.

Texas
TCEQ requires elimination of SSOs, and this elimination is not associated with a certain storm event. Elimination schedule is case specific, as detailed in reference 46.

Washington
WA DOE requires elimination of SSOs, and this elimination is not associated with a storm event of a certain magnitude.

Wisconsin
WI DNR requires elimination of SSOs, regardless of the magnitude of the storm event. The elimination schedule is dependent on the individual permit compliance schedule.

6.5 Inflow/Infiltration (I/I) Identification & Reduction

U.S. EPA HQ
"EPA uses the term excessive I/I when considering adjustments to percent removal requirements under the secondary treatment requirements." According to 40 CFR 133.103(d), a lower percent removal requirement may be authorized as long as the less concentrated influent is not determined to be the result of excessive I/I. Excessive I/I is defined by the Construction Grants program in 40 CFR 35.2005(b)(16) to be, "quantities of infiltration/inflow which can be economically eliminated from a sewer system as determined in a cost-effectiveness analysis that compares the costs for correcting the infiltration/inflow conditions to the total costs for transportation and treatment of the infiltration/inflow."[54]

U.S. EPA Region 1
Region 1 has not established standards for identifying excessive I/I.

U.S. EPA Region 4: No response.

U.S. EPA Region 5: No response.

U.S. EPA Region 6: No response.

Arizona
AZ DEQ has not established standards for identifying excessive I/I.

Connecticut
CT DEP has not established standards for identifying excessive I/I.

Florida
FL DEP has not established standards for identifying excessive I/I.

Georgia
GA DNR has not established standards for identifying excessive I/I.

Indiana
IDEM has not established standards for identifying excessive I/I.

Iowa
IA DNR has not established standards for identifying excessive I/I.

Kansas
KDHE uses the U.S. EPA's definition of excessive I/I.

Kentucky
KY DEP established standards for identifying excessive I/I in Kentucky Administrative Regulations, 401 KAR 5:005, Sections 8 & 9 (reference 55). These regulations require the integrity of newly constructed gravity sewer lines to be verified using either the infiltration-exfiltration test method with a positive head of two feet or the low pressure air testing method. Also, new gravity sewer lines must not allow groundwater to enter the system or waste to exit the system at a rate greater than 200 gallons per day (gpd) per inch of diameter per mile of sewer line. Owners of treatment plants must study the conveyance system to evaluate "the cost-effectiveness of transportation and treatment versus correction of the infiltration-inflow sources by using a twenty year present worth cost analysis."[55]

Louisiana
LA DEQ has not established standards for identifying excessive I/I.

Massachusetts
MA DEP has established standards for identifying excessive I/I, which can be found in "Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey" at http://www.mass.gov/dep/water/laws/iiguidln.pdf.

Michigan
MI DEQ generally uses the U.S. EPA recommended standards for identifying excessive I/I. U.S. EPA designated the cost effective solution to I/I above 120 gallons per capita per day (dry weather) and 275 gallons per capita per day (wet weather) is to reduce I/I.

Minnesota
MPCA examines the flow data included on Discharge Monitoring Reports to see trends (spring and fall spikes) in I/I at least annually, prior to inspections, or reviewing repeated SSOs at a facility. If Average Annual influent flow exceeds the Average Wet Weather design flow of the facility, additional flow extensions will be denied and enforceable schedules are established to reduce I/I.

Missouri
MO DNR has not established standards for identifying excessive I/I.

Montana
MT DEQ has not established standards for identifying excessive I/I.

Nevada
NDEP has not established standards for identifying excessive I/I.

New Hampshire: See EPA Region 1.

New Jersey
NJDEP has not established standards for identifying excessive I/I.

New York
New York has established standards for identifying excessive inflow and infiltration, modeled after those developed by U.S. EPA under 40 CFR 35. 40 CFR 35 states that an analysis of infiltration and inflow should include analysis of night flows and/or water consumption records and rainfall and stream flow data, respectively.

North Carolina
For grant purposes, NC DENR has defined excessive inflow and infiltration as 3000 gallon per inch diameter per mile. Also, if I/I is found to be the cause of an SSO, it must be eliminated by permit requirement.

North Dakota
ND DoH has not established standards for identifying excessive I/I.

Ohio
OH EPA has not established standards for identifying excessive I/I.

<u>Oklahoma</u>
OK DEQ has established standards for identifying excessive I/I, included in the determination of SNC communities.

<u>Oregon</u>
OR DEQ has not established standards for identifying excessive I/I.

<u>Rhode Island</u>
RI DEM has not established standards for identifying excessive I/I.

<u>Texas</u>
TCEQ has not established standards for identifying excessive I/I.

<u>Virginia</u>
VA DEQ has not established standards for identifying excessive I/I.

<u>Washington</u>
WA DOE uses U.S. EPA's standards for identifying excessive I/I.

<u>Wisconsin</u>
WI DNR uses U.S. EPA's standards for identifying excessive I/I (infiltration >120 gpcd, inflow > 275 gpcd). I/I may also be identified as excessive if it causes SSOs, basement backups, or WWTP problems or diversions.

<u>Wyoming</u>
WY DEQ has not developed standards for identifying excessive I/I.

6.6 SSO Funding Sources

<u>U.S. EPA HQ</u>
Loans, primarily from State Revolving Funds (SRF).

<u>U.S. EPA Region 1</u>: Not applicable.

<u>U.S. EPA Region 4</u>
Grants, loans, other (general budget, etc.)

<u>U.S. EPA Region 5</u>: No response.

<u>U.S. EPA Region 6</u>: No response.

<u>Arizona</u>
Utilities may apply for loans or grants from the Water Infrastructure Finance Authority of Arizona.

<u>Connecticut</u>
When funds are available, the Clean Water Fund provides a 2% loan for 20 years to cover SSO project costs.

Florida: No response.

Georgia
Georgia's SSO Compliance and Enforcement Program is funded by the Federal Clean Water Act Section 106 grants and State funds.

Indiana
Loans are available through the SRF.

Iowa
SRF loans, state grants, individual sewer fees, Community Development Block Grants (CDBGs), and Rural Development Grants.

Kansas
CDBGs, Rural Development Grants, and loans from the Kansas SRF are available for SSOs.

Kentucky
Special appropriation grants, state infrastructure authority low interest loans, conventional funds (e.g., bonds).

Louisiana
SRF loans, CDBGs, and private sources.

Massachusetts
Loans.

Michigan
SRF loans.

Minnesota
Grants and loans are available. The Minnesota Public Facilities Authority maintains a loan and grant program, which ranks facilities on a Project Priority List. This list is based on many factors, including whether a facility has SSOs. Also, the State Legislative authority provides funding to the SRF annually and facilities that qualify and meet state design standards for the project they are designing receive loans accordingly.

Montana
Grants and loans.

Nevada
SRF loans and grants.

New Hampshire: See EPA Region 1.

New Jersey
SRF loans and state grants. SSOs are among those projects that are assigned the highest priority in determining SRF eligibility.

New York
Primarily loans from New York SRF program, as well as some state grants available through the American Recovery and Reinvestment Act of 2009. State assistance is generally limited to loans rather than grants.

North Carolina
Both grants and loans are available, administered by the Construction Grants and Loans Section of the North Carolina Division of Water Quality and occasionally by the North Carolina Clean Water Management Trust Fund.

North Dakota
Grants and loans are available.

Ohio
Funding sources for SSOs are the same as those for other wastewater system needs: SRF loans, Ohio Public Works loans, Ohio Water Development Authority loans and grants, federal state/tribal assistance grants (STAG).

Oklahoma
USDA Rural Development Grants, SRF loans, HUD CDBGs, Bureau of Indian Affairs (BIA) Indian Health Service grants and loans, local banks, and sales taxes.

Oregon
SRF loans only. No grants exist.

Rhode Island
Communities may be eligible for SRF loans for SSO related construction projects.

Texas: No response.

Washington: No response.

Wisconsin
Loans, WDNR Clean Water Fund, many other funding sources (from which communities may seek loans for collection system projects).

Wyoming
Funding to increase sewer system capacity or reduce I/I is available through SRF loans.

6.7 Blending Policies

U.S. EPA HQ
The permit for the Blue Plains facility (in Washington DC), which has a combined sewer system, allows blending of primary treated wastewater with secondary treated wastewater. Blending operates with an interim authorization, but there is no schedule or plan to eliminate this blending in the future.

<u>U.S. EPA Region 1</u>
Region 1 does not allow blending in any of its wastewater treatment plant permits.

<u>U.S. EPA Region 4</u>
Region 4 does not allow blending in any of its wastewater treatment plant permits.

<u>U.S. EPA Region 5</u>: No response.

<u>U.S. EPA Region 6</u>: No response.

<u>Arizona</u>
AZ DEQ does not allow blending in any of its wastewater treatment plant permits.

<u>Connecticut</u>
CT DEP does allow blending in at least one of its wastewater treatment plant permits, and blending does not operate with an interim authorization.

<u>Florida</u>
FL DEP does not allow blending in any of its wastewater treatment plant permits.

<u>Georgia</u>
GA DNR does not allow blending in any of its wastewater treatment plant permits.

<u>Indiana</u>
Some of IDEM’s stormwater permits allow communities with CSOs to recombine effluent during wet weather. Blending operates with an interim authorization and the schedule of elimination is defined in an approved long term control plan.

<u>Iowa</u>
IA DNR does allow blending in at least one of its wastewater treatment plant permits.

<u>Kansas</u>
KDHE does not allow blending in any of its wastewater treatment plant permits.

<u>Kentucky</u>
KY DEP allows the blending of secondary effluent with partially treated effluent during wet weather events in several of its discharge permits. In each permit, blending operates with a temporary authorization, with each permit addressing the elimination schedule and/or plan on a case-by-case basis.

<u>Louisiana</u>
LA DEQ does allow blending in at least one of its wastewater treatment plant’s permits, and blending does not operate with an interim authorization.

<u>Massachusetts</u>
Blending of treated wastewater with a mixture of untreated wastewater and stormwater is not permitted.

Michigan
MI DEQ does allow blending at a limited number of facilities (less than five). At these facilities, the blending operates with an interim authorization and the facilities' NPDES permits contain a requirement to eliminate the blending.

Minnesota
Blending is not allowed in any of MPCA's wastewater treatment plant permits.

Missouri
MO DNR does allow blending at wastewater treatment plants, and does not consider blending to be a temporary solution. The U.S. EPA recently objected to the issuance of such permits.

Montana
MT DEQ does not allow blending in any of its wastewater treatment plant permits.

Nevada
Blending is not allowed in any of NV DEP's wastewater treatment plant permits.

New Hampshire: See EPA Region 1.

New Jersey
Blending is not allowed in any of NJDEP's wastewater treatment plant permits.

New York
Wastewater treatment plant permits issued by NYSDEC contain provisions for the blending of treated wastewater with the mixture of storm water and untreated sewage, and this blending does not operate with an interim authorization or schedule for elimination.

North Carolina
Blending is not allowed in any of NC DENR's wastewater treatment plant permits.

North Dakota
ND DoH does not allow blending in any of its wastewater treatment plant permits.

Ohio
Blending is not allowed in any of OH EPA's permits.

Oklahoma
Blending is not allowed in any of OK DEQ's wastewater treatment plant permits.

Oregon
Blending is not allowed in any of OR DEQ's permits.

Rhode Island
Two of Rhode Island's wastewater treatment plants that have combined sewer systems have both dry weather outfalls and wet weather outfalls. All discharges from the dry weather outfalls must meet secondary treatment

requirements, while wet weather discharges must meet only primary treatment requirements. All effluent from wastewater treatment plants with separate collection systems must meet secondary treatment requirements.

Texas

Blending is not allowed in any of TCEQ's wastewater treatment plant permits.

Virginia

Blending is not allowed in any of VA DEQ's wastewater treatment plant permits.

Washington

WA DOE does not allow blending in any of its wastewater treatment plant's permits.

Wisconsin

In some cases, in-plant diversions are allowed, but the discharged effluent must still meet any WPDES permit effluent limits. Such blending operates with an interim authorization and WI DNR is in the process of preparing a set of "SSO Rules" that will address blending.

Wyoming

Blending is not allowed in any of WY DEQ's wastewater treatment plant's permits.

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[1] Email correspondence from James Fischer, California State Water Resources Control Board, Office of Enforcement/Special Investigations Unit on 23 February 2010.

[2] Sanitary Sewer Overflow Survey. U.S. EPA HQ Response. 5 August 2009. Unless otherwise indicated, this reference applies to all information about EPA's SSO policies.

[3] Sanitary Sewer Overflow Survey. U.S. EPA Region 1 Response. 5 August 2009. Unless otherwise indicated, this reference applies to all information about EPA Region 1's SSO policies.

[4] Sanitary Sewer Overflow Survey. U.S. EPA Region 4 Response. 21 July 2009. Unless otherwise indicated, this reference applies to all information about EPA Region 4's SSO policies.

[5] Sanitary Sewer Overflow Survey. U.S. EPA Region 5 Response. 24 July 2009. Unless otherwise indicated, this reference applies to all information about EPA Region 5's SSO policies.

[6] Sanitary Sewer Overflow Survey. U.S. EPA Region 6 Response. 23 July 2009. Unless otherwise indicated, this reference applies to all information about EPA Region 6's SSO policies.

[7] Sanitary Sewer Overflow Survey. AZ DEQ Response. 14 August 2009. Unless otherwise indicated, this reference applies to all information about AZ DEQ's SSO policies.

[8] Sanitary Sewer Overflow Survey. CDPHE Response. 21 August 2009. Unless otherwise indicated, this reference applies to all information about CDPHE's SSO policies.

[9] Sanitary Sewer Overflow Survey. CT DEP Response. 21 July 2009. Unless otherwise indicated, this reference applies to all information about CT DEP's SSO policies.

[10] Sanitary Sewer Overflow Survey. FL DEP Response. 24 July 2009. Unless otherwise indicated, this reference applies to all information about FL DEP's SSO policies.

[11] Sanitary Sewer Overflow Survey. GA DNR Response. 20 July 2009. Unless otherwise indicated, this reference applies to all information about GA DNR's SSO policies.

[12] Sanitary Sewer Overflow Survey. IDEM Response. 4 August 2009. Unless otherwise indicated, this reference applies to all information about IDEM's SSO policies.

[13] Sanitary Sewer Overflow Survey. IA DNR Response. 22 July 2009. Unless otherwise indicated, this reference applies to all information about IA DNR's SSO policies.

[14] Sanitary Sewer Overflow Survey. KDHE Response. 21 July 2009. Unless otherwise indicated, this reference applies to all information about KDHE's SSO policies.

[15] Sanitary Sewer Overflow Survey. KY DEP Response. 20 August 2009. Unless otherwise indicated, this reference applies to all information about KY DEP's SSO policies.
[16] Sanitary Sewer Overflow Survey. LA DEQ Response. 28 July 2009. Unless otherwise indicated, this reference applies to all information about LA DEQ's SSO policies.
[17] Sanitary Sewer Overflow Survey. MA DEP Response. 31 July 2009. Unless otherwise indicated, this reference applies to all information about MA DEP's SSO policies.
[18] Sanitary Sewer Overflow Survey. MI DEQ Response. 25 November 2009. Unless otherwise indicated, this reference applies to all information about MI DEQ's SSO policies.
[19] Sanitary Sewer Overflow Survey. MPCA Response. 3 August 2009. Unless otherwise indicated, this reference applies to all information about MPCA's SSO policies.
[20] Sanitary Sewer Overflow Survey. MO DNR Response. 10 August 2009. Unless otherwise indicated, this reference applies to all information about MO DNR's SSO policies.
[21] Sanitary Sewer Overflow Survey. MT DEQ Response. 17 August 2009. Unless otherwise indicated, this reference applies to all information about Montana's SSO policies.
[22] Sanitary Sewer Overflow Survey. NV DEP Response. 27 July 2009. Unless otherwise indicated, this reference applies to all information about Nevada's SSO policies.
[23] Sanitary Sewer Overflow Survey. NJDEP Response. 28 July 2009. Unless otherwise indicated, this reference applies to all information about New Jersey's SSO policies.
[24] Sanitary Sewer Overflow Survey. NYSDEC Response. 23 July 2009. Unless otherwise indicated, this reference applies to all information about New York's SSO policies.
[25] Sanitary Sewer Overflow Survey. NCDENR Response. 28 July 2009. Unless otherwise indicated, this reference applies to all information about North Carolina's SSO policies.
[26] Sanitary Sewer Overflow Survey. ND DoH Response. 21 July 2009. Unless otherwise indicated, this reference applies to all information about ND DoH's SSO policies.
[27] Sanitary Sewer Overflow Survey. OH EPA Response. 24 July 2009. Unless otherwise indicated, this reference applies to all information about Ohio's SSO policies.
[28] Sanitary Sewer Overflow Survey. OK DEQ Response. 21 July 2009. Unless otherwise indicated, this reference applies to all information about OK DEQ's SSO policies.
[29] Sanitary Sewer Overflow Survey. OR DEQ Response. 28 July 2009. Unless otherwise indicated, this reference applies to all information about Oregon's SSO policies.
[30] Sanitary Sewer Overflow Survey. RI DEM Response. 19 August 2009. Unless otherwise indicated, this reference applies to all information about RI DEM's SSO policies.
[31] Sanitary Sewer Overflow Survey. TCEQ Response. 13 August 2009. Unless otherwise indicated, this reference applies to all information about Texas' SSO policies.
[32] Sanitary Sewer Overflow Survey. VA DEQ Response. 22 July 2009. Unless otherwise indicated, this reference applies to all information about VA DEQ's SSO policies.
[33] Sanitary Sewer Overflow Survey. WA DOE Response. 30 July 2009. Unless otherwise indicated, this reference applies to all information about Washington's SSO policies.
[34] Sanitary Sewer Overflow Survey. WI DNR Response. 27 August 2009. Unless otherwise indicated, this reference applies to all information about Wisconsin's SSO policies.
[35] Sanitary Sewer Overflow Survey. WY DEQ Response. 27 July 2009.
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[37] Sanitary Sewer Overflow Survey. U.S. EPA Region 1 Response. 5 August 2009.
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[39] Sanitary Sewer Overflow Survey. IDEM Response. 4 August 2009.
[40] Sanitary Sewer Overflow Survey. KDHE Response. 21 July 2009.
[41] Sanitary Sewer Overflow Survey. MPCA Response. 3 August 2009.
[42] Ibid.
[43] Sanitary Sewer Overflow Survey. NDEP Response. 27 July 2009.
[44] Ibid.
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[49] Sanitary Sewer Overflow Survey. KY DEP Response. 20 August 2009.
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Chapter 7: Stormwater Water Quality Based Effluent Limitation (WQBEL) Requirements

7.1 Introduction

In an effort to benchmark federal and state policies related to water quality based effluent limits (WQBELS), the U.S. Environmental Protection Agency (U.S. EPA), state agencies, and EPA regional offices were surveyed with regards to the WQBEL requirements that may have been developed for their stormwater permitting programs. The surveys focused on how WQBELs are developed, the pollutants for which WQBELs have been developed, the circumstances under which WQBELs are developed, and whether whole effluent toxicity (WET) based limits have been incorporated into stormwater permits. Three surveys were developed in order to capture any differences in WQBEL requirements that may exist between the industrial, MS4, and construction stormwater permitting programs. The survey that was developed for the construction stormwater permitting program elicited 17 responses: EPA Region 9, U.S. EPA Region 9, CT, FL, KS, IN, LA, MI, MO, MT, NC, NV, ND, OR TX, UT, VT, WA. The survey that was developed for the industrial permitting stormwater program elicited 14 responses: EPA Region 9, CT, FL, IN, KS, LA, MI, MO, MT, NV, NC, ND, OR, VA, WA, WI. The survey that was developed for the MS4 stormwater permitting program elicited 13 responses: EPA Region 9, CA, CT, FL, IN, MI, MO, MS, MT, ND, OR, TX, VT. The report contains survey responses as well as supplemental information gathered from the Internet.

Among the state and federal agencies that responded to the construction stormwater WQBEL survey, 80% (15 of 19 agencies) have not developed parameter-specific water quality standards (WQS) for stormwater discharges associated with construction stormwater. In addition, none of the state agencies surveyed have developed WQBELs that apply to construction stormwater permits. Furthermore, none of the state agencies have incorporated WET-based limits into construction stormwater permits. Although none of the agencies surveyed have developed WQBELs, 87.5% (7 of 8 agencies) have the statutory authority to derive and implement stormwater WQBELs. 31% (5 of 16 agencies) of the agencies acknowledge that stormwater has been identified as a primary source of impairment for one or more impaired water bodies on their states' 303(d) lists.

Among the state and federal agencies that responded to the industrial stormwater WQBEL survey, 65% (13 of 20 agencies) have not developed parameter-specific water quality standards (WQS) for stormwater discharges associated with industrial activities. In addition, 26% (5 of 19 agencies) have developed WQBELs that apply to industrial stormwater discharges. Among the agencies that have developed parameter-specific WQBELs, 60% (3 of 5 agencies) have incorporated WQBELs into their industrial stormwater general permits. Additionally, the Texas Commission on Environmental Quality (TCEQ) is the only state agency that incorporates WET-based limits into industrial stormwater permits, although on a case-by-case basis only. 90% (9 of 10 agencies) have statutory authority to derive and implement stormwater WQBELs. Finally, 73% (11 of 15 agencies) acknowledge that stormwater has been identified as a primary source of impairment for one or more impaired water bodies on their states' 303(d) lists.

Among the state and federal agencies that responded to the MS4 stormwater WQBEL survey, 80% (10 of 13 agencies) have not developed parameter-specific water quality standards (WQS) for stormwater discharges associated with MS4s. In addition, only Missouri has developed WQBELs that apply to MS4 stormwater discharges. Additionally, none of agencies surveyed incorporate WET-based limits into MS4 stormwater permits. 100% (6 of 6 agencies) have statutory authority to derive and implement stormwater WQBELs. Several survey respondents were unsure as to whether their respective agencies have statutory authority to derive stormwater WQBELs. Finally, 82% (9 of 11 agencies) acknowledge that stormwater has been identified as a primary source of impairment for one or more impaired water bodies on their states' 303(d) lists.

7.2 Water Quality Based Effluent Limitation Requirements for Industrial Stormwater

7.2.1 Water Quality Standards (WQS) for Industrial Stormwater

Connecticut

The Connecticut Department of Environmental Protection (CT DEP) has developed parameter-specific water quality standards for wet weather discharges associated with industrial activities.[1]

Florida

The Florida Department of Environmental Protection (FL DEP) has developed water quality standards for wet weather discharges associated with industrial activities.[2]

Indiana

The Indiana Department of Environmental Management (IDEM) has not developed parameter-specific water quality standards for wet weather discharges associated with industrial activities.[3]

Kansas

The Kansas Department of Health and Environment (KDHE) has not developed water quality standards for wet weather discharges associated with industrial activities.[4]

Louisiana

The Louisiana Department of Environmental Quality (LA DEQ) has not developed water quality standards for wet weather discharges associated with industrial activities.[5]

Missouri

The Missouri Department of Natural Resources (MO DNR) has not developed water quality standards for wet weather discharges associated with industrial activities.[6]

Michigan

The Michigan Department of Environmental Quality (MI DEQ) has not developed water quality standards for wet weather discharges associated with industrial activities.[7]

Montana

According to the survey respondent, the Montana Department of Environmental Quality (MT DEQ) has developed parameter-specific water quality standards for wet weather discharges.[8] The agency's industrial stormwater permit contains sector-specific monitoring parameters, and permittees are required to monitor stormwater discharges according to guidelines outlined in the agency's permit.[9] Sampling results must be compared to benchmark values specified in the "June 2006 Monitoring Parameter Benchmark Values" attachment. If exceedances are observed, permittees are required to make improvements to their Stormwater Pollution Prevention Plan (SWPPP) in order to improve the quality of stormwater discharges.[10]

Nevada

The Nevada Department of Environmental Protection (NV DEP) has not developed water quality standards for wet weather discharges associated with industrial activities.[11]

North Carolina

The North Carolina Department of Environment and Natural Resources (NC DENR) has developed parameter-specific water quality standards for wet weather discharges.[12]

North Dakota

The North Dakota Department of Health (ND DOH) has not developed parameter-specific water quality standards for wet weather discharges associated with industrial activities.[13]

Texas

The Texas Commission on Environmental Quality has developed parameter-specific water quality standards for wet weather discharges associated with industrial activities.[14] A set of numeric heavy metal limitations has been developed for industrial activities that discharge to inland waters and a second set of limitations has been developed for industrial activities that discharge to tidal waters. The numeric limitations are specified in the agency's industrial stormwater permit.[15]

Table 7-1. Numeric Limitations for Discharges of Storm Water to Inland Waters

Hazardous Metal	Daily Average (mg/L)	Daily Composite (mg/L)	Daily Maximum (mg/L)	Monitoring Frequency
Arsine	0.1	0.2	0.3	1/Year
Barium	1.0	2.0	4.0	1/Year
Cadmium	.05	0.1	0.2	1/Year
Chromium	.5	1	5.0	1/Year
Copper	.5	1	2.0	1/Year
Lead	.5	1	1.5	1/Year
Manganese	1	2	3	1/Year
Mercury	.005	0.005	0.01	1/Year
Nickel	1	2	3	1/Year
Selenium	0.05	.1	0.2	1/Year
Silver	0.05	.1	0.2	1/Year
Zinc	1.0	2.0	6	1/Year

Virginia

The Virginia Department of Environmental Quality (VA DEQ) has not developed water quality standards for wet weather discharges associated with industrial activities.[16]

Washington

The Washington Department of Ecology (WA DOE) has developed water quality standards for wet weather discharges associated with industrial activities.[17] There are three sets of effluent limitations; one for hazardous waste landfills, a second for non-hazardous waste landfills, and a third set of limitations that apply to coal piles.[18]

Table 7-2. Washington Stormwater Effluent Limitations for Hazardous Waste Landfills

Parameter	Average Monthly[a]	Maximum Daily[b]
pH	Daily minimum is equal to or greater than 6 and the daily maximum is less than or equal to 9.	
BOD5	56 mg/L	220 mg/L
TSS	27 mg/L	88 mg/L
Ammonia	4.9 mg/L	10 mg/L
Alpha Terpineol	0.019 mg/L	0.042 mg/L
Aniline	0.015 mg/L	0.024 mg/L
Benzoic Acid	0.073 mg/L	0.119 mg/L
Naphthalene	0.022 mg/L	0.059 mg/L
p-Cresol	0.015 mg/L	0.024 mg/L
Phenol	0.029 mg/L	0.048 mg/L
Pyridine	0.025 mg/L	0.072 mg/L
Arsenic (total)	0.54 mg/L	1.1 mg/L
Chromium (total)	0.46 mg/L	1.1 mg/L
Zinc	0.296 mg/L	0.535 mg/L

[a] The average monthly effluent limitation is defined as the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. If only one sample is taken during the calendar month, the average monthly effluent limitation applies to that sample. If only one sample is taken during the monitoring quarter, the average monthly effluent limitation applies to that sample.

[b] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. The daily discharge is the average measurement of the pollutant over the day.

Table 7-3. Stormwater Effluent Limitations for Non-Hazardous Waste Landfills

Parameter	Average Monthly[a]	Maximum Daily[b]
pH	Daily minimum is equal to or greater than 6 and the daily maximum is less than or equal to 9.	
BOD5	37 mg/L	140 mg/L
TSS	27 mg/L	88 mg/L
Ammonia	4.9 mg/L	10 mg/L
Alpha Terpineol	0.016 mg/L	0.033 mg/L
Benzoic Acid	0.071 mg/L	0.12 mg/L
p-Cresol	0.014 mg/L	0.12 mg/L
Phenol	0.015 mg/L	0.026 mg/L
Zinc (total)	0.11 mg/L	0.20 mg/L

[a] The average monthly effluent limitation is defined as the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month. If only one sample is taken during the calendar month, the average monthly effluent limitation applies to that sample. If only one sample is taken during the monitoring quarter, the average monthly effluent limitation applies to that sample.
[b] The maximum daily effluent limitation is defined as the highest allowable daily discharge. The daily discharge means the discharge of a pollutant measured during a calendar day. The daily discharge is the average measurement of the pollutant over the day.

Table 7-4. Effluent Limitations for Exposed Coal Piles

Parameter	Average Monthly	Maximum Daily
pH	Daily minimum is equal to or greater than 6 and the daily maximum is less than or equal to 9.	
Total Suspended Solids (TSS)	NA	50 mg/L

Source: Washington Department of Ecology. The Industrial Stormwater Permit. P. 17 – 19. [15 October 2008]. Online. 15 October 2009. http://www.ecy.wa.gov/programs/wq/stormwater/industrial/ISWGPfinalpermit101508.pdf

Wisconsin

The Wisconsin Department of Natural Resources (WI DNR) has not developed water quality standards for wet weather discharges associated with industrial activities.[19]

7.2.2 Water Quality Based Effluent Limitations for Industrial Activities

Connecticut

The CT DEP has developed parameter-specific water quality-based effluent limitations (WQBELs) for wet weather discharges. The stormwater WQBELs only apply to certain industrial activities and stormwater WQBELs have not been incorporated into Industrial Stormwater General Permits. Stormwater WQBELs have been developed for the following parameters: total suspended solids (TSS), ph, oil and grease, ammonia, and heavy metals.[20]

The CT DEP has developed benchmark monitoring values for stormwater discharges associated with industrial activities. The benchmark monitoring values are used as points of reference for assessing the effectiveness of stormwater BMPs. All industrial activities permitted under the industrial stormwater general permit must monitor stormwater discharges for the parameters listed below. If stormwater monitoring reveals that the stormwater discharges associated with a particular industrial activity are not exceeding the benchmark monitoring values for the specified parameters for a period of two consecutive years, then the operator may suspend sampling for a period of two years.[21]

The following benchmark monitoring values apply to industrial activities that were constructed after October 1, 1997.

Table 7-5 Connecticut Industrial Stormwater Discharge Benchmark Monitoring Values

Parameter	Benchmark value (mg/L)
Total Oil and Grease	2.5
Chemical Oxygen Demand	45
Total Suspended Solids	30
Total Phosphorus	0.2
Total Kjeldahl Nitrogen	1.25
Nitrate as Nitrogen	0.75
Total Copper	0.060
Total Lead	0.030
Total Zinc	0.200
Aquatic Toxicity = 100%	

The following benchmark monitoring values apply to industrial activities that were constructed before October 1, 1997.

Table 7-6 Connecticut Industrial Stormwater Discharge Benchmark Monitoring Values	
Parameter	Benchmark value (mg/l)
Total Oil and Grease	5
Chemical Oxygen Demand	75
Total Suspended Solids	100
Total Phosphorus	0.5
Total Kjeldahl Nitrogen	2.5
Nitrate as Nitrogen	1.5
Total Copper	0.100
Total Lead	0.050
Total Zinc	0.500
Aquatic Toxicity LC50 = 50%	

According to the results of the survey, CT DEP has not developed both acute and chronic WQBELs for stormwater discharges; only one stormwater WQBEL has been developed for each parameter. The stormwater WQBELs are based on acute toxicity criteria.[22]

<u>Florida</u>
There is no indication that FL DEP has developed WQBELs for stormwater discharges, as the National Pollutant Discharge Elimination System (NPDES) industrial stormwater general permit does not contain WQBEL requirements. FL DEP has however, developed benchmark monitoring values for stormwater discharges associated with industrial activities.[23]

<u>Indiana</u>
The IDEM has not developed parameter-specific WQBELs for stormwater discharges. IDEM has developed benchmark monitoring values for stormwater discharges, but benchmarks are seldom used. Benchmarking monitoring values may be used to determine the effectiveness of “stormwater quality measures.”[24]

<u>Kansas</u>
KDHE has not developed WQBELs for stormwater discharges associated with industrial activities nor have they developed benchmark monitoring values for stormwater discharges.

<u>Louisiana</u>
LA DEP has not developed WQBELs for stormwater discharges associated with industrial activities. Industrial activities that are regulated under the NPDES industrial stormwater permit are subject to the same BMP requirements and controls specified in the U.S. EPA’s Multi-Sector General Permit.[25]

Michigan

MDE has developed parameter-specific WQBELs for stormwater discharges associated with industrial activities, although WQBELs have not been incorporated into the agency's general stormwater permit. WQBELs are only incorporated into individual stormwater permits. As an example, the individual stormwater permit that was issued to Omni Source in Bay City, Michigan, included stormwater WQBELs for turbidity, pH, oil and grease, heavy metals, and PCBs. Stormwater WQBELs are only developed when there is an increased risk that contaminants generated at a particular site might lead to non-attainment of water quality standards (WQS).

Missouri

MO DNR has developed WQBELs for stormwater discharges associated with industrial activities that involve "wood treating operations." WQBELs have been developed for TSS, biological oxygen demand (BOD), oil and grease, and pentachlorophenol. In addition, industrial activities that utilize metal-based wood preservatives are subject to WQBELs that have been developed for arsenic, chromium, copper, and zinc. The permit specifies "daily maximum" limitations and "monthly average" limitations for each parameter.[26]

Montana

MT DEQ has not developed parameter-specific WQBELs for stormwater discharges. MT DEQ has developed benchmark monitoring values for stormwater discharges in an effort to assess the effectiveness of best management practices (BMPs).[27]

Nevada

The NV DEP has not developed WQBELs for stormwater discharges associated with industrial activities nor have they developed benchmark monitoring values for stormwater discharges.

North Carolina

NC DENR has not developed parameter-specific WQBELs for stormwater discharges. NC DENR has developed benchmark monitoring values for stormwater discharges.[28]

North Dakota

ND DoH has not developed parameter-specific WQBELs for stormwater discharges. ND DoH has developed benchmark monitoring values for stormwater discharges.

Oregon

The Oregon Department of Environmental Quality (OR DEQ) has developed parameter-specific WQBELs for wet weather discharges. Stormwater WQBELs are only developed under special circumstances, and are only incorporated into industrial stormwater individual permits.[29] When WQBELs are developed for stormwater discharges, they are based on acute criteria.[30]

Texas

The Texas Commission on Environmental Quality (TCEQ) has developed parameter-specific WQBELs for wet weather discharges. Stormwater WQBELs have been developed for a limited number of industrial activities including some "chemical facilities." Stormwater WQBELs have been developed for heavy metals, including zinc.[31] WQBELs may be developed if stormwater discharges "consistently approach applicable TBELs," or if an industrial activity discharges to a water body on the 303(d) list. A permit writer may also develop stormwater WQBELs if stormwater discharges contain "pollutants of concern."[32] TCEQ has not incorporated parameter-specific WQBEL requirements into industrial stormwater general permits.

TCEQ develops both acute and chronic stormwater WQBELs. Acute WQBELs are expressed as daily maximum limitations.[33] Chronic WQBELs are expressed as monthly average limitations, and are averaged over a thirty day period.[34]

Virginia
VA DEQ has not developed WQBELs for stormwater discharges associated with industrial activities. VA DEQ has developed benchmark monitoring values for stormwater discharges.[35]

Wisconsin
WI DNR has not developed WQBELs for stormwater discharges associated with industrial activities. WI DNR recommends that operators use the U.S. EPA benchmark monitoring values.[36]

7.2.3 Development of Water Quality Based Effluent Limitations

Connecticut
When calculating and developing WQBELs for storm water discharges, storm water discharge flows and receiving water body flows are not considered.[37] Furthermore, CT DEP does not account for storm-induced increases in stream flows when developing stormwater WQBELs.[38]

Michigan
Stormwater WQBELs are only developed when there is an increased risk that contaminants generated at a particular site might lead to non-attainment of water quality standards (WQS). Thus, WQBELs are developed according to "applicable water quality standards."[39] According to the survey respondent, MI DEQ does consider the flow of receiving water bodies when developing stormwater WQBELs.[40]

Texas
TCEQ considers stormwater discharge flows when calculating WQBELs for storm water discharges. Stormwater discharge flows are used to define "critical conditions" and for determining the "allowable initial zone of dilution." Stormwater discharges are determined under "worst-case scenario" conditions, such as dry weather conditions.[41]

TCEQ also considers receiving water body flows when calculating stormwater WQBELs. Receiving water body flows are used to determine "worst-case scenario" dilution conditions.[42] TCEQ does not account for storm-induced increases in stream flows when developing water quality standards and/or WQBELs for storm water discharges.[43] TCEQ utilizes the TexTox model to develop stormwater WQBELs.[44]

7.2.4 Whole Effluent Toxicity based limits

FL, IN, KS, LA, MI, MT, NV, NC, ND, VA, WI
The above state agencies have not developed WET-based limits for storwater discharges associated with industrial activities.

Connecticut
Although CT DEP has not developed whole effluent toxicity (WET) based limits for storm water discharges, the benchmark monitoring values developed for stormwater discharges include a LC50 benchmark for acute toxicity. For industrial activities that are constructed before October 1, 1997, the LC50 benchmark for aquatic toxicity is 50%. For industrial activities that are constructed after October 1, 1997 LC50 benchmark for aquatic toxicity is 100%.[45]

Texas
The Texas Commission on Environmental Quality (TCEQ) incorporates WET based limits into industrial stormwater permits on a case-by-case basis.

7.2.5 Technology-Based Limits

Connecticut
CT DEP has not developed technology-based limits for storm water discharges.

Indiana
IDEM has not developed technology-based limits for stormwater discharges associated with industrial activities.

Kansas
KDHE has not developed technology-based limits for stormwater discharges associated with industrial activities.

Louisiana
Although the Multi Sector General Permit does not include technology-based limits, technology-based limits may be incorporated into industrial stormwater individual permits when necessary.[46]

Michigan
MS DEQ has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s nor have they incorporated benchmark monitoring values into MS4 stormwater permits.

Montana
MT DEQ develops technology-based limits for stormwater discharges for appropriate industrial activities as required by the Federal Effluent Limitation Guidelines (ELGs).

Nevada
NV DEP has not developed technology-based limits for stormwater discharges associated with industrial activities.

North Dakota
ND DoH has developed technology-based limits for industrial activities that discharge "coal pile runoff."[47]

Texas
TCEQ has developed technology-based limits for stormwater discharges. Technology-based limits have been developed for BOD, oil and grease, TSS, and pH.[48]

Virginia
VA DEQ has developed technology-based limits for stormwater discharges. The limits are specified in the industrial stormwater general permit.[49]

7.2.6 Non-attainment of Water Quality Standards (Impaired Waters) and Negative Resource Impacts (Not Listed as Impaired)

Connecticut
CT DEP regulates all applicable point source wet weather discharges, regardless of whether the receiving water bodies are in compliance with water quality standards or not.[50]

Florida
FL DEP regulates all industrial activities that meet the requirements set forth in the industrial stormwater permit, 40CFR122.26, under the NPDES stormwater permitting program.[51]

Indiana
IDEM regulates all point source wet weather discharges, regardless of whether receiving water bodies are in compliance with water quality standards or not.

According to the survey respondent, the 303(d) list does not contain any water bodies that are impaired due to stormwater discharges. Furthermore, there are no known documented cases in which water bodies have suffered adverse impacts due to stormwater discharges.[52]

Kansas
KDHE regulates all industrial activities that meet the requirements specified in the industrial stormwater permit, 40 CFR 122, and any additional industrial activities "significant contributors of pollutants," under the industrial stormwater permitting program.[53]

None of the water bodies on the Kansas's 303(d) list are impaired due to stormwater discharges.[54] According to the survey respondent however, there are documented cases in which stormwater discharges originating from industrial activities have caused fish kills.[55]

Louisiana

LA DEQ regulates all industrial activities that meet the necessary requirements set forth in the industrial stormwater permit, under the NPDES stormwater permitting program.[56]

None of the water bodies on the state of Louisiana's 303(d) list are impaired due to stormwater discharges.[57] In addition, there are no documented cases in which stormwater discharges have adversely impacted water bodies.

Michigan

MI DEQ regulates industrial activities that meet the requirements of the agency's industrial stormwater permit. More specifically, facilities that are classified under one of the SIC codes or facilities that are determined to be significant contributors of pollutants are regulated under the stormwater permitting program.

According to the survey respondent, stormwater discharges originating from regulated facilities may contribute to nonattainment of water quality standards. Besides water bodies that are on the State of Michigan's 303(d) list, there are no additional documented instances in which water bodies have suffered adverse impacts due to stormwater discharges.

Montana

MT DEQ regulates all point source wet weather discharges, regardless of whether the receiving water bodies are in compliance with water quality standards.

There are water bodies in the state of Montana that are listed for non-attainment of water quality standards due to wet weather discharges.[58] Other than water bodies on the 303(d) list, there are documented cases of water bodies suffering adverse impacts due to stormwater discharges. There are several documented instances in which stormwater discharges, originating from mines and other industrial activities, have delivered harmful amounts of sediment and pollutants to "smaller and/or isolated surface waters," thus causing adverse impacts to the water bodies.[59]

North Carolina

NC DENR regulates all point source wet weather discharges, regardless of whether receiving water bodies are in compliance with water quality standards or not.

According to the survey respondent, there are water bodies in the state of North Carolina that are listed for non-attainment of water quality standards due to turbidity and other pollutants, which have been attributed to stormwater discharges. NC DENR acknowledges that stormwater discharges associated with industrial activities adversely impact surface waters that are not on the 303(d) list.[60 61]

Nevada

According to the survey respondent, NV DEP only regulates point source wet weather discharges when the corresponding receiving water bodies are not in compliance with water quality standards.

Although many of the water bodies on the 303(d) list are impaired due to turbidity, stormwater discharges are not identified as the primary source of impairment for any of the water bodies on the 303(d) list.[62]

North Dakota

ND DoH regulates all point source wet weather discharges, regardless of whether receiving water bodies are in compliance with water quality standards or not.

There are water bodies on the 303(d) list that are listed for non-attainment of water quality standards due to sediment and other causes that can be attributed to stormwater discharges.[63] There are no documented instances in which stormwater discharges have adversely impacted surface waters that are not on the 303(d) list.[64]

Texas

TCEQ regulates all applicable point source wet weather discharges, regardless of whether the receiving water bodies are in compliance with water quality standards.[65]

According to the survey respondent, there are water bodies in the state of Texas that are listed for non-attainment of water quality standards due to wet weather discharges.[66]

Virginia

VA DEQ regulates all industrial activities that meet the requirements specified in the industrial stormwater permit under the industrial stormwater permitting program, regardless of whether receiving water bodies are in compliance with water quality standards or not.[67]

According to the survey respondent, there are 303(d) listed water bodies that are impaired due to stormwater discharges. Other than water bodies on the 303(d) list, there are no documented cases in which water bodies have suffered adverse impacts due to stormwater discharges.[68]

Wisconsin

WI DNR regulates all industrial activities that meet the requirements specified in the industrial stormwater permit under the industrial stormwater permitting program, regardless of whether receiving water bodies are in compliance with water quality standards.

Although there are many water bodies on the 303(d) list that are impaired due to turbidity and nonpoint source (NPS) pollution, stormwater discharges are not identified as the primary source of impairment for any of the water bodies on the 303(d) list.[69]

7.3 Water Quality Based Effluent Limitation (WQBELs) Requirements for Construction Stormwater

7.3.1 Water Quality Standards for Construction Stormwater

U.S. EPA Region 9, CT, FL, IN, LA, MI, MO, NV, ND, OR TX, UT, VT

According to the results of the survey, U.S. EPA Region 9 and the above state agencies have not developed water quality standards that apply to wet weather discharges associated with construction activities.

California

California State Water Resources Control Board (CSWRCB) has developed technology-based numeric action levels (NALs) for pH and turbidity. The agency has also incorporated Technology-based Numeric Effluent Limitations (NELs) into construction stormwater general permits. A NEL has been developed for pH, but the limitation only applies to construction activities that have a "high risk of pH discharge." In addition, the agency has developed a daily average NEL for turbidity, although the NEL only applies to construction activities that are classified as "risk level 3." [70] The decision to incorporate NALs and NELs into the construction stormwater permit was influenced by the findings of a panel of stormwater quality experts. In 2005 the State Water Board of California convened an expert panel to evaluate the feasibility of developing numeric limits for stormwater permits. According to a report published in 2006, the panel determined it was feasible to develop numeric limitations for stormwater discharges associated with large construction activities.[71]

Kansas

According to the survey respondent, KDHE has developed parameter-specific water quality standards for wet weather discharges associated with construction activities.[72] Further research reveals that the agency's construction stormwater general permit does not specify parameter-specific water quality standards.[73]

Montana

According to the survey respondent, MT DEQ has developed parameter-specific water quality standards for wet weather discharges associated with construction activities.[74] Further review of MT DEQ's construction stormwater general permit, reveals that parameter-specific water quality standards have not been developed for stormwater discharges. The agency has however developed general narrative standards for stormwater discharges. [75]

North Carolina

According to the survey respondent, NC DENR has developed parameter-specific water quality standards for wet weather discharges associated with construction activities. Further research reveals that the agency's construction stormwater general permit does not specify numeric parameter-specific limitations.[76]

Washington

WA DOE has not developed water quality standards that apply to wet weather discharges associated with construction activities. The agency has however, developed benchmark monitoring values for turbidity, transparency, and pH. According to the agency's construction stormwater permit, operators are required to sample and analyze stormwater discharges on a weekly basis during wet weather periods. The benchmark monitoring value for turbidity is 25 NTUs, and the benchmark for transparency is 31 cm. If stormwater discharges exceed 250 NTUs for turbidity and 6 cm for transparency, operators are required to contact WA DOE and review their SWPPPs. Operators are required to install stormwater BMPs to help reduce turbidity within 10 days of the first exceedance. The benchmark for pH is 8.5 standard units, and if exceeded, operators are required to collect the stormwater and prevent discharge to surface waters. Operators may employ one or more treatment BMPs to adjust the pH of stormwater discharges that have exceeded the benchmark.[77]

7.3.2 Water Quality Based Effluent Limitations for Construction Stormwater

U.S. EPA Region 9, CT, FL, IN, KS, LA, MI, MT, NV, NC, ND, TX, UT

According to the results of the survey, U.S. EPA Region 9 and the above state agencies have not developed WQBELs for stormwater discharges associated with construction activities nor have they developed benchmark monitoring values.

Missouri

MO DEQ survey respondents indicated that the agency has not developed WQBELs for stormwater discharges associated with construction activities. MO DEQ has however developed effluent limitations for settleable solids that apply to stormwater discharges. According to the construction stormwater permit, the effluent limit for settleable solids is 2.5 ml/L/hr per stormwater outlet structure.[78] For ORWs and other "sensitive waters," the effluent limitation for settleable solids is 0.5 ml/L/hr.[79] In addition, MO DEQ has developed benchmark monitoring values for stormwater discharges.[80]

Oregon

OR DEQ has not developed WQBELs for stormwater discharges associated with construction activities. OR DEQ has however developed a benchmark monitoring value for turbidity. If a construction activity discharges to an impaired water body with a TMDL for sedimentation or turbidity, then the operator of the construction activity has one of two options. The operator may monitor the stormwater discharge for turbidity and compare the turbidity to a benchmark value of 160 NTUs. The benchmark is used to evaluate the effectiveness of stormwater BMPS installed at the construction site. If the level of turbidity in the stormwater discharge is greater than the benchmark value, the operator must evaluate the effectiveness the erosion and sedimentation control plan (ESCP) and address any inadequacies. If the supplemental BMPs and other improvements fail to reduce the turbidity, the operator must install one or more approved stormwater BMPs.[81]

The second option is to forego the monitoring and install one or more approved stormwater BMPs.[82]

Vermont

VT DEC has not developed WQBELs for stormwater discharges associated with construction activities. VT DEC has developed a benchmarking monitoring value or "action limit" for turbidity. Operators may be required to sample and analyze stormwater discharges if the stormwater BMPs implemented as part of the original SWPPP fails to reduce turbidity. If an operator observes a discolored stormwater discharge, the operator must install supplemental stormwater BMPs to reduce turbidity. If after installing supplemental stormwater BMPs the discharges are still discolored, an operator is required to sample and analyze the stormwater discharge for turbidity. The action limit for turbidity is 25 NTUs. If the turbidity of the discharge exceeds the action limit, operators must install supplemental stormwater BMPs and submit a report detailing the corrective measures that were taken to reduce turbidity.[83]

Washington

WA DOE has not developed WQBELs for stormwater discharges associated with construction activities. The agency has developed benchmark monitoring values for pH, turbidity, and transparency that apply to stormwater discharges.[84]

7.3.3 Whole Effluent Toxicity (WET)-Based Limits

U.S. EPA Region 9, CT, FL, IN, KS, LA, MI, MO, MT, NV, ND, NC, OR, TX, UT, VT, WA, WI

U.S. EPA Region 9 and the above state agencies have not developed WET-based limits for stormwater discharges associated with construction activities.

7.3.4 Technology-Based Limits

U.S. EPA Region 9

U.S EPA requires stormwater BMPs implementation as part of SWPPP technology-based limits.[85]

CT, IN, KS, LA, MI, MO, MT, NV, NC, ND, TX, UT, VT, WA

The above state agencies have not developed technology-based limits for stormwater discharges.

Oregon

OR DEQ has developed technology-based limits that may be enforced if a construction activity discharges stormwater to an impaired water body with a TMDL for sedimentation or turbidity. OR DEQ has approved five stormwater BMPs that operators may install as an alternative to monitoring the turbidity of stormwater discharges. The stormwater BMPs include: compost berms, compost blankets, or compost socks; erosion control mats; perimeter sediment control BMPs in combination with tackifiers; vegetated buffers that are a minimum of 50 feet deep; water treatment by electro-coagulation, chemical flocculation, or filtration; or "other substantially equivalent sediment or turbidity BMP approved by the department."[86] [87]

7.3.5 Non-attainment of Water Quality Standards (Impaired Waters) and Negative Resource Impacts (Not Listed as Impaired)

U.S. EPA Region 9

U.S. EPA Region 9 regulates all construction activities and industrial activities that meet the requirements of the agency's stormwater permits, regardless of whether receiving water bodies are in compliance with water quality standards.

According to the survey respondent, stormwater has been identified as a source of impairment for many 303(d) listed water bodies across the Region 9 states.[88]

Kansas

KDHE regulates all applicable point source wet weather discharges, regardless of whether the receiving water bodies are in compliance with water quality standards.

There are multiple water bodies in Kansas that are listed for non-attainment of water quality standards due to wet weather discharges. The state's 303(d) list identifies wet weather discharges and nonpoint source runoff as primary contributors of elevated levels of TSS. There are also documented cases in which wet weather discharges have contributed to stream bank erosion.[89]

Michigan

MI DEQ regulates all construction activities that meet the requirements of the agency's construction stormwater permit, regardless of whether receiving water bodies are in compliance with water quality standards.

Stormwater has been identified as the primary cause of impairment for one or more water bodies on the State of Michigan's 303(d) list. Besides water bodies that are included on the 303(d) list, there are many streams and rivers in the state of Michigan that have suffered adverse impacts due to construction stormwater. There are numerous eutrophic lakes that have suffered overenrichment as well as streams that have suffered bank erosion and sedimentation due to construction stormwater discharges.

Nevada

NV DEP regulates all construction activities that disturb one or more acres and any other construction activities that may contribute to the "violation of water quality standards." These construction activities are regulated regardless of whether receiving water bodies are in compliance with water quality standards.[90]

Stormwater run-off has not been identified as the primary cause of impairment for any of the water bodies on the state of Nevada's 303(d) list. Furthermore, there are no documented instances in which streams or rivers have suffered adverse impacts due to construction stormwater run-off.[91]

North Carolina

NC DENR regulates all construction activities that meet the requirements of NC DENR's construction stormwater permit, regardless of whether receiving water bodies are in compliance with water quality standards.

Stormwater is not identified as the source of impairment for any of the water bodies on the state of North Carolina's 303(d) list. Turbidity and sedimentation are identified as sources of impairment, but NC DENR does not officially attribute these sources of impairment to stormwater.[92] In addition to those water bodies included on the 303(d) list, there are many streams and rivers in the state of North Carolina that are impaired due to sedimentation, although the sources of sediment have not been determined.[93]

North Dakota

ND DoH regulates all construction activities that meet the requirements specified in the construction stormwater permit, regardless of whether the receiving water bodies are in compliance with stormwater discharges.[94]

Stormwater run-off has not been identified as the source of impairment for any of the water bodies on the state of North Dakota's 303(d) list.[95] ND DoH identifies individual parameters such as turbidity, TSS, and fecal coliform as the sources of impairment for 303(d) listed water bodies. In addition, ND DoH identifies the following primary causes and contributors of elevated pollutant level impairing 303(d) listed water bodies: riparian grazing, crop production, and stormwater run-off. ND DoH has identified stormwater as the primary cause of impairment for over 885 miles of impaired rivers and streams across North Dakota.[96]

Oregon

OR DEQ regulates all construction activities that meet the requirements of OR DEQ's construction stormwater permit, regardless of whether receiving water bodies are in compliance with water quality standards.[97]

Stormwater run-off is not identified as the primary cause of impairment for any of the water bodies on the state of Oregon's 303(d) list.[98]

Utah

All industrial activities that meet the requirements specified in the industrial stormwater permit are regulated under the NPDES stormwater permitting program, regardless of whether receiving water bodies are in compliance with water quality standards.

Stormwater discharges have not been identified as the primary source of impairment for any of the water bodies on the 303(d) list for Utah.

Vermont

VT DEQ only regulates stormwater discharges originating from construction activities that fulfill the requirements specified in the construction stormwater permit. These point source stormwater discharges are regulated regardless of whether receiving water bodies are in compliance with water quality standards.[99]

Stormwater discharges have been identified as the primary source of impairment for seventeen water bodies on Vermont's 303(d) list.[100] In addition to those water bodies on the 303(d) list, there are documented instances in which streams have suffered adverse impacts due to construction runoff.[101]

Washington

WA DOE regulates all construction activities that meet the requirements of the agency's construction stormwater permit, regardless of whether receiving water bodies are in compliance with water quality standards.

According to the survey respondent, stormwater has not been identified as a primary source of impairment for any of the water bodies on the state of Washington's 303(d) list. Although none of the water bodies on Washington's 303(d) list are impaired due to stormwater, the survey respondent indicated that there are documented cases in which water bodies have suffered adverse impacts due to stormwater discharges.

7.4 Municipal Separate Storm Sewer Systems (MS4s) WQBEL Requirements

7.4.1 Water Quality Standards

U.S. EPA Region 9

U.S. EPA Region 9 has not incorporated parameter-specific water quality standards into MS4 stormwater permits.

California

The California State Water Resources Control Board (CSWRCB) has not developed parameter-specific WQS for wet weather discharges associated with MS4s. The decision to not incorporate numeric water quality standards into the agency's MS4 stormwater permit was influenced by the findings of a panel of stormwater quality experts. In 2005 the State Water Board of California convened an expert panel to evaluate the feasibility of developing numeric limits for stormwater permits. The panel considered comments offered by public citizens, non-governmental organizations, and “regulated community” Representatives and considered each stormwater permitting program separately. According to a report published in 2006, the panel determined it was infeasible to develop numeric limitations for MS4 permits. However, the panel concluded that improving BMP design criteria and requiring proper BMP maintenance would help to minimize contamination of surface waters.[102]

Connecticut
CT DEP has not developed parameter-specific water quality standards for wet weather discharges associated with MS4s.

Florida
FL DEP has not developed parameter-specific water quality standards for wet weather discharges associated with MS4s.

Indiana
IDEM has not developed parameter-specific water quality standards for wet weather discharges associated with MS4s.

Michigan
MDE has not developed parameter-specific water quality standards for wet weather discharges associated with MS4s.

Mississippi
The Mississippi Department of Environmental Quality (MS DEQ) has not developed parameter-specific water quality standards for wet weather discharges associated with MS4s.

Missouri
MO DNR has developed parameter-specific water quality standards for wet weather discharges associated with MS4s.[103] The agency's small MS4s permit does not make reference to parameter-specific numeric water quality standards, but the permit does specify narrative standards.[104] The agency's MS4 stormwater general permit specifies median concentrations for TSS and nutrients. Permittees are required to monitor stormwater discharges and evaluate test results according to these median concentrations. If exceedances are observed, permittees must consider making improvements to their Stormwater Pollution Prevention Plan (SWPPP) in order to improve the quality of stormwater discharges.[105]

Table 7-7 Median Concentrations

Parameter	Median Concentration (mg/L)
Total Suspended Solids	125
Chemical Oxygen Demand	80
Total Phosphorus	0.41
Total Nitrogen	2.00
Total Copper	0.040
Total Lead	0.165
Total Zinc	0.210

Montana
MT DEQ has developed parameter-specific water quality standards for wet weather discharges associated with MS4s.[106]

North Dakota
ND DoH has not developed parameter-specific water quality standards for wet weather discharges associated with MS4s.

Oregon
OR DEQ has not developed parameter-specific water quality standards for wet weather discharges.[107]

Texas
TCEQ has not developed parameter-specific water quality standards for wet weather discharges associated with MS4s.

Vermont
VT DEC has not developed parameter-specific water quality standards for wet weather discharges associated with MS4s.[108]

7.4.2 Water Quality Based Effluent Limitations

U.S. EPA Region 9
U.S. EPA Region 9 has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s, nor has the agency developed benchmark monitoring values for stormwater discharges.

California
CSWRCB has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s. According to the survey respondent, CSWRCB has developed benchmark monitoring values for stormwater discharges.

Connecticut
CT DEP has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s.

Florida
FL DEP has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s. The agency has adopted benchmark standards specified in the U.S. EPA's Multi-Sector General Permit; though these have only been incorporated into stormwater permits that are specific to the activities regulated under the Multi-Sector General Permit. MS4s are not regulated under this permit, and thus FL DEP has not incorporated these standards into the agency's MS4 stormwater permit.

Indiana
IDEM has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s nor have they developed benchmark monitoring values for stormwater discharges.

Michigan
MI DEQ has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s nor has the agency developed benchmark monitoring values for stormwater discharges.

Mississippi
MS DEQ has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s nor has the agency developed benchmark monitoring values for stormwater discharges.

Missouri
The MS4 stormwater general permit available on MO DNR's stormwater permits website does not specify parameter-specific WQBELs. According to the survey respondent however, MO DNR has developed parameter-specific WQBELs for stormwater discharges associated with MS4s. The general stormwater permit for MS4s specifies WQBELs for TSS, oil and grease, and pH.[109] The City of Springfield, Missouri is subject to a more extensive set of WQBELs. Stormwater discharges are monitored at six sites across the city, and these discharges are subject to WQBELs that have been developed for the following parameters; TSS, turbidity, pH, oil and grease, dissolved oxygen, total phosphorus, ammonia, heavy metals, TDS, BOD, chemical oxygen demand (COD), fecal coliform, fecal streptococcus, mercury, beryllium, thallium, pesticides, nitrate/nitrite, cyanide, total phenols, VOAs (method 624 and Method 603), cadmium, chromium, lead, nickel, zinc, arsenic, selenium, silver, antimony, GNA (method 625), and PCBs.[110]

Montana
MT DEQ has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s. MT DEQ has developed benchmark monitoring values for stormwater discharges to assess the effectiveness of best management practices (BMPS).

North Dakota
ND DoH has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s nor have they incorporated benchmark monitoring values for stormwater discharges.

Oregon
OR DEQ has not developed parameter-specific WQBELs for stormwater discharges.

Texas
TCEQ has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s. Furthermore, TCEQ has not developed benchmark monitoring values for stormwater discharges to assess the effectiveness of best management practices (BMPs).

Vermont

VT DEC has not developed parameter-specific WQBELs for stormwater discharges associated with MS4s.

7.4.3 Development of Water Quality Based Effluent Limitations

Missouri

According to the survey respondent, MO DNR uses acute toxicity criteria, chronic toxicity criteria, wildlife criteria, taste and odor criteria, and human threshold criteria when developing stormwater WQBELs.[111] MO DNR does not account for stormwater discharge flows or receiving water body flows when calculating or developing WQBELs for stormwater discharges associated with MS4s.[112] MO DNR does not utilize models when calculating parameter-specific WQBELs.

MO DNR does not utilize models when calculating parameter-specific WQBELs.

Oregon

OR DEQ uses two models, PLOAD and the Storm Water Management Model (SWMM), for developing numeric limitations for wet weather discharges.[113] PLOAD is a GIS-based model that is used for calculating pollutant loads for watersheds.[114] SWMM is a rainfall-runoff simulation model that can be used to simulate the quantity and quality of stormwater run-off originating from urban settings.[115]

7.4.4 WET-Based Limits

U.S. EPA Region 9, CA, CT, FL, IN, MI, MO, MS, MT, ND, OR, TX, VT

U.S. EPA Region 9 and the above state agencies have not developed WET-based limits for stormwater discharges associated with MS4s.

7.4.5 Technology-Based Limits

U.S. EPA Region 9

The survey respondent for EPA Region 9 considers BMPs and other measures implemented towards "reducing pollutants to the maximum extent practicable" a technology-based limitation.

Connecticut

CT DEP requires operators to install "control measures," including stormwater BMPs; however the agency's MS4 stormwater permit does not include specific technology-based limits.[116]

California

CSWRCB has not developed technology-based limits for stormwater discharges associated with MS4s. Technology-based limits have been incorporated into construction and industrial stormwater permits.

Florida
FL DEP has not incorporated technology-based limits into MS4 stormwater permits administered under the NPDES stormwater permitting program. Activities permitted under Florida's Environmental Resource Permitting (ERP) program however, are subject to technology-based limits. The ERP program is responsible for regulating construction activities in uplands, wetlands and other surface waters that may result in the alteration of surface water flows. Activities that involve dredging or adding earthen material to wetlands are also regulated under this permitting program. Activities that involve the construction of impervious surface area and stormwater runoff (e.g., parking lots) are also regulated under the ERP program.[117]

Indiana
IDEM has not developed technology-based limits for stormwater discharges associated with MS4s.

Michigan
MI DEQ has developed technology-based limits for stormwater discharges associated with MS4s. The technology-based limits are in the form of structural and non-structural BMP requirements.

Mississippi
MS DEQ has not developed technology-based limits for stormwater discharges associated with MS4s.

Missouri
MO DNR has not developed technology-based limits for the purpose of controlling stormwater discharges associated with MS4s.

Montana
MT DEQ has not developed technology-based limits for stormwater discharges for the purpose of controlling stormwater discharges associated with MS4s.

North Dakota
According to the survey respondent, ND DoH requires operators to implement the six minimum control measures, which are specified in the MS4 stormwater permit. ND DoH has not however, incorporated technology-based limits into MS4 stormwater permits.

Oregon
OR DEQ requires operators to install technology-based BMPs for the purpose of controlling stormwater discharges associated with MS4s.[118]

Texas
TCEQ develops technology-based limits for stormwater discharges on a case-by-case basis.[119]

Vermont
VT DEC has not developed technology based limits for the purpose of controlling stormwater discharges associated with MS4s.

7.4.6 Non-attainment of Water Quality Standards (Impaired Waters) and Negative Resource Impacts (Not Listed as Impaired)

U.S. EPA Region 9

U.S. EPA Region 9 regulates all MS4s that meet the requirements outlined in the agency's MS4 permits, regardless of whether receiving water bodies are in compliance with water quality standards.

EPA Region 9 reviews the 303(d) lists compiled by Region 9 states and approves or disapproves these compilations. The survey respondent indicated that many states within the Region have officially identified stormwater as a primary source of impairment for 303(d) listed water bodies. Besides water bodies on the 303(d) list, the respondent was not aware of any additional documented instances in which water bodies have suffered adverse impacts due to stormwater discharges.

California

CSWRCB regulates all MS4s that meet the requirements of the agency's MS4 permit, regardless of whether receiving water bodies are in compliance with water quality standards.

Furthermore, stormwater has been identified as a primary source of impairment for certain water bodies on the state's 303(d) list. In addition to impaired water bodies on the 303(d) list, there are many documented instances in which water bodies have suffered adverse impacts due to stormwater discharges.

Connecticut

CT DEP regulates all MS4s that meet the requirements specified in the agency's MS4 permits, regardless of whether receiving water bodies are in compliance with water quality standards.

According to the survey respondent, the state's 303(d) list does include water bodies that are listed for non-attainment of water quality standards due to stormwater. Besides the water bodies included on the 303(d) list, the survey respondent was not aware of any other documented instances in which water bodies have suffered adverse impacts due to stormwater discharges.

Florida

FL DEP regulates all MS4s that meet the requirements specified in the agency's MS4 permits, regardless of whether receiving water bodies are in compliance with water quality standards.

Florida's 303(d) list identifies the individual parameters impairing 303(d) listed water bodies and does not identify the sources of these pollutants. Thus, stormwater has not been listed as a primary source of impairment for any of the water bodies on the state's 303(d) list.[120] Although Florida's 303(d) list does not account for all water bodies impaired by stormwater discharges, the survey respondent indicated that there are documented cases of water bodies suffering adverse impacts due to stormwater discharges.

Indiana

IDEM regulates all MS4s that meet the requirements of the agency's MS4 permits, regardless of whether receiving water bodies are in compliance with water quality standards.

Indiana's 303(d) list includes water bodies that are listed for non-attainment of water quality standards due to stormwater discharges. According to the survey respondent, the 303(d) list represents the only accounting or record of water bodies that have suffered adverse impacts due to stormwater discharges. Besides the water bodies on the 303(d) list, there are no documented instances in which water bodies have suffered adverse impacts due to stormwater discharges.

Michigan

MI DEQ regulates all MS4s that meet the requirements specified in the agency's MS4 permit, regardless of whether receiving water bodies are in compliance with water quality standards.

According to the survey respondent, stormwater has been identified as the primary source of impairment for one or more water bodies on the State of Michigan's 303(d) list. Besides water bodies included on the 303(d) list, there are no documented instances in which water bodies have suffered adverse impacts due to stormwater discharges originating from MS4s.

Mississippi

MS DEQ regulates all MS4s that meet the requirements specified in the agency's MS4 permit, regardless of whether receiving water bodies are in compliance with water quality standards.

Mississippi's 303(d) list includes water bodies that are listed for non-attainment of water quality standards due to stormwater. Besides water bodies included on the 303(d) list, there are no documented instances in which water bodies have suffered adverse impacts due to stormwater discharges.

Missouri

MO DNR regulates all MS4s regardless of whether receiving water bodies are in compliance with water quality standards.

According to the survey respondent, stormwater has not been identified as the primary source of impairment for any of the water bodies on the state of Missouri's 303(d) list. Urban and rural NPS pollution have been identified as sources of impairment for many bodies of water in Missouri.[121] In addition to 303(d) listed water bodies, there are many documented cases in which water bodies have suffered adverse impacts due to stormwater discharges in the state of Missouri. According to the survey respondent, there are numerous examples of WQS violations resulting from stormwater discharges originating from MS4s.[122]

Montana

MT DEQ regulates all small MS4s that meet the requirements of the NPDES MS4 permit, regardless of whether receiving water bodies are in compliance with water quality standards.

According to the survey respondent, stormwater has been identified as a primary source of impairment for more than one water body on the state's 303(d) list. Besides water bodies included on the 303(d) list, there are documented cases where surface waters have suffered adverse impacts as a result of stormwater discharges originating from both regulated MS4s and unregulated MS4s.

North Dakota
ND DoH regulates all MS4s that meet the requirements specified in the agency's MS4 permits, regardless of whether receiving water bodies are in compliance with water quality standards.

In addition, stormwater has been identified as a primary source of impairment for water bodies on the state's 303(d) list. The 303(d) list represents the only accounting of water bodies suffering adverse impacts due to stormwater discharges. Besides the water bodies included on the 303(d) list, the survey respondent was not aware of any other documented instances in which water bodies have suffered adverse impacts as a result of stormwater discharges associated with MS4s.

Oregon
OR DEQ regulates all applicable point source wet weather discharges, regardless of whether the receiving water bodies are in compliance with water quality standards.[123]

Texas
TCEQ regulates all MS4s regardless of whether receiving water bodies are in compliance with water quality standards.

According to the survey respondent, stormwater has not been identified as the primary source of impairment to any of the water bodies on the 303(d) list. Furthermore, the respondent indicated that there are no documented cases in which streams or other water bodies have suffered adverse impacts due to stormwater discharges.

Vermont
According to the survey respondent, VT DEC does not regulate all applicable point source wet weather discharges, regardless of whether receiving water bodies are in compliance with water quality standards or not. Further review of the agency's construction stormwater general permit reveals that the agency regulates all MS4s that meet the requirements specified in the agency's MS4 permit, regardless of the condition of receiving water bodies.

The respondent indicated that there are no documented instances in which streams or rivers have suffered adverse impacts due to stormwater discharges associated with MS4s. According to the "State of Vermont 303(d) list of Waters" however, stormwater has been identified as the primary source of impairment for 7 bodies of water.[124]

7.5 Enforcement

U.S. EPA Region 9
While each EPA Region 9 state administers its own stormwater permitting program, Region 9 provides oversight. EPA Region 9 does have statutory authority to derive and implement stormwater WQBELs at the state level. The permitting authority enforces compliance with stormwater permits through policy implementation and a "narrative permit requirement." [125] In addition to the NPDES permitting authority, the pesticides program and the NPS program are involved in the regulation of stormwater discharges.[126]

California

Stormwater permitting programs are administered by the Regional Water Quality Control Boards in collaboration with the CSWRCB. The CSWRCB sets minimum standards and provides oversight. In addition to the Water Quality Control Boards, the NPS program and the 401 certification program regulate stormwater discharges.

Connecticut

CT DEP administers the state's stormwater permitting program. The agency enforces stormwater WQBEL compliance through policy implementation, standards-based regulation, and voluntary compliance.[127] Furthermore, CT DEP has statutory authority to derive and implement stormwater WQBELs.[128] In addition to the NPDES stormwater permitting program, stormwater discharges are directly regulated under the TMDL program and the Coastal Management program.

Indiana

IDEM is the only agency that administers the stormwater permitting program in Indiana. IDEM enforces stormwater permit compliance through standards-based regulations, though does not have statutory authority to derive and implement WQBELs.[129]

Florida

FL DEP administers the state's stormwater permitting program as well as the ERP program. Both permitting programs directly regulate stormwater discharges in Florida. In addition to the NPDES permitting program administered at the state level, water management districts administer their own stormwater permitting programs.[130]

Kansas

KDHE has statutory authority to derive and implement stormwater WQBELs, although KDHE has not exercised this authority. KDHE is the only Kansas agency that administers stormwater permitting programs and directly addresses stormwater discharges.[131]

Louisiana

In addition to LA DEQ, there are many "local and parish flood control agencies" as well as "local drainage districts" that are involved in managing stormwater discharges.[132] [133]

Michigan

MI DEQ Water Bureau administers the state's stormwater permitting program. Only individual industrial stormwater permits may contain stormwater WQBELs, and WQBEL compliance is enforced through standards-based regulation. MI DEQ has statutory authority to derive and implement stormwater WQBELs. Furthermore, MI DEQ Water Bureau partners with the Nonpoint Source Program to increase the effectiveness of its stormwater permitting programs.

Mississippi

MS DEQ administers the state's stormwater permitting program and the agency has the statutory authority to derive and implement stormwater WQBELs. According to the survey respondent, MS DEQ is the only agency in Mississippi that directly regulates stormwater discharges associated with MS4s.

Missouri

Both MO DNR and the Missouri Attorney General's Office facilitate enforcement. MO DNR relies on voluntary compliance, standards-based regulation, and policy implementation to enforce permit compliance. In addition to performing inspections and reviewing self-monitoring reports to evaluate permit compliance, MO DNR issues notice of violation letters, settlement agreements, and abatement orders.

MO DNR administers the MS4 stormwater permitting program and the agency has statutory authority to derive and implement WQBELs. Both the MO DNR Hazardous Waste Program and Solid Waste Program also address stormwater discharges. In addition to the stormwater permitting program that is administered at the state level by MO DNR, water management districts also administer stormwater permitting programs. Only a small number of the water management districts, including the Metropolitan St. Louis Sewer District, have developed stormwater WQBELs that apply to MS4s.

Montana

MT DEQ has not developed stormwater WQBELs for industrial activities. MT DEQ partners with the NPS program, the TMDL program, and many public and private organizations.[134]

Nevada

NV DEP is the only agency that administers the stormwater permitting program in Nevada and is the only state agency that has statutory authority to derive and implement WQBELs. [135]

North Carolina

NC DENR has not developed stormwater WQBELs for industrial activities. NC DENR partners with the State Stormwater Management Program, which is responsible for stormwater management in all 20 coastal counties. The State Stormwater Management Program is also responsible for managing ORWs and high quality waters. NC DENR also partners with the Water Supply Watershed Protection Program, 401 Wetlands Certification Program, Division of Land Resources, and Sedimentation and Erosion Control Program.[136] [137]

North Dakota

The Water Quality Division of the ND DoH administers the MS4 stormwater permitting program. ND DoH does have statutory authority to derive and implement WQBELs, although the agency has not exercised this authority. In addition to ND DoH, the state's NPS Program directly regulates stormwater discharges.

Oregon

OR DEQ has developed a narrative WQBEL that the agency enforces through standards-based regulation. OR DEQ does have statutory authority to derive and implement stormwater WQBELs.[138] In addition to the NPDES permitting program, there are several other agency programs that address stormwater discharges, including the 401 Certification Program, the Underground Injection Control (UIC) program, and the TMDL program.[139]

Texas

TCEQ incorporates stormwater WQBELs into stormwater individual permits, and WQBEL compliance is enforced through policy implementation and standards-based regulation.[140] TCEQ has statutory authority to develop and implement stormwater WQBELs. Only the NPDES stormwater permitting program addresses stormwater discharges.[141]

Utah

UT DEQ is the only agency that administers the industrial stormwater permitting program in Utah.

Virginia

VA DEQ enforces compliance with the conditions of the industrial stormwater permit through standards-based regulation.[142] VA DEQ has statutory authority to derive and implement stormwater WQBELs. The Virginia Department of Conservation and Recreation (VA DCR) administers the NPDES stormwater permitting program according to guidelines outlined in the Virginia Stormwater Management Law and Virginia Stormwater Management Regulations.[143] [144]

Washington

WA DOE administers the state's stormwater permitting program. According to the survey respondent, there are no other state agencies that directly regulate stormwater discharges. WA DOE has statutory authority to derive and implement stormwater WQBELs, although the state has not yet exercised this authority. The effluent limitations that have been incorporated into the agency's stormwater permit are enforced through standards-based regulation.

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[140] Construction Stormwater: WQBEL Requirements Survey. Texas Response, questions 36. July 24, 2009

[141] Industrial Stormwater: WQBEL Requirements Survey. Texas Response, questions 1 and 2. July 24, 2009

[142] Industrial Stormwater: WQBEL Requirements Survey. Virginia Response, questions 36, 37. July 24, 2009

[143] Industrial Stormwater: WQBEL Requirements Survey. Virginia Response, questions 38, 39. July 24, 2009

[144] Virginia Stormwater Management Program. http://www.dcr.virginia.gov/soil_and_water/stormwat.shtml#overview

Chapter 8 : Land Application of Waste
8.1 Introduction

In an effort to benchmark policies pertaining to the land application of waste, one survey was developed for biosolids and residential septage, and a second survey for manure. The Environmental Protection Agency (EPA), state agencies, and EPA regional offices were surveyed with regards to land application of waste requirements including weather-related restrictions, agronomic rates, monitoring and certification requirements, historical records, and best management practices (BMPs). The "Land Application of Biosolids and Septage" survey elicited 31 responses: EPA Headquarters, EPA Region 3, EPA Region 5, EPA Region 6, EPA Region 8, EPA Region 9, AZ, CT, FL, GA, IA, KS, LA, ME, MA, MI, MN, MO, MT, NV, NJ, NY, NC, ND, OH, OR, TX, VT, VA, WA, and WI.

On August 4, 2009 the Michigan Department of Environmental Quality work group leaders noted that since biosolids regulatory requirements are relatively well documented, further research efforts should focus on septage regulation. With the revised focus on septage regulatory policies, our survey responses became less relevant and this required greater reliance on internet research. For instance, the Indiana and Illinois sections are based solely on internet research. As a result, we have abbreviated the biosolids section and created a separate section on septage. For the survey results please refer to the electronic appendix, "Survey Responses." For more information on biosolids please refer to the North East Biosolids and Residuals Association (NEBRA) "National Biosolids Report, Appendix D, Alabama - Missouri" and "National Biosolids Report, Appendix D, Montana - Wyoming" reports.[1]

The section on septage includes several survey summaries heavily supplemented by internet research findings. In order to provide a national view of the topic, we have included text from the North East Biosolids and Residuals Association (NEBRA) "U.S. and State-by-State Biosolids Regulation Quality, Treatment, and End Use and Disposal Data" report, published December 31, 2007 for its value as an extensive resource on septage management data across the nation.

The "Land Application of Manure" survey elicited 21 responses: EPA Region 6, EPA Region 7, CT, FL, GA, IN, IA, KS, MA, MI, MN, MO, NE, NH, NJ, NC, ND, OH, OR, TX, and WA. In all cases, survey responses were supplemented by internet research. The California and EPA sections are based solely on internet research. This section summarizes the state interpretations of the national-level Final 2008 CAFO Rule, which clearly defines the regulatory requirements that pertain to the land application of CAFO waste. The section also reflects the states' flexibility of determining their permitting approach (individual, general, watershed-based), state technical standards and nutrient management, no-potential-to-discharge determinations, and alternative performance standards.[2] Of the states surveyed, none require monitoring pharmaceuticals, and only Florida reports monitoring pathogens. Georgia and North Carolina stand alone in requiring the monitoring of zinc and copper in land-applied waste. Most states report nutrient monitoring, with the exception of Massachusetts, New Jersey, and New Hampshire. These three states only require monitoring if surface or ground water impacts are observed. Though there is no national standard on weather-specific land application restrictions, many states follow the EPA's encouragement to restrict land applications during wet weather events. Applications on saturated, frozen or snow-covered ground are often prohibited or discouraged in the states' permits. Applications to tiled land are allowed in most states and are subject to the EPA requirement for a 100 foot setback from the tile intake, or a 35 foot setback in the presence of a permanently vegetated buffer, or a site specific demonstration that setback is not necessary. Florida and New Hampshire prohibit land applications of waste on tiled land. Many states address slope restrictions through the use of the Phosphorous-Index, which requires consideration of the slope of an application site when calculating an agronomic rate. Only three of the state agencies survey, Minnesota, Missouri, and Ohio, report specific slope restrictions. In regards to certification requirements, California, Georgia, Iowa, Florida, Kansas, Minnesota, North Carolina, and Ohio report certification requirements for applicators, samplers or management plan authors. Agronomic rates are generally limited to by nitrogen and phosphorous crop uptake rates.

8.2 Biosolids

8.2.1 Pathogen Removal

Illinois*

In order to control the pathogen content and odor of land-applied sludge, the sludge must first be digested or stabilized. Several methods have been approved for digesting sludge, including aerobic digestion, anaerobic digestion, composting, and "lime stabilization."

Indiana*

In order to reduce the pathogen load and odor of land-applied sludge, the sludge must first be digested or stabilized. Several methods have been approved for digesting sludge, including aerobic digestion, anaerobic digestion, composting, and "lime stabilization."

Michigan

The Michigan Department of Environmental Quality (MI DEQ) requires that sludge be digested or stabilized prior to land application in order to reduce pathogen loads and odor. In addition MI DEQ requires permittees to monitor biosolids for pathogens. Monitoring of septage waste for pathogens is not required. [3]

8.2.2 Application Requirements

8.2.2.1 Application during/before wet weather

Illinois*

Sludge must not be applied to land during precipitation events or when the soil is saturated with water. It is also recommended that operators avoid applying sludge if a ¼ rainfall event occurs during the 24 hours preceding the scheduled time of application.[4]

Indiana*

Biosolids and industrial waste cannot be land applied if the soil is saturated and the "moisture holding capacity" of the soil has been exceeded.

Michigan

MI DEQ prohibits the application of CAFO waste to fields that are saturated with water if there is a risk that the land-applied waste will run-off into wetlands or other waters of the state.[5]

8.2.2.2 Application to frozen ground

Illinois*
Sludge may be applied to frozen ground if the ground is not covered with ice or snow. In addition to this requirement, the slope of the application site must not exceed 5% and there must also be a 200 foot vegetated buffer or "grassy area" between the application site and any nearby surface waters or potable water supply wells.[6]

Sludge applications to snow or ice covered-ground is only allowed during emergencies, and these types of applications require permit approval. Permit approval may be granted if the operator can demonstrate that the following conditions have been met:

1. The treatment plant does not have sufficient storage space to accommodate the sludge.
2. The slope of the field does not exceed 5%.
3. Runoff control measures have been installed to manage stormwater discharges from the application site. Recommended BMPs include vegetative fence rows, contour farming, terracing, catchment basins, and vegetated buffers.
4. There is no human habitation in the vicinity of the field.
5. It is not feasible to landfill the sludge.[7]

Indiana*
Biosolids or industrial waste may only be applied to snow or ice-covered ground if two conditions are met. First, the operator must be able to demonstrate that there is no risk of the land-applied waste discharging to surface waters or contaminating ground water. Second, a management plan must be submitted and approved by the commissioner. The management plan must specify appropriate setback distances from residences, surface waters, wells, and "other structures." The management plan must also provide a detailed description of the proposed application site. The description must specify the depth of the water table, the slope of the land, and it must specify whether the proposed application site is a flood plain or not. The management plan must also identify the person(s) who will provide supervision and operational oversight."[8]

Michigan
MI DEQ prohibits the application of CAFO waste to frozen or snow-covered ground if there is a risk that the land-applied waste will run-off into waters of the state, including wetlands.

8.2.2.3 Application restrictions to known features

Indiana*
IDEM has developed setback distances to restrict land applications near "surface conduits to subsurface features." These setback distances would presumably apply to tile intake structures, and should thus minimize the contamination of tile discharges. The setback distances vary according to the application procedure. The setback distance for land-applied biosolids that are not incorporated into the soil is 300 feet. The setback distance for land-applied biosolids that are injected or incorporated into the soil "by end of day" is 33 feet.[9]

Michigan
MI DEQ does allow land application of biosolids to tiled fields. There is no indication that MI DEQ has developed setback distances to prevent contamination of tile discharges.

8.2.2.4 Agronomic rates

Illinois*
If an operator intends to land-apply sludge for 5 years or less, the maximum loading rate will be based on the nitrogen requirements of the crop grown at the application site. When calculating agronomic rates, operators must utilize the nitrogen availabilities provided below, which vary according to soil type and application method. The nitrogen availability provided in Table Table 8-1 is the estimated nitrogen availability for the year of application.[10]

Table 8-1. Illinois EPA's Estimated Ammonia Nitrogen Availability

Application Method: Surface Application without incorporation	
Soil Type	**Nitrogen Availability**
Sand and non-sandy soil	50% NH availability
Tight clay soil	25% NH availability
Application Method: Surface Application with chisel, plowing, disking, etc.	
Sandy soil	50% NH availability
Non-sandy soil	80% NH availability
Application Method: Subsurface application (injection)	
Sandy soil	50% NH availability
Non-sandy soil	100% NH availability

Illinois EPA (IL EPA) recommends that operators measure the phosphorus content of soil and the total phosphorus of land-applied sludge every 2 years. After 5 years of applying sludge to an application site, operators are required to monitor the phosphorus content of the soil. IEPA prohibits the land application of sludge once the phosphorus content of the soil exceeds 400 pounds per acre for sandy soil or 800 pounds per acre for non-sandy soil.[11]

Indiana*
Indiana Department of Environmental Management (IDEM) has developed maximum crop and annual loading rates for biosolids and industrial waste in an effort to regulate plant available nitrogen (PAN) loading (Table Table 8-2).[12]

Table 8-2. IDEM's PAN Loading for Biosolids

Crop	Plant Available Nitrogen (PAN) loading for crop production (Pounds of PAN per acre)
Corn	200
Soybeans	100
Hay, pasture	100
Cereal grain	100
Set aside/idle	50

Michigan

MI DEQ's "General Permit Authorizing Land Application of Biosolids" requires that operators apply biosolids at application rates that are equal to or less than the agronomic rate.[13] Furthermore, MI DEQ requires permittees to perform biosolids nutrient monitoring in order to control agronomic rates. Although the general permit does not specify the method for calculating an agronomic rate, MI DEQ recommends that operators use the "multi-year plant available nitrogen method."

8.2.3 Monitoring Requirements and Pollutant Loading Rates

PCBs

Illinois*

In an effort to minimize exposure to polychlorinated biphenyls (PCBs) among domesticated animals and human populations alike, the Illinois Environmental Protection Agency has developed PCB limitations for contaminated sludge. Sludge that is contaminated with PCBs at a concentration of 10 mg/kg (dry weight basis) or higher must be incorporated at application sites that are used for growing animal feed. Furthermore, sludge that is contaminated with PCBs at a concentration of 50 mg/kg (dry weight) or higher cannot be used for land application.[14]

Indiana*

Operators are required to sample and analyze biosolids for heavy metals, pathogens, and PCBs. The monitoring frequency is determined by the amount of biosolid or industrial waste that is applied to an application site (Table 8-3).[15]

Table 8-3. IDEM's Biosolids Monitoring Frequency

Amount of Biosolid or Industrial Waste land-applied(dry tons per 365 day period)	Monitoring Frequency
Greater than 0 but less than 319	Once every 12 months
Equal to or greater than 319 but less than 1,653	Once every 3 months
Equal to or greater than 1,653 but less than 16,530	Once every 2 months
Equal to or greater than 16,530	Once per month

In an effort to minimize exposure to polychlorinated biphenyls (PCBs) among domesticated animals and human populations alike, IDEM prohibits the land-application of biosolids or industrial wastes that contain PCBs at concentrations of 2 milligrams per kilogram on a dry weight basis.

Michigan
MI DEQ has not developed regulatory requirements for controlling pharmaceuticals and personal care products (PPCPs) in land-applied biosolids nor does the agency require operators to monitor biosolids for these pollutants.

Heavy Metals

Illinois*
Before operators can apply sludge to an application site, they must first demonstrate that the cation exchange capacity (CEC) of the soil is sufficient to retain heavy metals. Heavy metal leaching will be minimized if the soil has a CEC in the range of 5 to 15 meq/100 gm; soils with CECs outside this range are not suitable for sludge application. Operators must measure the pH and CEC at the proposed application site and include these measures in the permit application.[16]

IL EPA has developed "loading rates" for heavy metals in order to limit the accumulation of heavy metals in soils fertilized with biosolids or industrial waste (Table 8-4). The loading rates apply over the lifespan of an application site. If the CEC of the soil is less than 5 meq/100 gm, the maximum acceptable loading rates are divided in half.[17] If the CEC of the soil is greater than 15 meq/100 gm, then the maximum acceptable loading rates for heavy metals may be doubled.[18]

Table 8-4. IL EPA Biosolids Loading Rates

Heavy Metal	Maximum Acceptable Loading Rate over the life of an application site (pounds/acre)
Lead	1000
MN	900
Zn	500
Cu	250
Ni	100
Cd	10

If the cumulative pollutant loading rate for a particular pollutant has been reached at an application site, IEPA will only reissue a permit authorizing land applications of sludge if the operator provides a detailed analysis of the condition of the application site in regards to heavy metal contamination. The summary must include the results of groundwater monitoring, soil monitoring, and plant tissue analysis. The operator must also describe any additional "operational controls" that he or she will implement in order to minimize heavy metal exposures.[19]

Indiana*

The Indiana Department of Environmental Management (IDEM) seeks to control the heavy metal content of land-applied biosolids by requiring operators to adhere to heavy metal ceiling concentrations (Table 8-5). Operators must monitor heavy metals in biosolids and industrial waste, and if the waste products contain heavy metal(s) at concentrations that exceed the specified ceiling concentrations, then the contaminated waste must not be land-applied[20]. The following ceiling concentrations are identical to ceiling concentrations specified in 40 CFR part 503.[21]

Table 8-5. IDEM Biosolids Ceiling Concentrations

Heavy Metal	Pollutant Ceiling Concentration (milligrams per kilogram)
Arsenic	75
Cadmium	85
Copper	4300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

The IDEM has developed cumulative pollutant loading rates for heavy metals in order to limit the accumulation of heavy metals in soils fertilized with biosolids or industrial waste (Table 8-6). Once the cumulative pollutant loading rate for a particular heavy metal has been reached at an application site, waste-to-land applications should cease.[22] The cumulative pollutant loading rates for all of the following heavy metals are slightly more stringent than the standard cumulative pollutant loading rates specified in 40 CFR part 503.[23]

Table 8-6. IDEM Biosolids Pollutant Loading Rates

Heavy Metal	Cumulative Pollutant Loading Rate (pounds per acre)
Arsenic	36
Cadmium	34
Copper	1,388
Lead	267
Mercury	15
Molybdenum	Not applicable
Nickel	374
Selenium	89
Zinc	2,499

Michigan

MI DEQ requires monitoring of land-applied biosolids for heavy metals. The frequency of monitoring is either dictated by the number of "hauling periods" that occur at a particular waste treatment facility or the amount of biosolids generated by a facility over the course of a year, whichever is greater. The specific monitoring frequency information is specified in table 8-7 of MI DEQ's "General Permit Authorizing Land Application of Biosolids." [24] If monitoring reveals that the biosolids generated by a particular facility exceed the monthly pollutant concentration limitations specified in MI DEQ's permit, than the monitoring frequency must be double the frequency specified in table 8-7. [25]

Table 8-7. MI DEQ Monitoring Requirements for Biosolids[26]

English Dry Tons (per year)	Frequency
Greater than zero, but Less than 319	Annually (Once per year)
Equal to or greater than 319, But less than 1,650	Quarterly (4 times per year)
Equal to or greater than 1,650, But less than 16,500	Once per 60 days (6 times per year)
Equal to or greater than 16,500	Monthly (12 times per year)

MI DEQ seeks to control the heavy metal content of land-applied biosolids by requiring operators to adhere to heavy metal ceiling concentrations. The ceiling concentrations specified in MI DEQ's "General Permit Authorizing Land Application" are identical to the ceiling concentrations specified in 40 CFR part 503.[27] MI DEQ has also developed cumulative pollutant loading rates, which are specified in table 8-8. The cumulative pollutant loading rates are very similar the limitations specified in the U.S. EPA's 40 CFR part 503.[28]

Table 8-8. Michigan Sludge Cumulative Pollutant Loading Rates (Maximum amount of an inorganic pollutant that can be applied to an area of land)

Pollutant	Rate (lbs/acre)
Arsenic	37
Cadmium	35
Copper	1335
Lead	267
Mercury	15
Nickel	374
Selenium	89
Zinc	2492

Minnesota

The state does require monitoring of heavy metals in land-applied biosolids for arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, zinc, and PCBs only from old sludge lagoons and when decommissioning old wastewater ponds. The monitoring frequency is determined by the amount of sludge applied to the field. The state used the federal ceiling concentrations for arsenic, PCBs, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc. The agency does not require monitoring of heavy metals in land-applied residential septage. [29]

The rule states that "no person shall apply bulk sewage sludge to agricultural lands, forest, a public contact site, or a reclamation site if any of the cumulative pollutant loading rates in
Table 8- have been reached. Before bulk sewage is applied the operator must contact the appropriate permitting authority to determine whether or cumulative pollutant loading rates have been reached. Applications must not exceed the listed cumulative pollutant loading rates or the bulk sewage sludge must be "exceptional quality sewage sludge."[30]

If bulk sewage sludge which has pollutant concentrations greater than those listed in

Table 8- has been applied since July 20, 1993, and the cumulative amount is not known, no additional bulk sewage may be applied to that land.[31] Bulk sewage sludge sold or given away in a bag or container must not be applied to land if the concentration of any pollutant exceeds the ceiling concentration in
Table 8- or rates in
Table 8-. [32] If the sludge is applied to a lawn or home garden the concentration of each pollutant cannot exceed limits in Table 8-9. The product of the concentration of each pollutant in the sludge and the annual whole sludge application rate for the sludge must not cause the annual pollutant loading rate for the pollutant in
Table 8- to be exceeded.

Table 8-9. Minnesota's Sludge Ceiling Concentrations

Pollutant	**Ceiling Concentration (mg/kg)** ***Dry weight basis***
Arsenic	75
Cadmium	85
Copper	4300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7500

Table 8-10. Minnesota Sludge Cumulative Pollutant Loading Rates (Maximum amount of an inorganic pollutant that can be applied to an area of land)

Pollutant	**Rate (kg/ha)**	**Rate (lbs/acre)**
Arsenic	41f	37
Cadmium	39	35
Copper	1500	1339
Lead	300	268
Mercury	17	15
Nickel	420	375
Selenium	100	89
Zinc	2800	2500

Table 8-11. Minnesota Sludge Pollutant Concentrations

Pollutant	Monthly Average Concentrations (mg/kg) *On a dray weight basis, the arithmetic mean of all measurements taken during the month.*
Arsenic	41
Cadmium	39
Copper	1500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2800

Table 8-12. Minnesota's Annual pollutant loading rates per 365-day period (Maximum amount of a pollutant that can be applied to a unit area of land during a 365-day period)

Pollutant	Rate (kg/ha)	Rate (lb/ac)
Arsenic	2.0	1.8
Cadmium	1.9	1.7
Copper	75.0	67.0
Lead	15.0	13.0
Mercury	0.85	0.76
Nickel	21.0	19.0
Selenium	5.0	4.5
Zinc	140.0	125.0

Wisconsin

Biosolids monitoring for arsenic, PCBs, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, beryllium, and chromium is required at a frequency determined by the amount of sludge produced. There is also "a priority pollutant scan once per term." Ceiling concentrations are in effect for arsenic, PCBs, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc. [33]

Nutrients

Illinois*

In an effort to manage phosphorus soil levels, operators are required to monitor phosphorus in both land-applied sludge and the soil at application sites. If the phosphorus concentration at the application site exceeds 400 pounds per acre for sandy soil or 800 pounds per acre for non-sandy soil, then sludge applications must cease. Regular soil monitoring must commence after sludge has been applied to the same field for 5 years.[34]

Indiana*

IDEM has developed maximum crop and annual loading rates for biosolids and industrial waste in an effort to control plant available nitrogen (PAN) loading.[35] See Table 8-.

Table 8-13. IDEM Nitrogen Loading for Biosolids

Crop	**Plant Available Nitrogen (PAN) loading for crop production (Pounds of PAN per acre)**
Corn	200
Soybeans	100
Hay, pasture	100
Cereal grain	100
Set aside/idle	50

Minnesota

The state does require biosolids monitoring for total nitrogen, ammonia nitrogen as N, total phosphorous as P, and total potassium. The monitoring frequency is determined by the amount of sludge applied to an application site. Representative samples are required per federal and state rules; actual requirement is not per site but per dry tons applied per year. The state does not require nutrient monitoring or heavy metal limitations monitoring in land-applied residential septage.[36] Soils high in phosphorous, defined "at 200 ppm, Bray 1,[require] the most stringent erosion control plan derived by NRCS would have to be in place."[37]

Wisconsin

Total nitrogen, ammonia nitrogen as N, total phosphorous as P, and total potassium, and water extractable phosphorus monitoring has been introduced in many biosolids permits with frequency dependent upon sludge production.[38]

Michigan

MI DEQ requires permittees to monitor biosolids for total nitrogen, ammonia nitrogen as N, total phosphorus as P, and total potassium. The frequency of monitoring is either dictated by the number of “hauling periods” that occur at a particular waste treatment facility or the amount of biosolids generated by a facility over the course of a year, whichever is greater.

Pharmaceuticals

Minnesota
The state has not developed regulatory requirements for controlling pharmaceuticals and personal care products (PPCPs) in land-applied waste.[39]

Wisconsin
There are no regulatory requirements to control pharmaceuticals and personal care products (PPCPs).There is some discussion over proposed requirements for controlling PPCPs, but no active policy at this time.[40]

8.2.4 Historical Record

Indiana*
Operators must maintain a record of the land applications of residential septage that occur at a particular land application site. Operators must record the amount (in gallons) of residential septage applied, the date of application, the acreage of the application site, the application method, etc. Operators must identify the types of crops grown at the application site and the corresponding “nitrogen requirements” of these crops. Operators must also test the soil pH. This record must be retained for a minimum of five years[41].
Once 200,000 gallons of residential septage has been applied to an application site, the operator must notify the commissioner before land applications may continue. Once this threshold has been reached, operators are required to sample and analyze the soil for heavy metals and PCBs to “ensure that conditions are not created which would endanger public health or have an adverse impact on vegetation and future crop utilization.”[42] The results of the initial soil analysis will determine whether land application of residential septage will be allowed to continue. If applications are allowed to continue, the commissioner may require periodic monitoring of heavy metals and PCBs. The frequency of the monitoring will be determined by the results of the initial soil analysis[43].

Michigan
MI DEQ requires permittees to maintain records of waste-to-land applications that occur over time. MI DEQ does not require permittees to measure the background levels of heavy metals or nutrients at application sites prior to the first application of biosolids. The agency does however require permittees to adhere to cumulative pollutant loading rates for heavy metals.

Minnesota
The state requires record keeping of waste-to-land applications on an annual basis. The agency does not require permittees to measure the background levels of heavy metals or nutrients at proposed application sites prior to the first application of biosolids or residential sludge.[44] When asked about how the historical

records of waste-to-land applications are used to regulate future land applications, the respondent noted "the only requirement used to regulate are the cumulative metal loading rates."[45]

Wisconsin

Records of waste-to-land application over time are required. Phosphorus is suggested to limit biosolids application to 1 per every three to four years. Background levels of heavy metals are not required prior to the first application of biosolids or septage. Background levels of nutrients are required for biosolids, but not residential septage. There are no cumulative pollutant loading rates for nutrients in biosolids or septage, but do exist for heavy metals in biosolids.[46]

8.2.5 BMPs

Illinois*

IL EPA has developed setback distances to restrict land applications within close proximity to surface waters. The setback distance for surface waters and "intermittent streams" is 200 feet, and the setback distance for potable water wells is 150 feet.[47]

Operators must incorporate sludge at application sites that have slopes in excess of 5%, unless the annual soil loss at the application site is less than 5 tons/acre. If the annual soil loss is less than 5 tons/acre, operators may continue to perform surface applications. If the slope of an application site is greater than 8%, operators may only incorporate sludge if the annual soil loss is less than 5 tons/acre. The annual soil loss must be calculated using the Universal Soil Loss Equation.[48]

Michigan

MI DEQ prohibits the application of biosolids to fields that have slopes in excess of a certain limit. The limit is 6% at sites where biosolids are applied to the surface, and 12% at sites where biosolids are injected below the surface.

Minnesota

Operators must notify the commissioner, the owner and applicator of the site, the city or township and county official of the area where the land application site is located, and any person known by the preparer to be interested in the approval of the site of intent to apply waste to land. Questions or comments will then be accepted by Minnesota's Water Quality Division and the Commissioner will approve or deny the application in writing after the 30-day comment period.[49] Applications boundaries should be marked with flags or other clear landmarks. Daily surface applications of liquid sewage must not exceed 25,000 gallons per acre in coarse-textured soils; 15,000 gallons per acre in medium-textured soils; or 10,000 gallons per acre in fine-textured soils. The sludge application method must be applied in a uniform matter.[50]

8.3 Septage

Federal regulation Title 40: Protection of Environment, Part 503: Standards for the Use or Disposal of Sewage Sludge is the primary source of federal guidance on sewage management and is referred to throughout the following section. The regulation "establishes standards, which consist of general requirements, pollutant limits, management practices, and operational standards, for the final use or disposal of sewage sludge generated during the treatment of domestic sewage in a treatment works. Standards are included in this part for sewage sludge applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator. Also included in this part are pathogen and alternative vector attraction reduction requirements for sewage sludge applied to the land or placed on a surface disposal site. In addition, the standards in this part include the frequency of monitoring and recordkeeping requirements when sewage sludge is applied to the land, placed on a surface disposal site, or fired in a sewage sludge incinerator. Also included in this part are reporting requirements for Class I sludge management facilities, publicly owned treatment works (POTWs) with a design flow rate equal to or greater than one million gallons per day, and POTWs that serve 10,000 people or more." [51]

In this section TWTDS refers to Treatment Works Treating Domestic Sewage; FOG refers to fats, oils, and grease; POTW refers to publicly owned treatment works.

NOTE: All text in the Septage management section is reprinted from the North East Biosolids and Residuals Association (NEBRA) "U.S. and State-by-State Biosolids Regulation Quality, Treatment, and End Use and Disposal Data" report, published December 31, 2007, except when otherwise noted. [52]

Alabama

Grease is regulated by the department of agriculture and septage is overseen by the health department.
Septage regulations updated: October 19, 1994.
Number of full-time equivalent staff (FTEs) for septage program: 1
Septage haulers based in state (estimated): 316
Septage management: Septage can be land applied if it meets part 503. POTWs are not required to accept septage. However, 75-80 % TWTDS accept septage.
Percentage of each management practice:

- Land applied = 20 %
- Hauled to TWTDS = 77 %
- Disposed in lagoons = 1 %
- Composted = 2 %

Other concerns: Alabama considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the Code of Alabama 1975, sections 22-27-70 through 22-27-73 and updated as section 22-27-90 through 22-27-94; Grease Law. Alabama does not have a proactive program to collect FOG and keep it out of the general wastewater flow. All FOG programs are primarily reactive vs. proactive. Some municipalities and treatment facilities require separators or a certain quality of biological oxygen demand (BOD).

Alaska

Septage – permitting of septic systems and septage management is in the water quality program.

Arizona

No data provided.

Arkansas
Septage regulations updated: Arkansas has adopted the federal Part 503 regulations, with some simplifications. The AR Department of Health and Human Services (DHHS) deals with septage, licensing septage haulers through the central state office. Trucks are licensed, and fees are based on the number of trucks. To be licensed, the hauler must have letters of permission to discharge at TWTDS and/or site plans for land application sites. Annual inspections of trucks, equipment, records, and land application sites are done by the regional state DHHS offices. In addition, county environmental health specialists are employees of the state DHHS and may be involved in overseeing septage management.
Number of full-time equivalent staff (FTEs) for septage program: 0.05 at the central state level, plus 0.05 FTE regional staff in each of the five state DHHS regions. Septage haulers based in state: 181 licensed
Septage management: Septage can be land applied, but must be done so in accordance with the federal Part 503 rule; however, Arkansas has removed some of the treatment options in Part 503 and only allows: 1) raising the pH (e.g. lime treatment) and surface application, 2) subsurface injection, or 3) land applying and tilling into the soil within six hours. TWTDS are not required to accept septage; however, many do, and most septage haulers dispose of septage at TWTDS (most haulers have two to ten TWTDS that have given them permission to discharge at them).
Percentage of each management practice:

- Land applied: ~5%, on non-food crops, such as sod and hay.
- Discharged at TWTDS: ~95%

Septage-only lagoons are not allowed in Arkansas.
Other concerns: Fats, oils, and grease (FOG) are a concern, and some wastewater treatment facilities are especially concerned about receiving loads of septage that include a lot of FOG (this has led to stricter record-keeping regarding the source of materials). FOG is not regulated by DHHS; the state Department of Environmental Quality oversees its management, and individual site-specific permits regulate the use and disposal of grease trap waste, but there is no special proactive program to keep it out of the general wastewater flow.

California
Septage regulations updated: Separate septage management regulations do not exist; however, septage is regulated pursuant to the California Water Code.
Number of full-time equivalent staff (FTEs) for septage program: 0 at the state level.
Septage haulers based in state (estimated): “Agencies reported 785 registered septage pumpers with 1,699 vehicles. This number does represent some duplication as the same hauler and vehicle may be registered in more than one jurisdiction” (California Wastewater Training and Research Center, California State University, Chico; 2002).
Septage management: Septage can be land applied if it meets part 503 and additional state requirements pursuant to the plans and policies of the California Water Boards (e.g., California Water Code, California Code of Regulations, Basin Plans, etc.). Statewide standards require that septage that is land applied must:

- not allow public contact
- meet and certify pathogen reduction and vector attraction reduction
- follow prescribed best management practices
- utilize site and crop specific nutrient application rates
- assure domestic nature of the applied material, and
- develop and maintain a record keeping system

(California Wastewater Training and Research Center, California State University, Chico; 2002).
POTWs are not required to accept septage; however, three-quarters of POTWs in California do.
Percentage of each management practice:

Land applied = 2 %
Hauled to TWTDS = 84 %
Disposed of in lagoons = 11%
Independent special treatment systems = 2 %

Total volume is estimated to be 230 million gallons/year of septage from approximately 1.2 million septic systems in the state; in addition, there is another 5 million gallons/year of grease waste. Note that an estimated 10% of new housing is relying on septic systems.
Other concerns: California considers fats, oils, and grease (FOG) to be a significant issue (FOGs play a significant part in the sanitary sewer overflow prevention program). The use and disposal of grease trap waste is also subject to the California Water Code. California has a proactive program to collect FOG and keep it out of the general wastewater flow. FOG is addressed via pretreatment programs, permits issued by local TWTDS, and the sanitary sewer overflow prevention program.

Colorado

Information on septage management in Colorado is difficult to obtain. State involvement is limited, and only some counties have formal regulatory programs. These county requirements were created in response to poor management of some septage land application programs. Such county regulations essentially mimic the requirements of the federal Part 503 rule, which is the only formal regulation that applies to land application of septage for most of the state.

Connecticut

Septage regulations updated: Connecticut has no septage management regulations; the state relies on the 503 rule.
Number of full-time equivalent staff (FTEs) for septage program: data not reported
Septage haulers based in state (estimated): data not reported
Septage management: Septage cannot be land applied. POTWs are not required to accept septage, but some do. Some septage is disposed at the state's incinerators.
Percentage of each management practice (estimated):

- Hauled to TWTDS = 70%.
- Incineration = 30%

Other concerns: Connecticut considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls mostly under local regulations. However, Connecticut has a proactive program to ensure that FOG is collected and kept out of the general wastewater flow. Connecticut's Department of Environmental Protection has a progressive program that provides towns with incentives and support to establish tough monitoring and enforcement of grease trap cleanouts and proper management of FOG.

Delaware

Septage regulations updated: 1988.
Number of full-time equivalent staff (FTEs) for septage program: 1
Septage haulers based in state (estimated): 50

Septage management: Septage can be land applied if it meets Part 503 and the following additional requirements: it must meet the same metals, pathogen, and vector requirements as Class B biosolids. POTWs are not required to accept septage. Approximately 7 POTWs accept septage.
Percentage of each management practice:

- Land applied = 20 %
- Hauled to TWTDS = 80 %

Other concerns: Delaware considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the land treatment regulations derived from 40 CFR part 257A. Delaware does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

<u>Florida</u>
The Florida Department of Health (DOH) is the lead agency dealing with septage and onsite systems. However, when a septage hauler manages more than 20,000 gallons in a single day or more than 10,000 gallons as a daily average, then a FL DEP permit, similar to a NPDES permit, is required and regulatory responsibility lies with FL DEP.
Septage regulations updated: May 24, 2004.
Number of full-time equivalent staff (FTEs) for septage program: There are 67 County Health Departments, which are regional offices of DOH; in these offices there are 300 people who work on on-site system permitting, installation, maintenance, etc.; part of their responsibility is inspecting septage land application sites.
Septage haulers based in state (estimated): There are 454 DOH regulated septage haulers.
Septage management: Septage can be land applied if it meets Part 503 requirements and has been stabilized with lime for 2 hours. In addition, there are setbacks and field condition requirements that must be met that are more stringent than Part 503; these are found in the state on-site regulations. POTWs are not required to accept septage, but there are many that do.
Percentage of each management practice:

- 50% goes to wastewater treatment facilities (i.e. POTWs)
- 45% is land applied
- 5% is landfilled after dewatering (usually from regional facilities that handle large volumes and are permitted by FL DEP).

There are 119 DOH-regulated septage facilities that screen and lime-treat septage; most are located at land application sites; a few are regional facilities that take from several haulers, but most of them are single hauler systems. Most land-applied septage is put on pastureland and some on hay crops.
Other concerns: Florida does consider fats, oils, and grease (FOG) to be a significant issue. FOG becomes regulated when mixed with septage or biosolids, but separated FOG by itself is not regulated. It can be taken to POTWs or septage management facilities. Sometimes it is blended with septage and land applied. Many local wastewater treatment facilities keep FOG from causing issues at the facility by addressing it in pretreatment programs. Florida has few issues with illegal FOG disposal – it has not been a big problem, so there is no special state program for it.

<u>Georgia</u>
Septage regulations updated: 1994.
Number of full-time equivalent staff (FTEs) for biosolids program: 0.2

Septage haulers based in state (estimated): 332
Septage management: Septage can be land applied if it meets part 503 and the following additional requirements: Maximum rate of 40,000 gallons annually per acre.
POTWs are not required to accept septage. The number of POTWs that accept septage is unknown.
Percentage of each management practice: Not known.
Other concerns: Georgia considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under commercial waste rules 391-3-6-.24. Georgia has a proactive program to collect FOG and keep it out of the general wastewater flow.

<u>Hawaii</u>
Septage regulations updated: December 2004
Number of full-time equivalent staff (FTEs) for septage program: 0.25
Septage haulers based in state (estimated): 65
Septage management: Septage can be land applied if it meets Part 503. POTWs are not required to accept septage. It is not known how many actually do.
Percentage of each management practice:

- Hauled to TWTDS = 100 %

Other concerns: Hawaii considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the wastewater rules. Hawaii does not have a proactive program to collect FOG and keep it out of the general wastewater flow. Local counties have FOG ordinances. Hawaii registers FOG pumpers and requires recordkeeping and reporting.

<u>Idaho</u>
Septage regulations updated: 1991.
Number of full-time equivalent staff (FTEs) for septage program: 0.1
Septage haulers based in state (estimated): 86
Septage management: Septage can be land applied if it meets part 503. POTWs are not required to accept septage. However, several TWTDS accept septage.
Percentage of each management practice: No data provided.
Other concerns: It was not reported whether Idaho considers fats, oils, and grease (FOG) to be a significant issue. Grease trap waste is handled under solid waste regulations and goes to landfills.

<u>Illinois</u>
In Illinois, septage is generally managed in accordance with the federal Part 503 regulations.
Annual reporting regarding septage management activities is also required to the Illinois Department of Health's private sewage division.
Septage regulations updated: The Illinois regulations pertaining to septage management were last updated in 2003; these are in Section 905.170, which deals with septage (or private sewage) collection, storage, and disposal in accordance with Part 503. All septage pumpers/haulers are licensed by the state. Annual reporting to the state is required regarding the disposal methods for septage, where it is used or disposed, and the volumes, etc. The use or disposal options for septage are lagoons, incinerators, landfills, disposal at TWTDS, and land application to agricultural land.
Number of full-time equivalent staff (FTEs) for septage program: 1 (assisted by local health departments for complaints and enforcement)

Septage haulers based in state (estimated): 723 (February 2007 data)
Septage management: In Illinois, TWTDS are not required to accept septage, but many do – although the number that do is declining.
Percentage of each management practice: No data provided.
Other concerns: Illinois considers fats, oils, and grease (FOG) to be somewhat of an issue – and it is becoming more of an issue. FOG is considered a special waste by IL EPA; some is recycled.

Indiana
Septage regulations updated: July 2002.
Number of full-time equivalent staff (FTEs) for septage program: 1.5
Septage haulers based in state (estimated): 350
Septage management: Septage can be land applied if it meets part 503. POTWs are not required to accept septage, however, 175 do.
Percentage of each management practice:

- Land applied = 10%
- Hauled to TWTDS = 80%
- Sent to other septage-only treatment facility = 10%

Other concerns: Indiana considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the septage rules. Indiana does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

Table 8-7 specifies Indiana Administrative Code's restrictions for the land application of residential septage.[53]

Table 8-7. IDEM's Agronomic Rates for Septage

Crop Type	Annual Application rate for domestic septage (gallons per acre)	Corresponding Nitrogen Loading Rate (pounds per acre)
Corn	76,000	200
Soybeans, wheat, hay	38,000	100
Grass	19,000	50

Once 200,000 gallons of residential septage have been applied to an application site, operators are required to sample and analyze the soil for heavy metals and PCBS to "ensure that conditions are not created which would endanger public health or have an adverse impact on vegetation and future crop utilization." The results of the initial soil analysis will determine whether land application of residential septage will be allowed to continue at a particular application site.[54]

Iowa
Septage regulations updated: August 1994.
Number of full-time equivalent staff (FTEs) for septage program: 0.125

Septage haulers based in state (estimated): data not available
Septage management: Septage can be land applied in accordance with Part 503. POTWs are not required to accept septage. However, 10 TWTDS accept septage.
Percentage of each management practice:

- Land applied = 85 %
- Hauled to TWTDS = 10 %
- Disposed of in Lagoons = 5%

Other concerns: Iowa does not consider fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste is not regulated. Iowa does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

Kansas
Septage regulations updated: Kansas has no state regulations; the state relies on the federal Part 503.
Number of full-time equivalent staff (FTEs) for septage program: 0. The septage program is delegated to the county health departments to administer. The state does not have the resources at the state level to oversee septage.
Septage haulers based in state (estimated): About 2 per county, which leads to a total of about 110 statewide.
Septage management: Septage can be land applied if it meets part 503. POTWs are not required to accept septage, and it is unknown how many do.
Percentage of each management practice (estimated):

- Land applied = 50 %
- Hauled to TWTDS = 50 %

Other concerns: Kansas considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the solid waste rules. Kansas does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

Kentucky
The Kentucky Department of Public Health regulates septage.
Septage regulations updated: August, 1996.
Number of full-time equivalent staff (FTEs) for septage program: No data provided.
Septage haulers based in state (estimated): No data provided.
Septage management: Septage can be land applied in Kentucky. POTWs are not required to accept septage, and the number of facilities that do is not known.
Percentage of each management practice: No data provided.
Other concerns: Kentucky does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

Louisiana
In Louisiana, septage management is overseen through licensure of septage pumping and hauling companies by a program in the state's Office of Public Health. A license is granted to a company (no matter how many individual trucks the company has) after the trucks have been inspected and the company has provided documentation that is has permission to discharge septage at a receiving site (e.g., a permitted wastewater treatment facility).

Septage regulations updated: While the Office of Public Health licenses haulers, the Louisiana Department of Environmental Quality (LA DEQ) is responsible for the end use or disposal of septage in Louisiana. DEQ is planning to establish new regulations in the next year or two that will require all domestic septage, as well as grease removed from food service facilities when the grease is mixed with sewage sludge, be regulated under the sewage sludge/biosolids management regulations.
There are approximately 110 licensed septage hauling companies based in Louisiana.
Septage management: Septage can be land applied if it meets the federal Part 503 and the same state requirements as those for land application of sewage sludge. POTWs are not required to accept septage, and the number of facilities that do is not known.
Estimated percentage of each management practice:

- Hauled to TWTDS = 30%
- Disposed of in lagoons = 65%
- Sent to other septage-only treatment facility = 5%

In the past, more septage haulers took septage to municipal wastewater treatment facilities; now these facilities are less interested in accepting septage due to concerns about meeting their effluent permit limits. There is at least one facility that is dedicated to receiving only septage. But today, most septage is being disposed in oxidation ditches/lagoons.
Other concerns: Louisiana considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the biosolids/sludge rules (if it is mixed with septage, sludge, or biosolids) or the solid waste regulations (if it is not mixed with septage, sludge, or biosolids). Louisiana does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

<u>Maine</u>
Number of full-time equivalent staff (FTEs) for septage program: The six residuals utilization program staff are responsible for septage licensing, compliance, and enforcement in addition to their responsibilities of overseeing biosolids and other residuals (such as paper mill residuals).
Septage haulers based in state: There are 235 licensed septage haulers in Maine.
Septage management: Maine has Septage Management Regulations. Each site upon which septage is land applied must be individually licensed. Licenses are issued for a five-year term and are renewable. Septage storage facilities must also be licensed. Septage can be land applied if it meets Part 503 and all requirements of the state regulations. POTWs are not required to accept septage, but some do.
Percentage of each management practice:

- Land applied = 25 %
- Hauled to TWTDS = 50 %
- Disposed of in lagoons = There are no septage-only lagoons in Maine and this is not allowed as a disposal practice.
- Composted = 25 %

Other concerns: Maine has some concerns about fats, oils, and grease (FOG), but does not regulate the use and disposal of brown grease and other forms of FOG through any special program – most is treated like septage, because it tends to be mixed with septage.

<u>Maryland</u>
Septage regulations updated: Maryland doesn't have septage regulations. Septage management is overseen by counties.

Number of full-time equivalent staff (FTEs) for septage program: 0 / Not applicable.
Septage haulers based in state (estimated): No data provided.
Septage management: Septage can be land applied if it meets the requirements of Part 503.
Some POTWs are required to accept septage, and at least 12 do.
Percentage of each management practice: No data provided.
Other concerns: Maryland does not consider fats, oils, and grease (FOG) to be a significant issue, nor do they regulate the use and disposal of grease trap waste. Maryland does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

<u>Massachusetts</u>
Septage regulations updated: April, 2006. Regulated through Title V.
Number of full-time equivalent staff (FTEs) for septage program: 0 – Septage management is handled by wastewater staff, when necessary. Most septage is discharged and treated at POTWs.
Septage haulers based in state (estimated): No data provided.
Septage management: Septage cannot be land applied in Massachusetts. POTWs are not required to accept septage, but at least 80 do so.
Percentage of each management practice:

- Hauled to TWTDS = 100% (on average, each day, 1,547,000 gallons of septage are accepted by MA POTWs, as reported in a 2005-06 MA DEP study)

Other concerns: Massachusetts does not consider fats, oils, and grease (FOG) to be a significant issue, nor does it regulate the use and disposal of grease trap waste. Massachusetts does not have a proactive program to collect FOG and keep it out of the general wastewater flow. Grease is addressed through state plumbing codes (requirements include traps, regular inspections, pumping by an approved hauler, etc.). Some local POTWs do more than others to enforce keeping FOG out of sewers at the local level (e.g. Newburyport).

<u>Michigan</u>
Septage regulations updated: 1994 (Part 117, a law; there are no regulations)
Number of full-time equivalent staff (FTEs) for septage program: 3.5
Septage haulers based in state (estimated): 465
Septage management: Under Part 117, the state licenses septage businesses through a fee-based program; vehicles are licensed as well. On average, there are 203,000,000 gallons of pumped septage used or disposed of each year. There is a one-time fee for each new land application site permit. There are roughly 400 permitted septage land application sites in the state. Land applied septage must meet requirements of Part 503 and state law Part 117, which has more restrictive requirements than Part 503 – soil testing for N & P (total P is limiting factor – 300 pounds / acre limit), agronomic rate applications, ban on winter application when soil is frozen; septage must be screened; surface applied septage must be incorporated in 6 hours or must be direct injected.
The state does not require POTWs to accept septage; 18 POTWs have DEQ authorization to accept septage (such authorization is required). Stand-alone septage storage facilities are permitted by the state (requires engineering plans, site plans, etc.). Three counties and two local municipalities have bans or restrictions on land application of septage; however, in general, counties have provided good septage treatment capacity.
Percentage of each management practice:

- Land applied: ~50%
- Hauled to TWTDS: ~50% (average price for disposal at POTWs is 7.5 cents/gallon)
- Septage only facilities: there are 5 stand-alone septage facilities that remove solids and return effluent to POTWs.

Other concerns: Michigan does consider fats, oils, and grease (FOG) to be a significant issue and regulates the use and disposal of grease trap waste. Most POTWs won't accept FOG. The septage law requires mixing FOG 1 to 3 with regular septage for land application or that FOG be taken to a POTW that is willing to receive it. For more information see http://www.michigan.gov/deqseptage.

Minnesota

Septage regulations updated: Minnesota does not have septage regulations, just guidelines.
Number of full-time equivalent staff (FTEs) for septage program: 0.1 - mainly on enforcement of licensed septage pumpers/haulers. Minnesota licenses and takes enforcement actions on pumpers/haulers, even though there are no state septage regulations; violations are usually due to not having a septage pumping/hauling license or due to egregious land application practices.
Septage haulers based in state (estimated): 424 licensed pumpers/haulers
Septage management: Septage can be land applied if it meets the requirements of Part 503.
POTWs are not required to accept septage, and the number that do is not known.
Percentage of each management practice (estimated):

- 75% land applied
- 25% hauled to TWTDS
- Less than 1% is disposed of in landfills

Other concerns: Minnesota does not consider fats, oils, and grease (FOG) to be a significant issue at this time; does not regulate the use or disposal of brown grease (grease trap waste); and has no proactive program for keeping FOG out of the general wastewater flow. Septage contact: Mark Westpetal (phone 651-296-9322, email mark.westpetal@state.mn.us.)

Additional internet research reveals that the state allows waste-to-land applications in fields that are tiled with a number of restrictions. Bulk sewage sludge must not be applied to agricultural land, forest, a public contact site, or a reclamation site that is 33 feet or less from surface waters or wetlands unless specified otherwise in a permit. Application approval requires 1) soils classified as by the USDA as fine sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, sandy clay, silty clay loam, silty clay, or clay; 2) the pH of the soil must be 5.5 or greater; 3) application suspension when the soil extractable phosphorus content determined by the Brays P-1 test exceeds 200 parts per million (400 pounds per acre) in the surface six inches of soil; 4) application suspension when the electrical conductivity of the saturation extract of the soil exceeds four millimeters per centimeter as determined by the soluble salt test; 5) soil samples must be collected and analyzed for parameters listed [below in 2d], at a minimum of once in the three-year time period; 6) liquid bulk sewage sludge must not be applied to soils with surface permeabilities of less than 0.2 inch per hour unless the sewage sludge is injected or incorporated within 48 hours of surface application; and 7) organic soils or peat soils must not be used for bulk sewage sludge application unless subsurface drainage is provided by a system designed according to or equivalent to Natural Resources Conservation Service engineering criteria.[55]

Suitable slopes and separation distances must be as described in Table 8-8, Table 8-9, and Table 8-10. If applied through irrigation equipment, aerosol drift shall not be in contact with the feature specified.

Table 8-8. Minnesota's Suitable Slopes & Separation for Bulk Sewage Sludge Applied to Land (see 7041.1200 Sewage Sludge Management for table specific notes)

Criteria	Surface Applied	Incorporation within 48 hrs.	Injection
Depth to bedrock	3[1] ft.	3[1] ft.	3[1] ft.
Depth to seasonal high water table[2] or drain tile[3]	3[1] ft.	3[1] ft.	3[1] ft.
Allowable slopes	0% to 6%	0% to 12%	0% to 12%
Distance to wells			
Private supply	200 ft.	200 ft.	200 ft.
Public supply	1000 ft.	1000 ft.	1000 ft.
Irrigation	50 ft.	25 ft.	25 ft.
Distance to residences[4]	200 ft.	200 ft.	100 ft.
Distance to residential development[4]	600 ft.	600 ft.	300 ft.
Distance to public contact site	600 ft.	600 ft.	300 ft.

[2] - For the purpose of this item, a perched water condition shall not be considered a seasonal high water table.
[3] - The depth to subsurface drainage tiles shall be considered the depth to the seasonal high water table for sites with tile drainage systems that are designed according to or equivalent to Natural Resources Conservation Service engineering standards and criteria.

Table 8-9. Minnesota's Required Distance to Down Gradient Lakes; Rivers;

Streams; Type 3, 4, 5 Wetlands; Intermittent Streams; Tile Inlets Connected To These Surface Waters; Sinkholes			
Slope 0% to 6%	200 ft.	50 ft.	50 ft.
Slope >6 to 12%	N/A	100 ft.	100 ft.

Table 8-10. Minnesota's Required Distance to Grassed Waterways

Slope 0% to 6%	100 ft.	33 ft.	33 ft.
Slope 6% to 12%	N/A	33 ft.	33 ft.

The "Land Application of Biosolids and Septage" survey respondent implied that the state does not require monitoring of pathogens for biosolids or residential septage.[56] The rule states that bulk sewage sludge must meet the requirements of Class A pathogen reduction, when applied to agricultural land, forest, public contact site, reclamation site, lawn or home garden. Class B pathogen reduction material may be used depending on site restrictions.[57]

Class A pathogen reduction requires a Class A alternative, listed below, in addition to vector attraction reduction requirements and that either the density of fecal coliform in the sludge is less than 1,000 most probable number per gram of total solids (dry weight basis), or the density of Salmonella sp. Bacteria in the sludge must be less than three most probable number per four grams of total solids at the time of land application. Class A alternatives include temperature regulations, pH raised above 12 for 72 hours, sludge analyzed for enteric viruses and helminth ova, composing, heat drying, heat treatment, thermophilic aerobic digestion, beta ray irradiation, gamma ray irradiation, pasteurization, or other equivalent process.[58] The chapter also includes standards for vector attraction reduction.

Class B pathogen reduction classification requires one of the following: 1) seven representative samples of sludge with geometric mean of the density of fecal coliform less than either 2,000,000 most probable number per gram of total solids (dry weight basis) or 2,000,000 colony forming units per gram of total solids; 2) treatments of aerobic digestion, air drying, anaerobic digestion, composting, lime stabilization; or 3) equivalent process. Table 8-16 shows the state's temporal restrictions on application and subsequent land use.

Table 8-11. Minnesota's Minimum Duration Between Application & Harvest/Grazing/Public Access for Land Applied Class B Sewage Sludge

Criteria	Surface Applied or Incorporated	Injected
Food crops whose harvested part may touch the soil/sludge mixture (melons, squash, tomatoes, etc.)	14 mos.	14 mos.
Food crops whose harvested parts grow in the soil (potatoes, carrots, etc.)	20/38 mos.[1]	38 mos.
Feed, other food crops (field corn, sweet corn, etc.) hay, or fiber crop	30 days	30 days
Grazing of animals	30 days	30 days
Public access to the land		
- High potential[2]	1 year	1 year
- Low potential[3]	30 days	30 days

Bulk sewage sludge applications are limited by weather specific restrictions. Waste must be injected or incorporated within 48 hours of surface application on ground which is subject to flooding unless specified otherwise in a site approval.[59] Bulk sewage sludge must not be applied during June, July and August unless a crop is growing on the land or a crop is seeded within fourteen days following the application.[60] With attention to highly permeable soils, the state requires a minimum distance between application zone and seasonal high water table and bedrock of five feet. In such soils, applications are also prohibited in September and require nitrification stabilizer additive in October.[61]

Sludge must not be applied to agricultural land, forest, or a public contact site, or a reclamation site that is flooded, frozen, or snow covered so that the bulk sewage sludge enters a wetland or other surface water. In addition to requirements listed below, land application of dewatered or liquid bulk sewage sludge to frozen or snow covered ground is restricted to land with zero to 2% slopes. The application of liquid sludge is also restricted to a 15,000 gallon per acre hydraulic loading rate for the period when the ground is frozen or snow covered and must take place no closer than 600 feet from down gradient surface waters.[62]

The state defines agronomic rate as the "sewage sludge rate (dry weight basis) designed to provide the amount of nitrogen which can be utilized by the food crop, feed crop, fiber crop, cover crop or vegetation grown on the land and minimize the amount of nitrogen in the sewage sludge that passes below the root zone of the crop or vegetation grown on the land to the groundwater."[63] Application rates must be equal to or less than the agronomic rate set by the commissioner.

Minnesota's agronomic rates are based on the nitrogen needed by the crop. In determining the amount of land-applied biosolids or septage allowed the following nutrient conditions are considered: cumulative pollutant loading rates for nutrients in biosolids, ceiling limits for nutrients in biosolids and residential septage, and sludge nutrient monitoring for biosolids and residential septage.[64] Application rates are based on nitrogen caps specific to alfalfa, soybeans, hay crops, a general cop for cover crops, and a maximum available nitrogen application rate set by the commissioner.

The state requires land applicators to obtain certification.[65]Applications for approvals for site application of waste must be completed and signed by a Type IV certified operator or inspector. The applications include information on management practices (method of sewage sludge application, crops and yield goals, available nitrogen application rate, agronomic rate in dry tons of bulk sewage sludge solids per acre per cropping year, controls for limiting public access), soil types, soil samples (percentage organic matter, extractable phosphorous in ppm, exchangeable potassium in ppm, water pH, and soluble salts in millimhos per centimeter), and acreage; applicants must reapply if conditions change.[66]

<u>Mississippi</u>
Number of full-time equivalent staff (FTEs) for septage program: 2
Septage haulers based in state (estimated): 63
Septage management: 50% of the state's population relies on septic systems. Septage can be land applied if it meets part 503. POTWs are not required to accept septage. The number POTWS that do is not known. Most major cities do.
Percentage of each management practice:

- Hauled to TWTDS = 100 %

Other concerns: Mississippi considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the solid waste rules. Mississippi has a proactive program to collect FOG and keep it out of the general wastewater flow. The state Health Department and /or local government entities conduct periodic inspections to ensure proper collection of FOG wastes. MS DEQ regulates the disposal of FOG wastes through its solid waste program.

Missouri
Septage regulations updated: This was not reported.
Number of full-time equivalent staff (FTEs) for septage program: 0.01
Septage haulers based in state (estimated): 50
Septage management: Septage can be land applied if it meets Part 503 and the following additional requirements: it must be lime stabilized.
POTWs are not required to accept septage. The number of TWTDS accepting septage is not known.
Percentage of each management practice:

- Land applied = 40 %
- Hauled to TWTDS = 45 %
- Sent to septage only facility = 15 %

Other concerns: Missouri considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste is regulated through conditions in a general permit. Missouri has a proactive program, in pretreatment regulations, to collect FOG and keep it out of the general wastewater flow.

Montana
Septage regulations updated: May 25, 2001.
Number of full-time equivalent staff (FTEs) for septage program: 0.3
Septage haulers based in state (estimated): 142
Septage management: Septage can be land applied if it meets Part 503. POTWs are not required to accept septage; however, 28 do.
Percentage of each management practice:

- Land applied = 75 %
- Hauled to TWTDS = 25 %

Other concerns: Montana considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the septage rules. Montana does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

Nebraska
No septage management data was provided.

Nevada
Number of full-time equivalent staff (FTEs) for septage program: 0.2
Septage haulers based in state (estimated): 30 – 35; only 5% of Nevada's population relies on septic systems.
Septage management: Septage can be land applied if it meets part 503. POTWs are not required to accept septage.
Percentage of each management practice:

- 50% goes to land application (most in Reno/Carson City area). Septage is usually mixed 3parts septage to 1 part grease waste to meet the land application requirement for grease waste.
- 50% is discharged at TWTDS

Other concerns: Nevada considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste is managed like septage and with septage. FOG can be land applied if properly blended with septage. The amount of grease being land applied will likely become less in the near future, because the Truckee Meadows POTW in Sparks is installing an acid-phase digester to further their generation of biogas that is used to generate electricity; this facility is expected to take in much of the currently-land-applied grease.

New Hampshire
Septage regulations updated: October, 2005.
Number of full-time equivalent staff (FTEs) for septage program: 2.5
Septage haulers based in state (estimated): 150
Septage management: Septage can be land applied if it meets Part 503 and the following additional requirements: New Hampshire septage rules define 2 classes of septage. One meets Part 503 for land application at permitted sites (with increased buffer distances over federal law), and the other is "Exceptional Quality" (EQ) and is determined by testing for metals and volatile & semi-volatile organic chemicals. EQ septage is allowed for general distribution. POTWs are not required to accept septage; however, 46 do.
Percentage of each management practice:

- Land applied = 7%
- Hauled to TWTDS = 76% (including several out of state)
- Disposed of in lagoons = 10% (lagoon disposal is being phased out)
- Sent to other septage-only treatment facilities = 7%

Other concerns: 60% or more of the state's residents are served by septic systems. 80% of new development in the past decade has been in areas not served by centralized sewer systems, so the percentage of the state population served by septic systems continues to rise. (This data is calculated by comparing the number of housing starts and the number of septic system permits granted by DES.)
FOG is being taken seriously in NH, because "EPA says this is the #1 cause of CSOs." However, the state has little data on FOG at this time and does not have a proactive program to collect FOG and keep it out of the general wastewater flow. In New Hampshire, the use and disposal of grease trap waste falls under the septage rules.

New Jersey
Septage regulations updated: 1997.
Number of full-time equivalent staff (FTEs) for septage program: some part of 11.33
Septage haulers based in state (estimated): No data reported.
Septage management: Septage can be land applied if it meets Part 503. 26 TWTDS accept septage.
Percentage of each management practice:

- Hauled to TWTDS = 100 %

Other concerns: New Jersey considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the septage rules. Although not specifically mentioned in the rules, FOG is typically managed like septage, although fewer facilities accept it. New Jersey has a proactive program to collect FOG and keep it out of the general wastewater flow. Most sewer ordinances require removal of FOG before discharging wastewater to sewers. A few POTWs will accept FOG, but it has been a problem when too much is sent to one POTW. One POTW operates an incinerator and has been able to work FOG into the process to help lower fuel costs.

New Mexico
Septage regulations updated: New Mexico has no formal regulatory structure for septage, but septage is included in the groundwater discharge rules. The regulations pertaining to septage permitting were written in 1977, and, although they haven't changed since, the way they permit and the way they handle violations have improved greatly over the years.
Number of full-time equivalent staff (FTEs) for septage program: 0
Septage haulers based in state (estimated): 144
Septage management: About 38% of the population of New Mexico is served by septic systems. Septage can be land applied if it meets the federal Part 503 rules. New Mexico requires permits in order to land apply, and each permit lists a specific Part 503 choice for treatment that bests meets the land and climate of the site. POTWs are not required to accept septage; however, about 25 do accept it.
Percentage of each management practice (estimated):

- Land applied = 40 %
- Hauled to TWTDS = 40 %
- Lagoons = 20

Other concerns: New Mexico considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls within the groundwater rules and/or NPDES permitting. New Mexico does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

New York
Number of full-time equivalent staff (FTEs) for septage program: 1.0
Septage haulers based in state (estimated): 615
Septage management: Septage can be land applied if it meets Part 503 and the following additional requirements: soil tests for N,P, and K, and all septage must be limed (pH of 12 for 30 minutes). POTWs are not required to accept septage. However, 89 TWTDS accept septage.
Percentage of each management practice:
Percentages are not known, but a rough estimate is that

- 50% of septage is applied to land and
- 50% is disposed of at wastewater treatment facilities.

Other concerns: New York does not consider fats, oils, and grease (FOG) to be a significant issue. The use and disposal of grease trap waste falls under the solid waste rules. New York does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

North Carolina
Septage regulations updated: 1995.
Number of full-time equivalent staff (FTEs) for septage program: 5
Septage haulers based in state (estimated): 500. Permits from the Division of Waste Management are required for hauling septage.
Septage management: Septage can be land applied if it meets part 503; a state permit is required. Training is being provided by the state. POTWs are not required to accept septage, but most larger municipal TWTDS do (often only from within their county).

Percentage of each management practice:

- Land applied = 60% (90% of grease trap waste), with Class B lime treatment.
- Hauled to TWTDS = 40% (this involves a cost for tipping fees; some counties have
- banned land application of septage).
- A few facilities compost septage, and a couple dewater, add lime, and then land apply the
- treated solids.

Other concerns: North Carolina considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the septage rules. North Carolina does not have a proactive program to collect FOG and keep it out of the general wastewater flow. Individual towns and counties adopt their own proactive programs, but there is not one on the state level. County health departments inspect restaurants and grease traps – and are pretty rigorous – one inspection per quarter is required of restaurants.

<u>North Dakota</u>
Septage regulations updated: 1979
Number of full-time equivalent staff (FTEs) for septage program: 0.2
Septage haulers based in state (estimated): 106
Septage management: Septage can be land applied if it meets Part 503 and additional state requirements. POTWs are not required to accept septage; the number of TWTDS that do accept septage was not reported.
Percentage of each management practice (estimated):

- Land applied = 80 %
- Hauled to TWTDS = 10 %
- Disposed of in Lagoons = 10 %

Other concerns: North Dakota considers fats, oils, and grease (FOG) to be a significant issue. North Dakota does not regulate the use and disposal of grease trap waste. North Dakota does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

<u>Ohio</u>
Septage regulations updated: January, 2007.
Number of full-time equivalent staff (FTEs) for septage program: .01
Septage haulers based in state (estimated): 500
Septage management: The Ohio health department estimates that 20% -25% of the population relies on septic systems. Septage can be land applied if it meets Part 503. POTWs are not required to accept septage and the number that do was not reported.
Percentage of each management practice:

- Land applied = 40 %
- Hauled to TWTDS = 60 %

Other concerns: Although Ohio has the authority to regulate the disposal of grease trap waste, there are no specific rules pertaining to grease trap waste. According to Ohio EPA, Ohio does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

<u>Oklahoma</u>
Septage regulations updated: 2001.

Number of full-time equivalent staff (FTEs) for septage program: 1
Septage haulers based in state (estimated): 147
Septage management: Septage can be land applied if it meets Part 503 requirements – domestic septage must maintain a pH of 12 for 30 minutes. POTWs are not required to accept septage, but many do.
Percentage of each management practice:

- Land applied = 5%
- Hauled to TWTDS = 95%

Other concerns: The use and disposal of grease trap waste falls under the industrial waste rules, which serve to help keep FOG out of the general wastewater flow.

<u>Oregon</u>
Septage regulations updated: July 1995.
Number of full-time equivalent staff (FTEs) for septage program: 0.5
Septage haulers based in state (estimated): 157
Septage management: Septage can be land applied, but must be screened and alkaline stabilized. POTWs are not required to accept septage. The number of TWTDS accepting septage is 54.
Percentage of each management practice:

- Data on management practices are required to be reported, but it is not easy to summarize, as data is not available electronically.

Other concerns: Oregon considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the septage rules. Oregon has a proactive program to collect FOG and keep it out of the general wastewater flow. There are educational efforts through the Oregon Association of Clean Water Agencies.

<u>Pennsylvania</u>
Septage regulations updated: January, 1997.
Number of full-time equivalent staff (FTEs) for septage program: ~2 (regional biosolids coordinators also deal with the septage program)
Septage haulers based in state (estimated): 537 registered, although there are more that are unregistered, even though the state requires registration
Septage management: Septage can be land applied if it meets Part 503 and the following additional requirement: all septage must be treated prior to land application. The typical treatment is lime stabilization (30 minutes at pH 12). POTWs are not required to accept septage; however, at least 19 TWTDS do (10 in southwest region and 9 in south-central region; the other four regions of the state did not report).
Percentage of each management practice:

- Land applied: in north-central region: 5,572,668 gallons; in southwest region: 1,773,560 gallons; in south-central region: 17.8 million gallons
- Hauled to TWTDS, disposed of in lagoons, sent to other septage-only treatment facility, and composted – data is not compiled and available

Other concerns: Pennsylvania considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the residual waste rules.

Rhode Island
Septage regulations updated: Rhode Island does not have septage regulations. The Department of Environmental Management's Office of Waste Management (solid waste) regulates the licensing of septage haulers under its hazardous waste regulations.
Number of full-time equivalent staff (FTEs) for septage program: 0
Septage haulers based in state (estimated): approximately 60
Septage management: Septage cannot be land applied in Rhode Island. POTWs are not required to accept septage; however, 14 TWTDS do.
Percentage of each management practice:

- 100% is hauled to TWTDS

Other concerns: Rhode Island considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the solid/hazardous waste rules. Rhode Island does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

South Carolina
Septage regulations updated: December 2003
Number of full-time equivalent staff (FTEs) for septage program: 0.1
Septage haulers based in state (estimated): 240
Septage management: Septage can be land applied if it meets Part 503. POTWs are not required to accept septage, but most will accept it from with their surrounding areas.
Percentage of each management practice:

- Land applied = 10 %
- Hauled to TWTDS = 90 %

Other concerns: South Carolina considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the solid waste rules. South Carolina has a proactive program to collect FOG and keep it out of the general wastewater flow. South Carolina requires that FOG be disposed of at landfills.

South Dakota
There is currently no formal septage regulatory program at the state level; DENR involvement is compliance-based.
Septage regulations updated: there are none
Number of full-time equivalent staff (FTEs) for septage program: 0
Septage haulers based in state (estimated): not known
Septage management: Septage can be land applied in accordance with the federal Part 503 regulations. POTWs are not required to accept septage, however, 2 or 3 do.
Percentage of each management practice: not known
Other concerns: South Dakota does not have any special program addressing fats, oils, and grease (FOG).

Tennessee
Septage regulations updated: January 2006 (they are updated every year)
Number of full-time equivalent staff (FTEs) for septage program: There are 100 – 120 FTE working on septic systems and septage, but almost all are addressing installation and design of septic systems. Septage is mostly dealt with at the county level, and most is taken to POTW's.

There are less than 10 septage land application sites, and the FTE working on the septage end is maybe 1 FTE.
Septage haulers based in state (estimated): 60
Septage management: Septage can be land applied if it meets Part 503. POTWs are not required to accept septage, but most, if not all, do.
Percentage of each management practice:

- Land applied = 5%
- Hauled to TWTDS = 95%

Other concerns: Tennessee considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the septage rules. Tennessee has a proactive program to collect FOG and keep it out of the general wastewater flow. All commercial establishments that might generate grease are required to have grease traps.

Texas

Septage regulations updated: 1995.
Number of full-time equivalent staff (FTEs) for septage program: 2 (there are 5 FTEs who work 40% on septage)
Septage haulers based in state (estimated): 683
Septage management: Septage can be land applied if it meets Part 503. POTWs are not required to accept septage, and the number that do is unknown; however, it is believed that all, or almost all, septage goes to landfills or land application.
Percentage of each management practice (estimated):

- 70 % landfill
- 30 % land application

Other concerns: Texas considers fats, oils, and grease (FOG) to be a significant issue. Texas does not regulate the use or disposal of grease trap waste. Texas has a proactive program to collect FOG and keep it out of the general wastewater flow. Texas encourages FOG to be directly placed in landfills. They do not allow FOG to be land applied.

Utah

Until recently, septage management has been overseen by local health departments; this may be changing and the state may become more involved soon, perhaps regulating septage pumpers/haulers and septage management by general permits.
Septage regulations updated: about 20 years ago
Number of full-time equivalent staff (FTEs) for septage program: 0.5 (same person as biosolids program)
Septage haulers based in state (estimated): 100
Septage management: Septage can be land applied if it meets Part 503. POTWs are not required to accept septage, however, 25 TWTDS do.
Percentage of each management practice:

- In Utah, some septage is land applied and the rest is hauled to TWTDS.

Other concerns: Utah does not consider fats, oils, and grease (FOG) to be a significant issue at this time. The use and disposal of grease trap waste is regulated under the septage and biosolids program. FOG is adequately addressed through pretreatment programs, which are created and enforced by individual TWTDS.

Vermont

Septage regulations updated: February 1989.
Number of full-time equivalent staff (FTEs) for septage program: 0.25
Septage haulers based in state (estimated): 35
Septage management: Septage can be land applied if it meets Part 503 and the following additional requirements: pH ≥ 12 for a minimum of two hours, for pathogen reduction. 27 POTWs currently accept septage. POTWs must accept septage if they have accepted certain funds for facility upgrade/ refurbishment projects. Otherwise, POTWs are not required to accept septage.
Percentage of each management practice:

- Land applied = 15.6%
- Hauled to TWTDS = 81.5%
- Disposed of in lagoons = 0.5%
- Dewatered, then landfilled = 2.4%

Other concerns: Vermont considers fats, oils, and grease (FOG) to be a significant issue, but does not regulate use and disposal of grease trap waste. Vermont does not have a proactive program to collect FOG and keep it out of the general wastewater flow, although such a program is currently being developed by the Chittenden Solid Waste District under a state grant.

Virginia

Septage is being generated at an increasing rate in Virginia as pressure increases on landowners to have their septic tanks pumped every five years to reduce nutrient loading to Chesapeake Bay and other surface waters. The proper management of septage is becoming an increasing issue and there is a need for more solutions other than hauling to TWTDS that are facing increasingly stiff effluent nutrient limits and cannot afford to take in much nutrient-rich septage.
Septage regulations updated: Virginia has no formal state septage regulations. Septage that is land applied must be managed like biosolids in accordance with state regulations and Part 503. Short-term treatment in the hauling truck is discouraged and most land-applied septage is treated over a long term in lagoons, then tested and treated prior to land application.
Number of full-time equivalent staff (FTEs) for septage program: 0.05 at the state level, but there are county employees too who do permitting and enforcement of septage hauling vehicles and haulers.
Septage haulers based in state (estimated): This is not known: there are 99 counties that each conduct permitting and enforcement of septage hauling operations.
Septage management: TWTDS are not required to accept septage, and most don't, because of the high nutrient load in septage. VDH recommends that TWTDS take in no more than 3% of daily flow in the form of septage.
Percentage of each management practice:

- Land applied = some
- Hauled to TWTDS = most
- Placed in lagoons = some
- There is at least one developing septage-only treatment facility, but there is a need for
- more.

Other concerns: Virginia counties are responsible for septage hauling permits; they also oversee the management of fats, oils, and grease (FOG). Much FOG is managed by placement in lagoons, just as some septage is managed. Some high grade FOG is recycled.

Washington

Septage regulations updated: February 1998. The state regulations are currently being updated, with an expected completion date of June 30, 2007. Septage management requirements are more restrictive, in that alkaline-stabilized and non-alkaline-stabilized septage must meet the same site access and crop harvesting restrictions.
Number of full-time equivalent staff (FTEs) for septage program: 1.1
Septage haulers based in state (estimated): This number is unknown, because the haulers are permitted by local health departments unless they land apply or treat septage.
Septage management: Septage can be land applied if it meets Part 503. POTWs are not required to accept septage. It is unknown how many TWTDS accept septage.
Percentage of each management practice: This information is not available, as we do not track the amount hauled to TWTDS, and TWTDS are not required to report volumes received. Only septage operations that land apply or treat septage are required to report.
Other concerns: Washington does not consider fats, oils, and grease (FOG) to be a significant issue. The use and disposal of grease trap waste falls under the…

- septage rules, if it is less than 25% of the total volume, and
- solid waste rules, if it is greater than 25% in the septage mixture.
- Washington does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

West Virginia

Septage regulations updated: 2000.
Number of full-time equivalent staff (FTEs) for septage program: 0.6
Septage haulers based in state (estimated): 125
Septage management: Approximately 60% of the population of West Virginia relies on septic systems. Septage can be land applied if it meets Part 503 and the following additional requirements: annual soil samples, and must hold pH at or above 12 for 2 hours. POTWs are not required to accept septage. However, ~10 TWTDS accept septage.
Percentage of each management practice:

- Land applied = 50 %
- Hauled to TWTDS = 50 %

Other concerns: West Virginia considers fats, oils, and grease (FOG) to be a significant issue. West Virginia does not regulate the use and disposal of grease trap waste. West Virginia does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

Wisconsin

Septage regulations updated: January, 1997, with a slight modification in 1999.
Number of full-time equivalent staff (FTEs) for septage program: 2.1
Septage haulers based in state (estimated): 495

Septage management: Septage can be land applied if it meets Part 503 and the following additional requirements: site approvals and requirements are identical to biosolids land application, except no soil test is required. Wisconsin generally limits application to 39,000 gallons/acre/crop/year (100 lbs N), with winter prohibitions and restrictions. POTWs are not required to accept septage. However, 193 TWTDS accept septage (122 take it from septic tanks, and 15 take it from grease traps).
Percentage of each management practice:

- Land applied = 30 % (252,517,200 gal.)
- Hauled to TWTDS = 70 % (583,126,496 gal.) The amount hauled to TWTDS can be further broken down to 63.4 % (529,414,886 gal.) from holding tanks, 6.3% (52,376,252 gal.) from septic tanks, and 0.2% (1,335,358 gal.) from grease traps.

Other concerns: Wisconsin considers fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste falls under the septage rules. Wisconsin has a proactive program to collect FOG and keep it out of the general wastewater flow. Wisconsin encourages having FOG fed directly into anaerobic digesters and allows land application of grease trap waste at one-third the rate of septage.

The "Lane Application of Biosolids and Septage" survey respondent confirmed that monitoring is required for biosolids, but not residential septage.[67] Applications are allowed to tiled fields with no setback requirement. The survey respondent indicated that "tiled fields are identified as encountered. More issues with land applied industrial wastes (food byproducts, solids, sludges) than with biosolids (DM issues). Though important to incorporate relatively soon on tiled sites--specific site conditions that site approvers will add. Same with Karst geology." Slope-specific application restrictions are in place for biosolids and septage.[68]

Agronomic rates for biosolids and septage are based upon University of Wisconsin research. Crop uptake tables are provided to the operator upon submitting soil test results. Nutrients for septage are based upon the EPA formula: pounds of nitrogen/acre divided by 0.0026. Biosolid application rates are based on a mineralization rate of 25% - 1st yr, 12% - 2nd yr, 6% - 3rd yr for Nitrogen (TKN). Biosolids application with >30% of agronomic rate requires nutrient management plan in order to account for other sources of nitrogen.[69] Nutrient nor heavy metal monitoring are required for residential septage. Nutrient monitoring is not required for residential septage.[70] Metals are not measured and there are no heavy metal limitations for land-applied residential septage.[71]

<u>Wyoming</u>
Septage regulations updated: Wyoming has no formal state septage regulations; the federal Part 503 must be followed.
Number of full-time equivalent staff (FTEs) for septage program: 0
Septage haulers based in state (estimated): No data provided.
Septage management: Septage can be land applied if it meets Part 503 and it is kept adequate distances away from surface and ground waters. POTWs are not required to accept septage, but some do.
Percentage of each management practice:

- Only a small amount of septage is land-applied, and mostly on rural ranches.
- The remainder is hauled to TWTDS.

Other concerns: Wyoming does not consider fats, oils, and grease (FOG) to be a significant issue, and the use and disposal of grease trap waste is in accordance with Part 503 and other federal regulations.

Wyoming does not have a proactive program to collect FOG and keep it out of the general wastewater flow.

8.4 Manure

8.4.1 Federal Regulations of CAFOs

AFOs and CAFOs Defined

An animal feeding operation (AFO) is a lot or facility (other than an aquatic animal production facility) where animals are stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period and where crops, vegetation, forage growth, or post-harvest residues are not sustained in the normal growing season. A confined animal feeding operation (CAFO) is defined as a large AFO based on animal type/number.[72] Medium CAFOs are defined by animal type/number and if 1) pollutants are discharged into waters of the United States through a man-made ditch, flushing system, or other similar man-made device; or 2) if pollutants discharged directly into a water of the U.S. which originate outside of and pass through or come into direct contact with the animals confined in the operation. Small CAFOs are AFOs that are designated as a CAFO, but not a medium or large operation.[73] AFOs are designated as a CAFO by the appropriate authority (e.g. State Director or Regional Administrator) upon determining that it is a significant contributor of pollutants to the waters of the United States. In making designation decisions the authority must make on on-site inspection, consider AFO size, amount of waste reaching waters of the U.S., location relative to water, means of conveyance of waste, and the slope, vegetation, rainfall and other factors affecting the likelihood or frequency of a discharge.[74]

Permitting Requirements and Exceptions

CAFO operators must seek coverage under an NPDES permit if the CAFO discharges or proposes to discharge or submit. Coverage may be sought through an individual permit, or by submitting a notice of intent if the state uses a general permit. NPDES applications require operator location, animal and waste capacity, acres accessible for land application, and most recently, a nutrient management plan for the terms of which will be incorporated into the enforceable permit.[75] The nutrient management plan must also meet applicable effluent limitations and standards listed in 40 CFR part 412 (summarized below).[76] If the owner can demonstrate that their operation will not discharge to a water of the U.S., they may file for "no discharge certification" and is not required to seek NPDES permit coverage, but must retain a NMP, records and management practices to ensure no discharge.

Discharges are subject to the NPDES requirements except when the activity falls under the definition of an "agricultural storm water discharge." Where the waste has been applied with site-specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients, a precipitation-related discharge is considered to be an agricultural storm water discharge.[77]

Effluent Limitation Guidelines

Effluent limitations guidelines and standards (‘‘effluent guidelines’’ or ‘‘ELGs’’) are national regulations that establish limitations on the discharge of pollutants by industrial category and subcategory as listed below: [78]

Horses and sheep
Discharges resulting from the production areas with more than 500 horses or 10,000 sheep must meet effluent limitations attainable by the application of best practicable control technology available (BPT) to avoid discharge of pollutants to navigable waters, with the exception that overflow may be discharged when rainfall causes an overflow from a facility operated to process wastes and runoff from a 10-year, 24-hour rainfall event. The effluent limit attainable with the best available technology economically achievable (BAT) would allow overflow only with a 25-year, 24 hour rainfall event. New source performance standards (NSPS) require no discharge except in the case of a 25-year, 24 hour rainfall event.

Ducks
ELGs for duck operations (with more than 5,000 ducks)require BPT of maximum BOD_5 and a most probable number (MPN) not to exceed 400 per 100 ml at any time. The NSPS requires no discharge except when rainfall events cause an overflow of process wastewater from a facility designed, constructed, operated, and maintained to contain all process-generated wastewaters plus the runoff from a 25-year, 24-hour rainfall event at the location of the point source, any process wastewater pollutants in the overflow may be discharged into U.S. waters. Pretreatment standards for new sources (PSNS) require no introduction of process wastewater to a publically owned treatment works (POTW) except in the case of a 25-year, 24-hour rainfall event.

Dairy Cows and Cattle other than Veal Calves
Existing operations with over 700 dairy cows and over 1,000 cattle other than mature dairy cows or veal calves must comply with the BPT prohibiting discharge from the production area except when additional measures (listed in EPA BMPs section) are implemented at the facility to manage a 25-year, 24-hour rainfall event. Voluntary alternative performance standards may be set if the operator requests NPDES permit effluent limitations based on site-specific alternative technologies that achieve equal to or less than the pollutant discharge from the baseline standards. For CAFO land application, the operator must follow the land application best management practices (listed in the EPA BMPs section) and maintain records (as listed in the EPA Historical Record Section). The best conventional pollutant control/ best control technology (BCT), best available technology economically achievable (BAT), and new source performance standards (NSPS) echo the BPT requirement.

Swine, Poultry, and Veal Calves
This section applied to CAFOs with more than 2,500 swine each weighing 55 lbs. or more; 10,000 swine each weighing less than 55 lbs.; 30,000 laying hens or broilers if the facility uses a liquid manure handling system; 82,000 laying hens if the facility uses other than a liquid manure handling system; 125,000 chickens other than laying hens if the facility uses other than a liquid manure handling system; 55,000 turkeys; or 1,000 veal calves. The BPT prohibits discharge from the production area except when

additional measured (listed in the EPA BMPs section) are implemented at the facility to manage a 25-year, 24-hour rainfall event. Voluntary alternative performance standards may be set if the operator requests NPDES permit effluent limitations based on site-specific alternative technologies that achieve equal to or less than the pollutant discharge from the baseline standards. For CAFO land application, the operator must follow the land application BMPs (listed in the EPA BMPs section) and maintain records (as listed in the EPA Historical Record Section). The best conventional pollutant control/ best control technology (BCT) and best available technology economically achievable (BAT) echo the BPT requirement.

The new source performance standards (NSPS) require BMP effluent limitations to ensure no discharge based upon a site-specific evaluation of the CAFO's open surface manure storage structure. The structure should be designed with consideration of: minimum storage periods for rainy seasons, additional minimum capacity for chronic rainfalls, applicable technical standards that prohibit or otherwise limit land application to frozen, saturated, or snow-covered ground, planned emptying and dewatering schedules consistent with the CAFO's Nutrient Management Plan, additional storage capacity for manure intended to be transferred to another recipient at a later time, and any other factors that would affect the sizing of the open manure storage structure. Systems should be designed as determined by the NRCS Animal Waste Management (AWM) software with consideration to region specific climate and conditions. The design should be evaluated by the Soil Plant Air Water (SPAW) Hydrology Tool. The operator must also undertake the additional measures (listed in the EPA BMP section) and maintain land application and production area records (as listed in the EPA Historical Record Section).

Final 2008 CAFO Rule: Summary of Revisions

The EPA has finalized a rule requiring concentrated animal feeding operations (CAFOs) to safely manage manure. The final rule is a response to a February 2005 federal court decision (*Waterkeeper Alliance et al. v. EPA)* that upheld most of the agency's 2003 rule, but includes two key changes. First, it revises the requirement for all CAFOs to apply for NPDES permits and instead requires only those CAFOs that discharge or propose to discharge to apply for permits. Second, the rule adds new requirements relating to NMPs for permitted CAFOs. Whereas the plans were already required, now the plans must be submitted along with the NPDES permit application so that the terms of the NMP are incorporated as enforceable elements of the permit. The final rule also addresses other aspects relating to the *Waterkeeper* court decision. First, EPA is clarifying that water quality-based effluent limitations (WQBELs) may be required in any CAFO permit with respect to production area discharges and discharges from land application areas that are not exempt agricultural stormwater. Second, EPA removed the provision that allowed new source swine, poultry, and veal calf CAFOs to use containment structures designed for the 100-year, 24-hour storm to fulfill the no discharge requirement. Such CAFOs may now meet the no discharge requirement with site-specific best management practice effluent limitations. Finally, the final rule affirms that the Best Conventional Technology (BCT) limitations established in 2003 do, in fact, represent the Best Conventional Control Technology for achieving fecal coliform reductions.[79]

8.4.2 Pathogen Removal

EPA

In 2005 the court held that the 2003 CAFO rule violated the CWA because EPA had not made an affirmative finding that the best conventional technology (BCT) based Effluent Limitations Guidelines (ELGs), for conventional pollutants such as fecal coliform, do in fact represent BCT for pathogens. The court remanded this issue to EPA for such a finding.[80] The 2008 Final CAFO rule affirms that the BCT limitations established in 2003 do in fact, represent the Best Conventional Control Technology for achieving fecal coliform reductions.[81]

In 2003 the EPA considered in-stream monitoring for pathogens and other pollutants, but rejected the idea due to concerns about the ability of operators to collect and analyze samples accurately due to the technical difficulty in obtaining representative samples and holding time constraints. Accordingly, the EPA believes that the imposition of in-stream monitoring requirements is more appropriately addressed through NPDES permit conditions established by the permitting authority. Another option considered, and rejected, at proposal would have required large dairy (and swine) operations to install anaerobic digester systems to treat their manure. Though anaerobic digesters offer certain benefits to CAFOs (e.g., energy recovery, control of methane emissions), they would not necessarily lead to significant reductions for many of the pollutants discharged to surface waters from CAFOs. Although the effluent limitation guidelines (ELG) requirements in the rule are not specifically designed to reduce the pathogens in animal wastes, pathogens in CAFO discharges may be reduced by applying manure at rates that ensure appropriate agricultural utilization of nutrients and by establishing setbacks or buffers. Pathogen die-off can occur during the period manure is stored prior to land application, and when the animal waste is exposed to sunlight following application to land. Because of the presence of pathogens in animal wastes and the potential risk they pose to human health and the environment, EPA continues to be concerned about the potential for transmission of pathogenic disease from CAFOs. However, based on the current state of the science, a quantified link has not been established between pathogenic diseases outbreaks and CAFO discharges and runoff. EPA has a number of research efforts underway to better understand and reduce the environmental impact resulting from the discharge and runoff of manure from these facilities. This research will help inform future decisions to address pathogens in CAFO discharges.[82]

EPA Region 7, Ct, IN, IA, KS, MA, MI, MN, MO, NE, NH, NJ, NC, ND, OH, OR, TX, WA

Do not require monitoring of pathogens for CAFO or AFO land applications of waste.[83]

EPA Region 6 (AR, LA, NM, OK, TX, and 66 Tribes)

No, except when unauthorized discharge to a water of the U.S. occurs in which case the "permittee is then required to sample the discharge and analyze for pathogens, among other things."[84]

California

The Central Valley Regional Water Quality Control Board (RWQCB) promotes a series of pathogen related BMPs to reduce the spread of pathogens by the land-application of manure.[85] There does not appear to be a state-wide monitoring requirement, though RWQCBs may determine their own standards (see explanation in BMPs section.)

Florida

The Florida Department of Environmental Protection (FL DEP) survey indicates a requirement for monitoring of pathogens in land-applied CAFO waste. The respondent noted "AFOs are currently addressed on a case-by-case basis. However, FL DEP is developing permitting rules for AFOs that discharge to ground water."[86] No details were found in the land application of waste rules, though a rule on the production and use of compost requires monitoring of most probable number (MPN) of fecal coliform in compost made from manure only when other solid wastes have been added.[87]

8.4.3 Application Requirements

8.4.3.1 Application during/before wet weather

EPA

Weather specific restrictions are not made explicit in the Final 2008 CAFO rule. However, the rule does state that "the terms of the NMP must include any timing limitations in the NMP that would make fields unavailable for land application at certain times or under certain conditions" where timing limitations refers to "restrictions on applying under certain conditions, such as on saturated or frozen fields, or at certain times of the year."[88] Operators utilizing the narrative approach to nutrient application must consider weather in projections offered to the Director, but the figures are not part of the actual permit terms. The rule notes that "permitting authorities may establish in permits or technical standards for nutrient management land application timing restrictions, such as prohibitions on land application to frozen or saturated ground that would be [included as] permit terms.[89]

This reasoning is more thoroughly outlined in the 2003 CAFO rule which rejected establishing national requirements that would prohibit manure application to frozen, snow-covered, or saturated ground. As envisioned, the prohibition considered (but also rejected) at the time of proposal would have required CAFOs to install sufficient storage capacity to hold manure for the period of time during which the ground is frozen, snow-covered, or saturated. According to EPA's analyses, to meet such a requirement CAFOs in some areas, such as northern States, would need to be able to store manure, litter, and other process wastewaters for up to 270 days, depending on the amount of precipitation and severity of winter. In practice, such a prohibition could result in some facilities needing storage to hold manure and wastes for 12 months to allow for spreading manure at times that coincide with crop growing periods. EPA rejected establishing these requirements in the final Effluent Limitations Guidelines and Standards (ELGs) because pollutant runoff associated with the application of manure, litter, or other process wastewaters on frozen, snow-covered, or saturated ground is dependent on a number of highly site-specific variables, including climate and topographic variability, distance to surface water, and slope of the land. Such variability makes it difficult to develop a national technology-based standard that is reasonable and does not impose unnecessary cost on CAFO operators. Further, given the site-specific nature of the cropland and runoff characteristics, quantifying the pollutant reduction associated with these requirements is difficult and imposing such requirements through a national regulation could divert resources from other technologies and practices that are more effective. Therefore, EPA believes that requirements limiting the application of manure, litter, or other process wastewaters to frozen, snow-covered, or saturated ground are more appropriately addressed through NPDES permit limits established by the permitting authority. Although EPA has decided not to include requirements limiting the application of manure, litter, or other process wastewaters to frozen, snow-covered, or saturated ground in today's rule, the permitting authority retains the authority and is encouraged to include these types of requirements as technology-based standards using best professional judgment in NPDES permits as appropriate.[90]

EPA Region 6 (AR, LA, NM, OK, TX, and 66 Tribes)
The 1997 CAFO permit stated that wastewater shall not be irrigated when the ground is frozen or saturated or during rainfall events (unless to filter wastewaters from retention structures which are going to overflow directly to a water of the U.S.). It shall be considered "Proper Operation and Maintenance" for a facility which has been properly operated, and that is in danger of imminent overflow due to chronic or catastrophic rainfall, to discharge wastewaters to land application sites for filtering prior to discharging to waters of the U.S.[91]

EPA Region 7 (IA, KS, MO, NE, and 9 Tribal Nations)
No restrictions found.

California*
Operators should "avoid applications as much as possible to frozen soil and during periods of leaching or runoff."[92] The Colorado River Basin Region (R-7) Regional Water Quality Control Board require declaration and monitoring of storm water discharge.[93]

Connecticut
The 2002 draft NRCS-CT Nutrient Management Policy indicates that "nutrients shall not be applied during periods when flooding, frozen, snow-covered, or saturated soil conditions can reasonably be expected (typically November through March), or when the potential for surface runoff, soil compaction, and/or creation of ruts is high or when weather forecasts indicate these conditions are likely.[94] The current status of this regulation is unclear as the DEP develops their first CAFO permit.

Florida
Nutrients should not be applied to flooded or saturated soils when the potential for soil compaction and creation of ruts is high. Waste/wastewater applications are not allowed within 3 days of likely rainfall or during periods of frequent rainfall in a defined drainage way(s) that carries concentrated flow. Such material may be applied to newly constructed grass waterways if incorporated immediately.[95]

For all egg processing facilities and dairy farms in the Lake Okeechobee drainage basin, the water table must be 18 inches or deeper below the normal ground surface when wastes are applied to the land. Storage of pretreated wastes is not required if the sprayfield (land application system) has adequate hydraulic capacity to accept waste during wet-weather periods. The permittee must provide reasonable assurance runoff will not occur during wet-weather periods and failure to do so results in a requirement for adequate storage.[96]

Georgia
No application restrictions were noted in the code, but facilities must contain all process generated wastewater resulting from the operation of the AFO plus all runoff from a 25 year, 24-hour rainfall event for the location of the AFO.[97]

Indiana
Indiana prohibits manure application to "saturated ground."[98] The 2004 rendition of this rule required the operator to record "precipitation events at the time of application and for twenty-four (24) hours prior to and following application" for a period of five years from the date of permit coverage, but this requirement was not retained in the 2008 rendition. The older language also instructed that "manure, litter, and process wastewater shall not be applied to saturated ground" and further instructed that the operator planning land application must not apply manure for 24 hours before precipitation causing runoff is forecasted.[99]

Iowa
Though the state considered proposed comprehensive slopes, frozen or saturated soils standards in early 2009, it seems that the saturated soils and slopes components were not adopted in the final legislation (see discussion below). However, though the state may not have such requirements, if the producer is required to have a nutrient management plan or Comprehensive Nutrient Management Plan by the USDA-NRCS, they may be subject to land application restrictions on certain slopes or frozen or saturated soils.[100]

Producers without alternative storage options are encouraged to contact the Iowa Department of Natural Resources to discuss emergency wet-weather land application before allowing a storage tank or pond to overflow. The agency discourages saturated soil applications, but recognizes that a wet-weather application is less harmful than an all out breach of the storage unit. The long-term implications of the wet weather may require producers to change fields where they had planned to apply manure. Producers with manure and nutrient management plans must document these changes prior to land application.[101]

If a manure release impacts surface water, groundwater, a drainage tile line or intake, or to a designated area resulting from storing, handling, transporting or land-applying manure occurred, the incident must be reported to the DNR within six hours.[102]

Kansas
Unless approved in advance by the Secretary, liquid waste, concentrated animal waste or other liquid process waste shall not be land-applied when the ground is frozen, snow-covered or saturated, or during a precipitation event. Land application of wastes may be authorized if retention structures are in danger of overflow due to a chronic or catastrophic precipitation event.[103]

Operators storing and handling liquid wastes shall maintain application equipment capable of applying the ten (10) day wastewater accumulation volume and the design storm (25-year, 24-hour) volume, in ten twelve-hour operating days.[104]

Massachusetts
There are no explicit weather-specific prohibitions. State endorsed BMPs urge operators to "avoid manure application to saturated soils and areas prone to flooding."[105]

Michigan
Application is not allowed on saturated ground or when there is a 70% chance of a half inch of rain forecasted within24 hours.[106]

Minnesota
Though manure must not be applied to land in a manner that will discharge to waters of the state during the application process, there seems to be an exception for manure and process wastewater application applied to seasonally saturated soils that are seeded to annual farm crops or crop rotations of perennial grasses or legumes.[107] Manure applied in a special protection area must be injected or incorporated within 24 hours prior to rainfall.[108]

Missouri
No surface application of manure is allowed if precipitation, likely to create runoff, is forecasted to occur within 24 hours of the planned application.[109]

Nebraska
No restrictions found. The agency seems to focus more on routing runoff, requiring weekly inspections of all storm water diversion devices.[110]

New Hampshire
The BMP document directs operators to "avoid irrigation with liquid manure when the soil is saturated or when excessive rainfall causes ponding or runoff. When the water table is within 6" of the surface, irrigation should be delayed."[111] However, "the management of manure is not regulated by the Department of Environmental Services, unless it impacts groundwater or surface water." [112] See BMPs section for explanation.

New Jersey
Manure should not be spread on ground that is frozen, snow covered or too wet to be plowed within 48 hours for manure with less than 60% moisture content or on the same day or in the same day for manure containing more than 60% moisture.[113]

North Carolina
Land application of waste is prohibited during precipitation events; furthermore the permittee should consider pending weather conditions when scheduling application and must document the conditions and supply the forms to the Division.[114]

Facilities must be designed to contain waste plus runoff from a 25-year, 24-hour rainfall event. Discharges from more extreme events are not considered as violations. No collection, treatment or storage facilities may be constructed in the 100 year floodplain. Also, waste application is restricted in wind conditions that might cause mist to reach surface waters or wetlands. [115]

North Dakota
State law prohibits feeding livestock on ice or handling that would allow the waste to enter waters of the state, or to be washed into these waters by runoff from rain or snow melt.[116] No language specific to application found.

Ohio
Surface application of manure by is prohibited "if the forecast contains a greater than fifty per cent chance of precipitation… exceeding an amount of one-quarter inch for hydrologic soil group D soils and one-half inch for hydrologic soil group A, B, and C soils, for a period extending twenty-four hours after the start of land application." Operators must record weather conditions 24 hours before and after application."[117]

Oregon
The NRCS directs operators to avoid applying manure on frozen, saturated or snow-covered ground if possible.[118] Livestock should not be permitted to graze the disposal area during periods of saturated soil conditions.[119] Targeting western Oregon, the manure spreading index (MSI) tracks rainfall and rainfall forecasts to instruct operators on when to perform application in order to prevent surface water contamination.[120]

Texas
Land application shall not occur when the ground is frozen or saturated or during rainfall events unless there is danger of imminent overflow from a retention control structure or as approved by the commission.[121] If irrigation results in a discharge from a land management unit (LMU), the CAFO operator must collect samples from the drainage pathway at the point of discharge from the edge of the LMU where the discharge occurs for 1) fecal coliform bacteria; 2) total coliform; 3) five-day biochemical oxygen demand (BOD_5); 4) total suspended solids (TSS); 5) Ammonia Nitrogen (as N); 6) Nitrate (as N); 7) total dissolved solids (TDS); 8) total phosphorus (as P); and 9) any pesticide which the operator has reason to believe could be in the discharge. The operator shall orally notify the appropriate regional office within 24 hours of beginning irrigation under this provision and in writing within 14 working days.[122]

Washington
The state lists surface water effluent limitation guidelines which prohibit discharges for CAFOs except when the production area is designed to contain all manure and runoff from a 25-year, 24-hour rainfall event and precipitation causes an overflow. New swine, poultry and veal Large CAFOs are subject only to prohibition of discharge except in the event of a 100-year, 24-hour rainfall event. Ground water effluent limitations require that discharges from waste storage facilities do not reduce existing ground water quality (unless the operator can demonstrate that public interest will be met and that all reasonable methods of prevention, treatment and control have been undertaken prior to entry). Contaminant concentrations of chemicals and nutrients found in saturated soils that have been applied at agronomic rates for agricultural purposes are exempt if they will not cause pollution of any ground waters below the root zone.[123]

8.4.3.2 Application on frozen ground

EPA
Weather specific restrictions are not made explicit in the Final 2008 CAFO rule. (See full explanation in the EPA Application during wet weather section.) Technical guidance for the application of CAFO manure on land in the winter is available.[124]

EPA Region 6 (AR, LA, NM, OK, TX, and 66 Tribes)
The 1997 CAFO permit stated that wastewater shall not be irrigated when the ground is frozen or saturated or during rainfall events (unless to filter wastewaters from retention structures which are going to overflow directly to a water of the U.S.).[125]

EPA Region 7 (IA, KA, MO, NE, and 9 Tribal Nations)
No restrictions found.

California*
Operators should "avoid applications as much as possible to frozen soil and during periods of leaching or runoff."[126]

Connecticut
The 2002 draft NRCS-CT Nutrient Management Policy indicates that "nutrients shall not be applied during periods when flooding, frozen, snow-covered, or saturated soil conditions can reasonably be expected (typically November through March), or when the potential for surface runoff, soil compaction, and/or creation of ruts is high or when weather forecasts indicate these conditions are likely.[127] The current status of this regulation is unclear as the DEP develops their first CAFO permit.

Florida
No restrictions found.

Georgia
No restrictions found.

Indiana
Surface applications of manure on frozen or snow covered ground are prohibited on slopes in excess of 2% without adequate residue protection or crop cover. Spray irrigation of liquid manure on snow covered or frozen ground is prohibited. [128]

Iowa
The agency reported that that land applications of waste on frozen or snow-covered ground "require the plugging of intakes during application."[129] This is substantiated by new amendments to Iowa Administrative Code Chapter 65: Animal Feeding Operations, Section 459 which define "surface water drain tile intake" to mean an opening to a drain tile which allows surface water to enter the drain tile without filtration through the soil profile. The revision states that "any surface water drain tile intake that is on land in the owner's manure management plan and located down gradient of the application must be

temporarily blocked beginning not later than the time that the liquid manure is first applied and ending not earlier than two weeks after the completion of the application."[130]

The DNR summarizes that the new law restricts surface manure application on frozen or snow-covered ground, except for emergencies. It applies only to liquid manure from confinement producers (those with completely roofed facilities) and to producers required to submit a manure management plan to the DNR. "For the most part, the law will affect confinement producers with hog operations housing 1,250 or more finishers and dairy operations with 350 or more dairy cows," said Gene Tinker, coordinator of DNR's animal feeding operations. The law became effective July 1, 2009 and prohibits surface application of liquid manure on snow-covered ground from December 21 to April 1. It also prohibits surface application of liquid manure on frozen ground from February 1 to April 1. The law does not prohibit winter application of dry, solid or bedded manure.[131]

This legislation identified temporal restrictions versus spatial restrictions as originally proposed. Through early 2009, the Iowa Department of Natural Resources had publicized restrictions for the surface application of manure to frozen or snow covered ground based on type of application and slope of land. The proposal would have prohibited liquid application on snow-covered or frozen ground with slopes of 2% or greater (unless soil conservation practices are in place and the phosphorous index (P-Index) rating is 2 or less, or to frozen ground with slopes of 5% or greater). Solid application would not have been permitted for to snow-covered ground with slopes of 5% or greater, frozen ground with slopes of 9% or greater unless soil conservation practices are in place and the P-Index rating is 2 or less, or to frozen ground with slopes of 14% or greater.[132] The IDNR produced a fact sheet with a flowchart of the proposed rule.[133]

<u>Kansas</u>
As a liquid, when soil is frozen, snow-covered, saturated, or during a precipitation event, unless approved in advance by the Department. Solid wastes may be applied to frozen ground if measures are taken to ensure that the wastes will be retained at the application site.[134]

<u>Massachusetts</u>
There are no explicit weather-specific prohibitions. State endorsed BMPs urge operators to "avoid manure application to frozen soils, or if necessary only spread on sod-covered fields."[135]

<u>Michigan</u>
The Generally Accepted Agricultural Management Practices, which if followed offer legal protection to operators, recommend that application of manure to frozen or snow-covered soils should be avoided. When necessary solid manures should only be applied to areas where slopes are six percent or less; liquid manures should only be applied to soils where slopes are three percent or less. In either situation, provisions must be made to control runoff and erosion with soil and water conservation practices, such as vegetative buffer strips between surface waters and soils where manure is applied.[136] CAFOs are required to run and document the Manure Application Risk Index (MARI)[137] for any fields used during winter application.[138]

Minnesota
CAFO winter application, when allowed, has a 6% slope restriction for solid manure and 2% for liquids.[139] For application onto frozen or snow-covered soil the manure management plan requires information on field location, land slopes, proximity to surface waters, expected months of application to each field, and tillage or other conservation measures used to minimize contamination.[140] When soil is frozen or snow-covered, manure or process wastewater application is prohibited in special protection areas.[141]

Missouri
Manure must not be surface applied to frozen, snow-covered or saturated soils.[142]

Nebraska
For a field or field segment with a high or very high phosphorus risk assessment rating, there shall be no application of manure, litter, or process wastewater when the soil is frozen, or snow or ice covered.[143]

New Hampshire
The BMP documentation guides operators to avoid application on frozen or snow-covered ground.[144] However, "the management of manure is not regulated by the Department of Environmental Services, unless it impacts groundwater or surface water." [145] See BMPs section for explanation.

New Jersey
Manure should not be spread on ground that is frozen, snow covered or too wet to be plowed within 48 hours for manure with less than 60% moisture content or on the same day or in the same day for manure containing more than 60% moisture.[146]

North Carolina
Waste shall not be applied on land that is flooded, saturated with water, frozen or snow covered at the time of application.[147]

North Dakota
State law prohibits feeding livestock on ice or handling that would allow the waste to enter waters of the state, or to be washed into these waters by runoff from rain or snow melt.[148] Winter application does not appear to be prohibited, but does warrant submission of a nutrient management plan for facilities applying manure on frozen ground.[149]

Ohio
Surface application of manure on frozen or snow-covered ground requires the Director's approval. Manure injection or incorporation within 24 hours is the preferred alternative to surface application. Solid manure with less than 50% moisture is stockpiled at the site in lieu of manure application on frozen or snow covered ground.

When allowed, applications must be in accordance with the setback rules stated below and limited to 10 wet tons per acre for solid manure with more than 50% moisture and 5,000 gallons per acre for liquid manure. Sites must have at least 90% surface residue cover that is not completely covered by ice or snow at the time of application. Applications must not exceed 20 contiguous acres, with 200 foot breaks at those increments. Areas furthest from streams, ditches, and waterways should be given initial preference while retaining a 200 foot setback from these features.

For fields with slopes greater than 6%, application should be done in alternating strips 60 to 200 feet, generally on the contour. The application rates must be determined for each separate application strip area and not the area of the entire application field. Any manure application with phosphorus exceeding two hundred and fifty pounds per acre is prohibited.

Weather specific monitoring is required. Operators must visually inspect field surface drainage and tile outlets for runoff until the manure is assimilated. In the case of a discharges the operator must conduct representative grab samples from the point of discharge to waters of the state for ammonia nitrogen analysis within 30 minutes of detection or as soon as safely possible with documentation of the delay and report the discharge within two hours of detection.[150] See the discussion of Ohio's historical record for the use of monitoring results.

Oregon

The NRCS directs operators to avoid applying manure on frozen, saturated or snow-covered ground if possible[151] and offers a Waste Storage Period Determination worksheet used to calculate the number of days needed to store animal waste during the wet winter months.[152] The state's Agricultural Water Quality Program documentation instructs: "do not apply to soils that are saturated or frozen."[153]

Texas

Land application shall not occur when the ground is frozen or saturated or during rainfall events unless there is danger of imminent overflow from a retention control structure or as approved by the commission.[154] Known discharges resulting from winter application are subject to detailed monitoring (outlined above in the wet weather section).

Washington

None found.

8.4.3.3 Application restrictions on known features

EPA

Manure, litter, and process wastewater may not be applied closer than 100 feet to any down-gradient surface waters, open tile line intake structures, sinkholes, agricultural well heads, or other conduits to surface waters. As a compliance alternative, the CAFO may substitute the 100-foot setback with a 35-foot wide vegetated buffer where applications of manure, litter, or process wastewater are prohibited. Additionally, the CAFO may demonstrate that a setback or buffer is not necessary because implementation of alternative conservation practices or field-specific conditions will provide pollutant reductions equivalent or better than the reductions that would be achieved by the 100-foot setback.[155]

EPA Region 6 (AR, LA, NM, OK, TX, and 66 Tribes)
The region does allow application of waste to fields that are tiled, with the requirement for a 100' setback or 35' vegetated buffer or some other arrangement approved by the Agency. The respondent noted that tiles are note used a lot in the region, but are more common in Region 5. Slopes are considered in the concept of the Phosphorus Index which takes into account slope, proximity to a water body, etc.[156]

EPA Region 7 (IA, KS, MO, NE, and 9 Tribal Nations)
The region does allow waste-to-land applications on tiled fields with the requirement for a 100 foot setback from tile intake, or a 35 foot setback if area is a permanently vegetated buffer, or site specific demonstration that setback is not necessary. The respondent noted that the region advises states to cover tile intake while applying waste. Prohibitions and application (N-based or P-based) depends on a Phosphorus Risk Index that takes into account slope. The P-Index is normally developed by NRCS and can vary by state.[157]

California*
Operators must evaluation field limitations and develop appropriate buffer areas, based on environmental hazards or concerns such as (a) sinkholes, shallow soils over fractured bedrock, and soils with high leaching potential; (b) lands near or draining into surface water; (c) highly erodible soils; and (d) shallow aquifers.[158] For each land application area in the Central Valley that is within 100 feet of a surface water or a conduit to surface water, operators must identify the setback, vegetated buffer, or other alternative practice that will be implemented to protect surface water.[159]

Connecticut
No restrictions on land-application to tiled land were reported and there are no slope-related restrictions for land application of waste.[160] The current status of this regulation is unclear as the DEP develops their first CAFO permit.

Florida
The respondent noted that the state does not allow application of waste to fields that are tiled and that the "FL DEP has adopted EPA CAFO rules in [their] entirety by reference." The slope of land application is addressed on a site-specific basis in permits.[161]

Details on required buffer widths separating features of interest and application are available in the NRCS Conservation Practice Standard for Nutrient Management, Code 590. With established vegetation, applications must be setback 50 feet from wetland ditches, with requirement for an additional 2 feet for each 1% slope for slopes up to 8%. If there is poor vegetation, the setback is increased to 100 feet.[162]

Georgia
Waste-to-land application is allowed on fields that are tiled with restrictions based on circumstance. There are no slope-specific restrictions.[163] A setback shall be maintained of 100 feet between application areas or waste disposal areas and drainage ditches, surface water bodies, or wetlands. As a compliance alternative, the owner may substitute the 100 feet setback with a 35 feet wide vegetated buffer where waste disposal is prohibited.[164]

Indiana

Indiana allows land application of wastes on tiled fields, with requirements for setbacks depending on the type of application. Agricultural drainage tiles are included in the definition of "drainage inlet" defined as "any surficial opening to an underground tile drainage system that drains to waters of the state. For purposes of this article, 'drainage inlet' includes water and sediment control basins."[165]

Application of manure must be in accordance with a number of specified setbacks required for public water supply wells or intake structure, surface waters of the state, sinkholes, wells, drainage inlets, property lines and public roads as described in Table 8-17.

Table 8-12. Indiana's Setback Distances for Application of Manure to Tiled Lands

	SETBACK DISTANCES (in feet)			
			Liquid Surface Application	
Known Feature	Liquid Injection or Single Pass Incorporation	Liquid Incorporation; Application to Pasture; or Solid or Composted Manure Application	Less than or Equal to 6% Slope; or Residue Cover	Greater than 6% Slope
Public water supply wells and public water supply surface intake structures	500	500	500	500
Surface waters of the state	25	50	100	200
Sinkholes (measured from the surficial opening or the lowest point)	25	50	100	200
Wells	50	50	100	200
Drainage inlets	5	50	100	200
Property lines and public roads	0	10	50	50

Source: 327 IAC 16-10-4 Manure application setbacks. Table 1. (2008)

Setback distances are measures from the edge of the area of actually placement of manure on the land. The distance of the setback varies according to whether the waste is incorporated into the soil immediately or not. Immediate incorporation means that manure has been incorporated into the soil within 24 hours and results in the smallest setbacks. The property line setback may be waved with the written permission of the adjoining landowner. Exceptions to these setback parameters are made for "properly designed and maintained filter strips" wherein the setback is the width of the filter strip buffering the feature of interest. Also, if there is a gradient barrier located between the application site and the feature, the setback is set at ten feet. [166]

Iowa

Chapter 65 of the Iowa Administrative Code contains rules that govern land application of manure, including separation distances between designated areas based on type of manure and method of manure application. Table 8-18 shows the required setback distances.

Table 8-13. Separation Distances for Land Applied Manure

Designated Areas	Dry Manure		Liquid Manure		
	Surface Application			Surface Application	
	Incorporated on same date	Not incorporated	Direct Injection	Incorporated on same date	Not incorporated
• sinkhole • abandoned well • cistern • drinking water well • designated wetland • water source	0	200 ft.[2] (50 ft. with buffer[3])	0	0	200 ft.[2] (50 ft. with buffer[3])
• high quality water resource	0	800 ft. [2, 4] (50 ft. with buffer[3])	0	0	800 ft. [2, 4] (50 ft. with buffer[3])
• unplugged ag drainage well • ag drainage well surface inlet	0	200 ft. [5]	0	0	200 ft. no application if irrigated [5]

Source: Separation Distances for Land Application of Manure from Open Feedlots & Confinement Feeding Operations, including SAFOs. Table 2. (October 2008)

No manure can be applied by spray irrigation equipment within an agricultural drainage well area, which includes all land where surface or subsurface water drain to the well directly or through a drainage system connected to the well.

Iowa also restricts applications by proximity to buildings, public use areas, property boundary lines, and high quality water resources identified as high quality water (HQ), high quality resource water (HQR), or protected water area (PWA).[167] If the designated features (excluding drainage inlets) have an established 50-foot buffer, manure can be applied up to the edge of the buffer but not within.

Regarding slope specific application restrictions, the agency survey respondent noted that “some slopes may be restricted during calculation of the P-index,” referring to their phosphorous index (described in section 3b). The respondent also noted “a slope restriction during winter application.”[168] The Iowa DNR provided a flowchart for the proposed regulations, but these specific slope requirements to not appear to have been adopted (see section 2ii on Application on Frozen Ground).[169]

<u>Kansas</u>

Unless the CAFO exercises an approved compliance alternative, manure, litter, and process wastewater may not be applied closer than 100 feet to any down-gradient surface water, open tile line intake structure, sinkhole, agricultural well head, or other conduits to surface water. As a compliance alternative, the CAFO may substitute the 100-foot setback with a 35-foot wide vegetative buffer on which applications of manure, litter, or process wastewater are prohibited.[170]

<u>Massachusetts</u>

The EPA has permitting authority so the CAFO General Permit standards are used. This requires a 100’ setback, a 35’ vegetated buffer, or analogous practice.

<u>Michigan</u>

Land application of waste is allowed on tiled fields with a 100 foot setback or a 35 foot setback if there is a vegetative buffer. Manure applications must be incorporated within 24 hours and are subject to weather related restrictions. CAFOs are required to field specific assessments for all land application areas, which attend to the impact of slope on runoff and environmentally sensitive areas, such as surface waters.[171] The Generally Accepted Agricultural Management Practices, which if followed offer legal protection to operators, state that an application that results in manure flow in a field tile line is an unacceptable practice.[172]

Minnesota

The state does allow application to tiled fields, with the requirement for a 300 foot setback from open tile inlets for surface application.[173] If applied within 300 feet of open tile intakes the manure must be injected or incorporated within 24 hours of application.[174] Application to soils in special protection areas (including protected water, protected wetland, intermittent stream, drainage ditches) require a vegetative buffer of perennial grasses or forages that is 100 feet wide along lakes and perennial streams and 50 feet wide elsewhere. Application is prohibited within the buffer or within 25 feet of the protected feature. Manure application by a traveling gun, center pivot, or other device that allows liquid to travel more than 50 feet in the air is prohibited in the protection areas.[175] Also manure must not be applied to land within 50 feet of an active or inactive water supply well, sinkhole, mine, or quarry. Manure applied to land that slopes toward a sinkhole and is less than 300 feet away (without a permanent diversion) must be incorporated within 24 hours of surface applications.[176]

Missouri

The technical standard indicates that tile line inlets (if left unplugged during the manure application) must be set back 35 feet from an up-gradient permanently vegetated buffer, 100 feet from an up-gradient insufficient or absent buffer, or zero feet from a down gradient tiled site.[177] There are slope specific restrictions for CAFOs, but not AFOs.[178] Manure will not be applied on land with a slope of greater than 20%.[179]

Nebraska

The state allows manure application to tiled lands with CAFO/AFO-specific setback requirements. CAFO waste must only be applied at 100 foot distance to down gradient open tile line intake structure; or at a distance of 35 feet with a vegetated buffer, or no setback if alternative conservation practice will provide reductions equal to or better than reductions achieved at 100-foot setback. AFO waste applications must be set back 30 feet from identified streams, lakes and impounded waters unless the application is in accordance with a department approved nutrient management plan. No slope specific requirements were reported.[180] This information is in line with NDEQ Title 130 Livestock Waste Control Regulations.[181]

New Hampshire

Waste-to-land applications are not allowed on fields that are tiled. No limitations on slope were reported.[182] The BMP recommends 10 foot filter strips for slopes of <1% and proportionally up to at least 20 feet for slopes of 15%.[183]

New Jersey

The respondent indicated that the state allows application in fields that are tiled without a required setback and that there are no slope restrictions on application.[184] The rule on poultry manure indicates that manure should not be applied where slope exceeds 8% except when injected or plow furrow application is made. If using the plow furrow method, the slope must not exceed 10%.[185]

A manure free vegetative buffer zone of 25 feet is required along or around defined drainage channels and sinkholes on slopes of 6% or less. On slopes greater than 6%, the vegetative buffer shall be four times the percent slope times 100 feet. Where a vegetative buffer is not established, manure shall not be spread closer than 50 feet from the defined drainage channel or sinkholes on slopes of 6% or less. Without a vegetative buffer on slopes greater than 6%, the distance shall be eight times percent slope times 100 feet. For example, the buffer zone for a 10 percent slope should be 8 x 0.10 x 100 = 80 feet.[186]

North Carolina

The state allows application of waste to fields that are tiled with setback requirements of "25 feet for pre-1997 farms, 75 feet after 1997." As a BMP, the agency requires inspections of tile drain outlets and ditches during land application. The agency does not prohibit application of CAFO/AFO waste to fields with slopes in excess of a certain limit.[187]
Animal waste application is prohibited within 100 feet of any well, with the exception of monitoring wells. Manure applied to conventionally tilled bare soil must be incorporated within two days. This requirement does not apply to no-till fields, pastures or fields where crops are actively growing.[188]

North Dakota

Applications are allowed on tiled land, but must be set back either 35 feet with a vegetative buffer, or 100 feet without vegetation. The state also utilized slope-specific restrictions. [189]

Ohio

The state allows waste-to-land application in fields that are tiled, but regulates the activity by requiring a "100' or 35' vegetated strip for land application, and 300' [setback] for stockpiles from [an] open tile inlet." To reduce contamination the agency utilizes the following BMPs: "lower rates, disrupting pathways to tiles, shallow injection, tile stops/plugs, visual monitoring."[190]

Operators engaging in liquid application of waste must use methods or devices to capture or stop subsurface drain flow if linked to drain outlets. The use of drain plugs should be recorded in the operating record.[191] Ohio's land application restrictions and setbacks are described in Table 8-19.

Table 8-14. Ohio's Land Application restrictions and setbacks

	1	2	3	4
	Staging Areas and Stockpiles (10)	Surface Application	Winter Applications Frozen or Snow Covered Ground (1)	Surface Incorporation w/I 24 Hours OR Direct Injection
Class V wells, sinkholes	300'	300'	300'	100'
Surface Waters of the State (7)	300'	35' veg cover, 100' (2)	35' veg. cover, 200' (8)	35' veg. cover, 100'(2)
Wells	300'	300'	300'	100'
Bedrock	> 3' from bedrock	none	none	none
Public Surface Drinking Water Intake	1500'	300'	300'	300'
Springs	300'	300'	300'	300'
Neighboring residences:	500'	300'	300'	100'
Flooding/flood plains/floodways (3):	do not stockpile	do not apply	do not apply	permissible (3)
Slope (4):	0-6%	>15% see note 5	If > 6% see note 1	>15% see note 5
Field Surface Furrows(6)	300'	35' veg cover, 100' (2) or 35' see note 9	200'	none
Maximum Application Rate:	Liquid Manure - Based on Appendix B (AWC Chart) & Appendix F (Most Limiting Nutrient Chart) Solid Manure - Based on Appendix F (Most Limiting Nutrient Chart)			

Source: Appendix A Table 2 to Rule 901:10-2-14 Land application restrictions and setbacks.[192]

The code ("note 5" above) prohibits manure application to cropland over 15% slope or to pastures/hayland over 20% slope unless *one* of the following precautions are taken:

- Immediate incorporation or injection with operations done on the contour, unless the field has 80% ground cover (residue or canopy).
- Applications are timed during periods of lower runoff and/or rainfall (May 20th - October 15th)
- Split applications are made (separated by rainfall events) with single applications not exceeding 10 wet tons/ac or 5,000 gal/ac.
- The field is established and managed in contour strips with alternated strips in grass or legume.

Oregon

Applications to tiled lands are allowed with a 100' non-vegetated setback, 35' vegetated setback, or other alternative as protective as the first two options. The NPDES CAFO/AFO Permit does not allow tile line discharge, so many tile systems are fitted with valves or recycle systems to achieve no discharge. There are no slope related restrictions.[193] The code does state that "land with poor vertical drainage characteristics, high water table or steep slopes should not be selected for use in a year-round plan of manure disposal." [194]

Texas

Application to tiled land is allowed without requirements for setbacks or slope restrictions. No BMP requirements to minimize contamination by tile discharges were reported.[195]

Land applicators must respect well buffer zones and install a minimum of 100 foot vegetative buffer strips between waste application sites and waters of the state (unless using a low pressure system in areas of the state where the average rainfall is less than 25 inches per years).[196] Sinkholes require a 100-foot buffer from manure, litter, and wastewater application. Alternatively, the CAFO may substitute a 35-foot wide vegetative buffer around a sinkhole where alternative conservation practices or field-specific conditions will provide equivalent pollutant reductions.[197]

Washington
Manure, litter, and process wastewater may not be applied closer than 100 feet to any down-gradient surface waters, open tile line intake structures, sinkholes, agricultural well heads, or other conduits to surface waters. Compliance alternatives include the substitution of the 100-foot setback with a 35-foot wide vegetated buffer where applications of manure, litter, or process wastewater are prohibited; also the CAFO may demonstrate that a setback or buffer is not necessary because implementation of alternative conservation practices or field-specific conditions will provide pollutant reductions equivalent or better than the reductions.[198]

8.4.3.4 Agronomic rates

EPA
The terms of the nutrient management plan, with respect to protocols for land application of manure, litter, or process wastewater must include the acres available for land application; field-specific rates of application developed to ensure appropriate agricultural utilization of the nutrients in the manure, litter, or process wastewater; and any timing limitations identified in the nutrient management plan concerning land application on the fields available for land application. The permitting authority may use the USDA Natural Resource Conservation Service (NRCS) Nutrient Management Conservation Practice Standard, Code 590[199], or other appropriate technical standards, as guidance for development of the applicable technical standard. The 590 Standard describes three field-specific risk assessment methods to determine whether the land application rate is to be based on nitrogen or phosphorus, or whether land application is to be avoided. These three methods are: (1) Phosphorus Index; (2) Soil Phosphorus Threshold Level; and (3) Soil Test Phosphorus Level. The permitting authority has the discretion to determine which of these three methods, or other State-approved alternative method, is to be used."[200]

The final rule provides two approaches a CAFO may use in its NMP to identify annual maximum rates of application of manure, litter, and process wastewater by field and crop for each year of permit coverage. First, the "linear approach" expresses field-specific maximum rates of application in terms of the amount of nitrogen and phosphorus from manure, litter, and process wastewater allowed to be applied. Second, the "narrative rate approach" allows application rates to be determined based on the total amount of nutrients combined with a specific, quantitative method for calculating the amount of manure, litter, process wastewater allowed to be land applied.[201]

EPA Region 6 (AR, LA, NM, OK, TX, and 66 Tribes)
The region uses soil nutrient monitoring information to set agronomic rates. The CAFO operator is required to analyze the waste for nutrients and then apply that waste based on crop need. In other words, the waste has to be land applied in accordance with crop needs. Region 6 has developed a tool to determine whether the CAFO is applying manure at agronomic rates that is now being tested by other EPA Regions.[202]

EPA Region 7 (IA, KS, MO, NE, and 9 Tribal Nations)
Agronomic rates are informed by the Phosphorous-Index and the Purdue Manure Management Planning which determines the balance between manure application with crop uptake while considers P and N from

all sources. Additionally each state in the region has developed state technical standards similar to NRCS 590 Standard for guidance.[203]

California*

Nutrient management plans are required to ensure nutrient application at rates necessary to achieve realistic crop yields, to improve the timing of application, and the use agronomic crop production technology to increase nutrient use efficiency. The agency recommends using the USDA NRCS Standard 590 in developing plans. Realistic yield expectations for the crop(s) to be grown based primarily on the producer's yield history, State Land Grant University yield expectations for the soil series, or USDA NRCS Soils-5 information for the soil series.[204] Operators must maintain a "reasonable soil amendment rate" where application of manure and wastewater to disposal fields or crop lands matches rates that are reasonable for the crop, soil, climate, special local situations, management system, and type of manure.[205]

Connecticut

Soil nutrient monitoring information informs CAFO agronomic rates which will be set using a "narrative rate approach, when [a general permit] is issued."[206] Following the EPA decision to designate CAFOs as point sources, CT DEP began planning for implementation of a CAFO permitting program and statewide general permit. Under the general permit, each farm will be required to develop a Comprehensive Nutrient Management Plan (CNMP). Connecticut is using phosphorous-based manure application criteria for CNMPs. Recommendations for nutrient application rates will be based on the agronomic critical ranges required for crop production as established by the UConn Soil Test Lab, or UConn-recognized industry practice. Recommended rates are based on soil and post-mortem tissue tests, documented yield information, and management capabilities.[207]

Florida

The agency utilizes site-specific nutrient loading rates and soil nutrient monitoring information in determining agronomic rates for CAFOs. Operators must submit a nutrient management plan with the permit application which is then subject to FDEP approval and incorporated as an enforceable part of the permit.

Operators must base nutrient application rates for commercial fertilizer on University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS standardized fertilization recommendations for agronomic crops (posted a revisable document, #SL – 129[208]), and/or industry practice where calibration curves have been developed. These guidelines are taken with consideration of current soil test results, realistic yield goals and landowner management capabilities. If UF/IFAS does not provide specific recommendations, the operator should base nutrient application on realistic yield goals and associated plant nutrient uptake rates.[209] All sources of nutrients must not exceed the annual nutrient requirements of the grasses or crops in the area.

The survey respondent noted "we have developed a tool that we use to determine whether the CAFO is applying manure at agronomic rates. The Region 6 tool is now being tested by other EPA Regions." AFO rates are managed on a case-by-case basis.[210]

Georgia

CAFO and AFO agronomic rates are based on crop yield, soil test analysis and crop needs based on University of Georgia recommendations.[211]

Indiana

In determining agronomic rates, the Indiana Department of Environmental Management (IDEM) survey respondent indicated that cumulative pollutant loading rates and ceiling limits for nutrients for CAFO land applied waste are utilized. Additionally, soil and sludge nutrient monitoring are considered when determining agronomic rates for both CAFO and AFO land applied waste.[212] IDEM utilizes the National Resources Conservation Service nutrient management guidance (NRCS 590) in calculating CAFO agronomic rates and land grant publications in determining the requirements for AFOs.[213]

Indiana Administrative Code 327 IAC 16-10-2 on manure application rates states that the agronomic rate for potentially available nitrogen must not exceed the nitrogen requirements of current or planned crops of the upcoming growing season as documented in the operating record.[214]

Iowa

In determining agronomic rates, Iowa survey respondent indicated that ceiling limits for nutrients and soil nutrient monitoring information is used in determining agronomic rates for the state's "confinements" and "open feedlots."[215] The determination of agronomic rates and "yield goals [are] usually tied to nitrogen rates."[216] The DNR mandates that confinement feeding operators with more than 500 animal unit capacity must apply manure at or below the nitrogen use level necessary to obtain crop yields.[217]

The agency uses the phosphorous index (P-Index) in several management applications. The Iowa phosphorus (P) index is used to assess the risk of P delivery to surface waters. The index is a tool to help conservation planners, landowners, land users and others to evaluate the current risk from P reaching surface water from a specific site, and to determine factors which dominate the risk due to P transport to surface waters. The index takes into account soil test P, total soil P, rate, method, and timing of P application (fertilizer, manure, and other organic sources), erosion as well as transport factors such as sediment delivery, relative field location in the watershed, soil conservation practices, precipitation, runoff and tile flow/subsurface drainage. [218] By modeling soil and phosphorous transport, land users are better informed to make management decisions to reduce the risk.

Kansas

"Agronomic application rates" means the method and amount of swine waste defined by the secretary that in the secretary's discretion best protects the environment, including consideration of the crops or soil to which swine waste may be applied and the economic impact associated with any application of swine waste.[219] Since July 2007, CAFOs with 1,000 animal units or more must develop and implement nutrient management plans. The plans require that application rates for federal swine facilities be based on phosphorous holding capacity of the soil per Kansas Administrative Regulation (KAR) 4-21-1. Application rates for nitrogen and phosphorous are determined by completing a Kansas Site Assessment Index -Phosphorous. This USDA-NRCS assessment evaluates soil test phosphorous, annual average phosphorous (organic and inorganic) application rates, phosphorous fertilizer application method, soil erosion by water, soil runoff classification, proximity to perennial and intermittent surface water, and irrigation erosion. The planned application rates for manure, litter, or processed wastewater must be consistent with the site assessment. If the site is ranked low for phosphorous losses, a nitrogen based nutrient management plan is sufficient. Sites ranking high or medium must implement practices to reduce P losses such as planting crops with high removal capacity, limiting inorganic P fertilizer inputs, restrictions on manure application, and P-based management plans must be developed. The state uses NRCS metrics for crop-specific application rates for Nutrient Application Rates in Areas of Impaired Water Quality by Nutrients.[220]

Operators must conduct sampling to determine nutrient and salinity levels to confirm utilization of animal process wastes at agronomic rates.[221] Waste may be applied to agricultural land by any method that will result in uniform application of the material and not exceed agronomic rates. Liquid wastes shall be applied at agronomic rates and at rates less than or equal to the soil intake rates.[222]

<u>Massachusetts</u>
The University of Massachusetts at Amherst Extension has published "Guidelines to Nitrogen Application on Agronomic Crops in Massachusetts."[223]

<u>Michigan</u>
Soil nutrient monitoring information informs agronomic rates for CAFO waste. The rates are based on manure tests, soil tests, and the crop to be grown.[224] The Generally Accepted Agricultural Management Practices, which if followed offer legal protection to operators, state that the agronomic rate of N recommended for crops (consistent with Michigan State University N fertilizer recommendations) should not be exceeded by the amount of available N added, either by manure applied, or by manure plus fertilizer N applied, and/or by other N sources. For legume crops, the removal value of N may be used as the maximum N rate for manure applications. The available N per ton or per 1000 gallons of manure should be determined by using a manure analysis and the appropriate mineralization factors for organic N released during the first growing season following application and the three succeeding growing seasons. If phosphorous monitoring shows that Bray P1 reaches 150 lb/acre (75ppm) then application should be reduced to a rate matched by P removed by harvested crop. If Bray P1 reaches 300 lb/acre (150ppm) manure application should be discontinued until nutrient harvest by crops reduces P to less than 300 lb/acre).[225]

<u>Minnesota</u>
In determining agronomic rates for CAFO and AFO land applied waste, the state's survey respondent indicated that ceiling limits for nutrients and soil nutrient monitoring are utilized. More specifically, combined sources of nutrients cannot exceed University [of Minnesota Extension Service] recommendations (or crop N removal for legumes), which are based on crop type, previous crop and in some cases crop yield. Phosphorus is used as rate criteria in areas where soil test phosphorus is high."[226]

<u>Missouri</u>
Soil and sludge nutrient monitoring information inform agronomic rates[227] which are set using the University of Missouri Extension's Manure Plant Available Nitrogen (PAN) Calculation.[228] The CAFO rule requires operators engaging in land application to adhere to a set of BMPs including a nutrient

management plan and a set of technical standards for nutrient management.[229] The technical standards guide the development of the nutrient management plan and set application and monitoring protocol. Annual nitrogen application from all sources should not exceed the recommended nitrogen application rate for non-legume crops and the nitrogen removal capacity of legume crops by more than 10 pounds per acre or 10 percent, whichever is greater. Manure application rates must also comply with the results of a field-specific phosphorus loss assessment, based on Missouri P-Index and soil test ratings.[230]

Nebraska

Soil nutrient monitoring and sludge nutrient monitoring information guide determination of agronomic rates for CAFOs and AFOs. The state uses University of Nebraska crop recommendations based on soil sample analysis, waste analysis, P-index, and irrigation water analysis. The respondent noted a "need to define cumulative pollutant loading rate."[231]

New Hampshire

Sludge nutrient monitoring information is used in determining the agronomic rates for CAFO and AFO land-applied waste, which are recommended by the New Hampshire Cooperative Extension. [232]

The respondent noted "the management of manure is not regulated by the Department of Environmental Services, unless it impacts groundwater or surface water." [233] See BMPs section.

New Jersey

Agronomic rates are calculated by the USDA and NJ Department of Agriculture and are outlined in NRCS Comprehensive Nutrient Management Plans.[234] The poultry manure rule states that application should be limited to the amount required for crop production dependent upon crop needs, fertility levels, physical characteristics of the soil, and the potency of the manure.[235]

North Carolina

The agency utilizes nutrients and sludge nutrient monitoring information in determining agronomic rates for CAFOs and AFOs. Agronomic rates for N and P are based on Realistic Yield Expectation derived from waste nutrient content, crop and soil type, or yield records. Rates are limited by annual pollutant loading rates, but are not subject to lifetime loading restrictions.[236]

North Dakota

The agency uses soil nutrient monitoring information to determine agronomic rates which are subject to acreage requirements.[237] The agronomic rate for nitrogen must not exceed the plant utilization rate for the cropping year. Phosphorous must not be applied at rates exceeding the recommendations based on either the North Dakota phosphorous index, the North Dakota state university extension service soil tests, or other risk assessment methods approved by the department.[238]

Ohio

CAFO "operators are required to monitor nutrient [content] in the waste annually for the purpose of determining application rates."[239] The agency utilizes cumulative pollutant loading rates for nutrient, soil nutrient monitoring, and sludge nutrient monitoring information in determining agronomic rates for CAFOs and AFOs. Agronomic rates are based on crop nutrient needs and also influenced by "hydraulic capacity of the soil, cap on total P applications, lower rates on frozen/snow covered ground, etc."[240] The manure application rate is based on based on the most limiting factor among crop nitrogen requirements, phosphate application limits, water capacity of soil, and avoidance of surface ponding.[241]

Oregon

Cumulative pollutant loading rates and soil nutrient monitoring information is used to determine agronomic rates for CAFO and AFO waste.[242] Agronomic rates are informed by a P-Index, manure spreading index (MSI described in precipitation section) and the Oregon Animal Waste Management (ORAWM) spreadsheet. The OnePlan Nutrient Management Planner will soon replace ORAWM as a comprehensive nutrient management plan development aid.[243]

Texas

Soil and sludge nutrient monitoring information are used to inform agronomic rates for CAFO and AFO land applied waste. The respondent noted "application is based on the needed nutrients for optimum health and growth of the crop. Nutrient needs are based on soil and waste analyses. Application rates cannot exceed the nitrogen requirement of the crop. As P levels in the soil rise, increasing the P Risk index, the maximum rate is reduced to the phosphorus requirement of the crop, then to the crop P removal rate." CAFO agronomic rates are set in accordance with the Texas NRCS Practice Standard Code 590; AFO "application is based on the needed nutrients for optimum health and growth of the crop."[244]

Washington

Agronomic rates are detailed in the NMP and are based on field-specific assessment of the potential for nitrogen and phosphorus transport from the field and that addresses the form, source, amount, timing, and method of application of nutrients on each field to achieve realistic production goals, while minimizing to the lowest achievable level nitrogen and phosphorus movement to surface and ground waters.[245]

8.4.3.5 Certification Requirements

EPA

The 2003 CAFO rule states: "although EPA promotes and supports the use of certified specialists to help ensure the quality of nutrient management plans, the Agency is not requiring such plans to be developed or reviewed by a certified planner" and no revisions were offered in the 2008 rule.[246]

EPA Region 6, EPA Region 7, CT, IN, MA, MI, MO, NE, NH, NJ, ND, OR, TX, WA

No state or region-wide requirement for land applicator or soil sampler certification reported or identified through research.

California*

The Central Valley Regional Water Board regulations require dairy men to use a Certified Crop Advisor-approved nutrient management plan.[247] There are four areas of certification required to prepare a CNMP: (1) evaluation of facilities and equipment for handling and storage of manure and storm water, (2) nutrient management for land application of manure, (3) runoff and erosion control from land, and (4) conservation planning.[248]

Florida
CAFOs that land apply manure or process wastewater must be permitted.[249] Management plans should be prepared by the Soil Conservation Service or a Florida licensed professional engineer.[250]

Georgia
Land applicators are required to attain certification.[251] A "certified operator" is defined as a person who has been trained and certified by the Georgia Department of Agriculture and has direct general charge of the day-to-day field operation of an AFO waste storage and disposal system, and who is responsible for the quality of the treated waste.[252] Training and certification requirements are included in the code.[253]

Iowa
Manure applicators are required to be certified when land applied manure from a confinement feeding operation with an animal capacity of more than 500 animal units; smaller operations and open feedlots may land apply manure without being certified.[254]

Kansas
As a condition of permitting, swine facilities with capacity of 1,000 or more animal units require the operator to be certified by the department or a third party approved by the department as to the operators knowledge of manure and wastewater management, nutrient utilization planning and implementation, and emergency response planning and implementation.[255]

Minnesota
Requires certification for land application of waste.[256] Manure sampling and analysis must be conducted by a laboratory certified by the Minnesota Department of agriculture and in accordance with University of Minnesota Extension Service recommendations.[257]

North Carolina
Land applicators are required to obtain certification, but soil/waste samplers are not.[258] In 1996 the North Carolina General Assembly required all permitted animal waste management systems to be operated by a certified operator. To be certified, an operator must attend 10-hours of classroom training, pass an exam and pay an annual fee. Certified operators must also acquire 6-hours of continuing education credits every three years to remain certified.[259] Technical specialists provide guidance on collection, storage and treatment of waste, runoff controls including development and implementation of filter strips, grass channels, and related nonstructural BMPs, irrigation equipment design and installation, determination of wettable areas, creation of waste utilization and nutrient management plan, and design and installation of subsurface water management systems.[260]

Ohio
No certification requirements were reported,[261] however, the operating records must be generated by certified livestock managers.[262]

8.4.4 Monitoring Requirements

Heavy metals

<u>EPA</u>
The 2003 CAFO rule recognizes trace metals as a significant threat to water resources, but relies on agronomic rates for land application of manure to limit exposure. The rule notes that "arsenic, copper, selenium, and zinc are often added to animal feed as growth stimulants or biocides... Trace elements in agronomically applied manures are generally expected to pose little risk to human health and the environment. However, repeated application of manures above agronomic rates could result in cumulative metal loadings to levels that potentially affect human health and the environment." The 2008 rule made no specific reference to the matter.[263]

<u>EPA Region 6, EPA Region 7, CA, CT, FL, IN, IA, KS, MA, MI, MN, MO, NE, NH, NJ, ND, OH, OR, TX</u>
Heavy metals are not monitored as applied or as initial background concentration for land-applied CAFO or AFO waste. Nor are there any set heavy metal limitations for land applications of manure.[264]

<u>Georgia</u>
The respondent indicated that heavy metals are not monitored as applied or as initial background concentration for land-applied CAFO or AFO waste. Nor are there any set heavy metal limitations for land applications of manure.[265] However, the Swine Feeding Operation Permit states that operations expanding to have more than 3000 AU will require monitoring for cumulative loading of copper and zinc.[266]

<u>North Carolina</u>
The agency requires monitoring of copper and zinc in land-applied CAFO and AFO waste, but has not set a lifetime loading restriction. The respondent noted "Soil tests are required for Cu and Zn, and if the index reaches a certain level, application must stop… but there is no pre-determined cumulative rate for metals." Applicants must measure the background levels of heavy metals at a proposed application site prior to the first application. of CAFO/AFO waste and subsequent monitoring frequency is determined by the amount of manure applied to an application site. [267] Waste-to-land application must cease when the Mehlich 3 Soil Test Index for copper is greater than 3,000 (108 pounds per acre) or Zinc of greater than 3,000 (213 pounds per acre). [268]

<u>Washington</u>
The Permittee shall comply with effluent standards or prohibitions established under the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.[269]

Nutrients

EPA
Manure must be analyzed a minimum of once annually for nitrogen and phosphorus content, and soil analyzed a minimum of once every five years for phosphorus content. The results of these analyses are to be used in determining application rates for manure, litter, and other process wastewater.[270]

EPA Region 6 (AR, LA, NM, OK, TX, and 66 Tribes)
Total nitrogen and total phosphorous as P in CAFO and AFO land applied waste must be monitored annually. Ammonia Nitrogen analysis is also required where unauthorized discharge has occurred. The region requires states to measure background levels of nutrients for CAFOs and AFOs prior to the first application of waste.[271]

EPA Region 7 (IA, KS, MO, NE, and 9 Tribal Nations)
The region adheres to federal law by sampling CAFO manure, litter or wastewater at least annually for total nitrogen and total phosphorous as P. The Region also monitors for ammonia nitrogen as N. AFO nutrients are not tracked across the region. There is not a universal requirement to measure background levels of nutrients for CAFOs and AFOs prior to the first application of waste.[272]

California*
The Regional Water Quality Control Board (RWQCB) can require confined animal facility operations to undertake a monitoring program as a condition to the issuance or waiver of water discharge requirements (WDRs).[273] Nutrient management plans must include a summary of the nutrient resources available to the producer, including (a) soil test results for pH, phosphorus, nitrogen, and potassium; (b) nutrient analysis of manure, sludge, mortality compost (birds, pigs, etc.), or effluent (if applicable); (c) nitrogen contribution to the soil from legumes grown in rotation (if applicable); and (d) other significant nutrient sources (e.g., irrigation water).[274]

Connecticut
Annual nutrient monitoring is required with a CAFO permit. No monitoring is required for AFOs. The respondent did not indicate whether or not background levels of nutrients are monitored but stated that cumulative pollutant loading rates for nutrients are not used.[275]

Florida
Total nitrogen, nitrate nitrogen, total phosphorous, and orthophosphates are monitored in the ground water near storage ponds and land application areas. Background water quality must also be monitored on wells up-gradient of ground water flow to storage ponds and land application sites, presumably to provide a reference for potential contamination. The locations and depths of monitoring wells are specified in the permits. Monitoring is typically conducted quarterly, but the frequency may be reduced to semi-annual if more than six consecutive samples show no increase in the concentration of a given parameter.[276] The nutrient management plan (NMP) specifies waste monitoring frequency though these components must also be monitored in the event of a discharge to a surface water of the state.

AFOs are currently regulated on a case-by-case basis though FL DEP is currently developing permitting rules for AFOs that discharge to ground water. Prior to the first application of waste, the agency requires permittees to measure background levels of nutrients for CAFOs as part of the NMP and on a case by case basis for AFOs.[277]

Georgia

Total nitrogen must be monitored twice a year for CAFOs and once a year for AFOs. Georgia requires AFOs with liquid manure systems to apply for Land Application System Permit for 300 animal units or more. Dry manure AFOs with less than 1000 animal units are not required to apply for a state issued permit. The agency also requires permittees to measure background levels of nutrients for CAFOs and AFOs prior to the first application of waste.[278]

Representative samples shall be collected from each major soil series present within the waste disposal fields. One down gradient ground water monitoring well shall be installed for each waste storage lagoon or series of lagoons. Waste storage lagoon effluent to be land applied and for the ground water monitoring wells must be monitored, at a minimum, semiannually for Total Kjeldahl Nitrogen (TKN) and Nitrate Nitrogen (NO3-N) as well as semiannual monitoring of the wells for TKN and NO3- N.[279]

Indiana

The agency requires operators to produce a soil test and a manure test conducted in accordance with the manure management plan.[280] The survey respondent indicated that the agency requires land applied CAFO wastes to be monitored once per year for total nitrogen and total phosphorous levels.[281] IDEM does not require AFO waste to be monitored for nutrients.

Operators selling manure in quantities greater than ten cubic yards (or 2,000 gallons) must supply the buyer with the nutrient content information of the manure.[282]

Iowa

The agency survey respondent indicated that total nitrogen, total phosphorous as P, and total potassium are monitored for land-applied CAFO and AFO waste, but that “book values may be used in lieu of sampling.” Furthermore, the agency does require permittees to measure background levels of nutrients for CAFOs and AFOs prior to the first application of waste.[283]

The state requires nutrient management plans (NMP) from open feedlot producers who have who have 1,000 or more animal units (100 beef cattle, 700 dairy cattle or 2,500 finishing hogs kept in an unroofed pen) or other livestock and poultry producers with a NPDES permit. The plan is a tool that producers use to manage their feedlot's manure and process waste water, matching up the nutrient value of the manure with the fertilization needs of crops.[284] The plans require soil samples, calculation of P-Index, and soil loss (using the Revised Universal Soil Loss Equation), verification of adequate acreage for land application, and written agreements if spreading on land not owned or rented.

Kansas

Land application of CAFO waste (over 1,000 animal units) must be analyzed at least annually for nitrogen and phosphorous content. Annually cropped fields will have a soil test in the first year of a new plan or rotation and thereafter, once in three years. If organic fertilizers are used two or more consecutive years, annual soil testing is required. Samples are taken from the top six inches of soil and tested for organic carbon, pH, potassium, nitrate (as N), phosphorous (Bray-1, Mehlich III, or Olson P test), electrical conductivity and/or other parameters specified in the permit. [285]

Land applied AFO waste must be monitored once a permit cycle for nitrogen, ammonia nitrogen as N, and total phosphorous as P if the field is located in a sensitive groundwater area.[286]

Massachusetts
The survey respondent indicated that the state does not require nutrient monitoring in land-applied CAFO or AFO waste.[287] However, permitted operators will be required to develop an NMP indicating management of nutrients and waste in terms of storage, mortality management, water quality, chemical handling, runoff, testing, land application, record keeping. The NMP requirements are designed to be consistent with the NRCS CNMP Technical Guidance.[288]

Michigan
CAFO land-applied waste is monitored annually for total nitrogen, ammonia nitrogen as N, and total phosphorous, nutrients for which cumulative pollutant loading rates have been set. Land-applied AFO waste is only monitored for those operations issued a NPDES permit. The agency requires permittees to measure background levels of nutrients for CAFOs (but not AFOs) prior to the first application of waste.[289]

Minnesota
The survey respondent indicated that the agency does require permittees to monitor nutrients in land-applied CAFO and AFO waste. Land applied CAFO wastes (operators storing more manure from 300 or more animal unites) are monitored once per year for total nitrogen and total phosphorous levels for the first three year, and then at least once every four years thereafter. Manure must be retested following changed in conditions such as unusual climatic conditions, changes in storage or handling, changes in livestock types or feed.[290] Land applied AFO waste (operators with 100-300 animal units) is required to be tested for total nitrogen and total phosphorous once every four years, or with a change in conditions, management, or permit. [291]

The state examines phosphorus cumulative loading near waters and on high phosphorus soils at both CAFOs and AFOs.[292] CAFOs are required to complete a manure management plan in the following cases: 1) fields in special protection areas or within 300 feet of open tile intakes that have an average soil phosphorus test level exceeding 75 ppm using the Bray P1 test or 60 ppm using the Olsen test; 2) fields outside the special protection areas and more than 300 feet from open tile intakes that have an average soil phosphorus test level exceeding 150 ppm using the Bray P1 test or 120 ppm using the Olsen test.[293]

Missouri
CAFO land-applied waste is monitored for total nitrogen, ammonia nitrogen as N, and total phosphorous at a frequency determined by the amount of manure applied to the application site. Land-applied AFO waste is not monitored. The agency does not require permittees to measure background levels of nutrients for CAFOs and AFOs prior to the first application of waste.[294] Manure must be analyzed a minimum of

once annually for nitrogen and phosphorous content, and soil analyzed a minimum of every five years for P content.[295]

Nebraska
Total nitrogen, ammonia nitrogen as N, and total phosphorous as P are monitored annually for CAFO and AFO land-applied waste. The agency also requires permittees to measure background levels of nutrients for CAFOs and AFOs prior to the first application of waste.[296] Information on the nutrient management plan and performance standards are available.[297]

New Hampshire
Does not require monitoring of nutrients in CAFO or AFO land-applied waste or of the background levels of nutrients prior to the first application of waste.[298]

New Jersey
Does not require monitoring of nutrients in CAFO or AFO land-applied waste or of the background levels of nutrients prior to the first application of waste.[299]

North Carolina
Animal waste used for land-application is analyzed for nitrogen, phosphorous, zinc, and copper within sixty days (before or after) the date of application.[300] Permittees must measure background levels of soil nutrients for CAFOs and AFOs prior to the first application of waste. The agency has developed annual limits for nutrient loading, but "no lifetime loading restriction."[301]

The Commission may classify any surface waters of the state as nutrient sensitive waters (NSW) upon finding excessive growths of microscopic or macroscopic vegetation, typically linked to phosphorous or nitrogen loading. NSW will be subject to limitations on nutrients inputs to protect or restore the designated use of the water body. The Administrative Code reflects individual NSW Management Strategies specific to the known stressors for individual systems. For example the Neuse River Basin is targeted for agricultural nitrogen loading reduction, calling for a 30% net total nitrogen loading from the cumulative average from 1991-1995 loadings for the entire basin. The management strategy requires nutrient management certification for operators applying fertilizers to 50 or more acres, or in the absence of certification, the development of a nutrient management plan. Cropland nutrient management plans must been USDA-NRCS standards and those of the NC Soil and Water Conservation Commission.[302]

North Dakota
Total nitrogen and total phosphorous as P are monitored annually for CAFO land-applied waste and once every three years for nutrients in AFO waste. The agency also requires permittees to measure background levels of nutrients for CAFOs and AFOs prior to the first application of waste.[303]

Ohio
Total nitrogen, ammonia nitrogen as N, total phosphorous as P, total potassium, and organic nitrogen are monitored annually for CAFO and AFO land-applied waste. CAFO "operators are required to monitor nutrient [content] in the waste annually for the purpose of determining application rates" and "they may also be required to monitor nutrients in runoff or the receiving stream if there is a release." The

only AFOs that conduct annual monitoring as described above are those required to have an NPDES permit. The agency also requires permittees to measure background levels of nutrients for CAFOs and AFOs prior to the first application of waste.[304]

A cumulative pollutant loading rate for total phosphorous as P was developed for CAFOs.[305] Detailed phosphate requirements are included in the code and applications exceeding 250 pounds per acres to frozen or snow-covered fields are prohibited.[306] The agency also utilizes a “phosphorus index risk assessment procedure” or “P-Index” in tracking nutrients and determining agronomic rates.[307]

Oregon

Total nitrogen and total phosphorous as P for CAFO and AFO land applied waste must be monitored with frequency variable by facility size, location, system used and compliance history. The agency requires permittees to measure background levels of nutrients for CAFOs and AFOs prior to the first application of waste.[308] The Oregon State Extension service produced guidance on reducing the risk of groundwater contamination by assessing the amount of N & P produced per head of livestock, paired with manure storage protocol, nitrification by geographic region, and crop needs to guide application.[309]

Texas

Background levels of nutrients are measured for each land management unit where manure, litter or wastewater were applied the preceding year. The requirement is waived if there were no applications the preceding year. Annual samples are required for operators applying waste to land. Samples should be collected and tested within the same 45-day time frame each year with procedures in accordance with the agency’s "Soil Sampling for Nutrient Utilization Plans (RG-408)” publication. One composite sample must be obtained at soil depths of 0-6” and 6-24” for each uniform soil type within each land management unit. Laboratory analysis of the soil samples must include: nitrate as nitrogen in parts per million (ppm), extractable phosphorus (ppm, using Mehlich III with Inductively Coupled Plasma (ICP)), potassium (extractable, ppm); sodium (extractable, ppm); magnesium (extractable, ppm); calcium (extractable, ppm); soluble salts (ppm) or electrical conductivity (deciSiemens/meter (dS/m) - determined from extract of 2:1 volume to volume (v/v) water/soil mixture); and soil water pH.[310] Cumulative pollutant loading rates are not used in Texas for CAFO/AFO waste.[311]

Washington

Does monitor nutrients in CAFO land-applied waste, but not for AFOs.[312] Manure must be analyzed a minimum of once annually for nitrogen and phosphorus content. Soil must be analyzed a minimum of once every five years for phosphorus content. The results of these analyses are to be used in determining application rates for manure, litter, and other process wastewater.[313]

Large CAFOs must collect soil samples of land application areas annually in the fall for analysis for nitrate-N concentrations. The CAFOs must collect samples prior to heavy rainfall and at least 30 days after manure applications. The depth of soil samples is region specific. Operators may choose ground water monitoring in lieu of soil monitoring.[314]

Pharmaceuticals

EPA
The 2003 CAFO rule expresses concern over antibiotic concentrations in animal wastes, but that "little information is available regarding the concentrations of antibiotics in animal wastes, or on their fate and transport in the environment." There was no mention of the issue in the 2008 rule.[315]

EPA Region 6, EPA Region 7, CA, CT, FL, GA, IN, IA, KS, MA, MI, MN, MO, NE, NH, NJ, NC, ND, OH, OR, TX, WA
Does not have regulatory requirements for controlling pharmaceuticals in land-applied waste, nor was the respondent aware of any proposed requirement for controls.[316]

8.4.5 Historical Record

EPA
The permittee must create, maintain for five years, and make available to the Director, upon request, the records exhibiting compliance with the BMPs in the nutrient management plan (described in the EPA BMPs section). Annual reports should include the number and type of animals, amount of manure/wastewater generated, amount of manure/wastewater transferred, land application acres covered by NMP, acres used for application in the last 12 months, summary of production area discharges, statement of development and approval of NMP by certified nutrient planner. Actual crop yields, N and P content of manure, litter, process wastewater, and monitoring results. [317]

Record keeping requirements for the production area.
Each CAFO must also retain records on weekly records of depth of manure in impoundment as indicated by depth markers, documentation of actions taken to correct deficiencies, records of mortality management, design of storage structures and number of days of storage capacity, and the record, time, and estimated volume of any overflow.[318]

Recordkeeping requirements for the land application areas.
Land application records must include 1) expected crop yields; 2) the date(s) manure, litter, or process waste water is applied to each field; 3) weather conditions at time of application and for 24 hours prior to and following application; 4) test methods used to sample and analyze manure, litter, process waste water, and soil; 5) results from manure, litter, process waste water, and soil sampling; 6) explanation of the basis for determining manure application rates, as provided in the technical standards established by the Director; 7) calculations showing the total nitrogen and phosphorus to be applied to each field, including sources other than manure, litter, or process wastewater; 8) total amount of nitrogen and phosphorus actually applied to each field, including documentation of calculations for the total amount applied; 9) the method used to apply the manure, litter, or process wastewater; and 10) date(s) of manure application equipment inspection.[319]

EPA Region 6 (AR, LA, NM, OK, TX, and 66 Tribes)
The region requires operators to keep records of land applications and reports using "soil phosphorus limits, such as 200 ppm. If this limit is reached, then the operator needs special permission to continue

land applying manure to those fields with high phosphorus concentrations." Additionally land application records are used to determine whether or not the CAFO is land applying manure at agronomic rates.[320]

EPA Region 7 (IA, KS, MO, NE, and 9 Tribal Nations)
States are required to maintain a record of application. The life history of a field is considered by the requirement to account for all sources of P and N, including organic N and synthetic fertilizer. The region utilizes the P-Index which attends to soil nutrient concentrations.[321]

CAFO inspections include a record and document review including: animal inventory records, local precipitation records, records of waste levels in the retention structure waste disposal records (application dates, location, acreage, receiving crops, soil manure and lagoon nutrient testing results), NPDEA permit, lease if applicable, "spreading agreements" if waste spread on land not owned or leased by the operator, construction plans or drawings of facility, waste/nutrient management plans.[322]

California*
The nutrient management plan should be maintained for easy reference and updated at least every 5 years or once per crop rotation period. [323]

Connecticut
Applications records will be required with the general permit is developed and issued.[324] NRCS and University of Connecticut's Cooperative Extension System are working with agricultural producers to develop a user-friendly computerized record-keeping system to track nutrient use. The record-keeping program is being tested and developed for uploading to UConn's Soil Testing Laboratory's web site for ease of access for farmers. [325]

Florida
Permitted CAFOs are required to maintain records and submit annual operating reports. At the time of permit renewal, the applicant reevaluates and adjusts loading rates as needed. Nutrient management plans must be maintained for five years to include details on management, monitoring, and site-specific loading rates.[326] In addition to soil, water and manure testing, Florida also considers plant tissue analysis as a metric for nutrient management.[327]

Georgia
All permitted operations must submit to the Division and annual reports including details of land application.[328]

Indiana
The survey respondent indicated that the agency require permittees to measure the background levels of nutrients at proposed application sites prior to the first application of CAFO and/or AFO waste and that cumulative pollutant loading rates have been developed, though no details were specified.[329] Operating records are required and must include the type and amount of manure applied, manure test results, soil tests for all manure application sites, application method and date, location and number of application acres, and justification for the determination of potentially available nitrogen and agronomic rates.[330]

Iowa

Confinement feeding operators with more than 500 animal unit capacity must submit a manure management plan to the DNR each year and keep records of manure application.[331] Rule 65.17(13) on record keeping requires that records shall be maintained for five years following the year of application or for the length of the crop rotation, whichever is greater. Records to demonstrate compliance with the manure management plan shall include the following: optimum yield for the planned crop, types of nitrogen credits and amounts, remaining crop nitrogen needed, nitrogen content and first-year nitrogen availability of the manure, and phosphorous content of the manure with record of the sampling documentation. If the producer chooses to apply under phosphorous-based application rates rather than nitrogen based rates, additional information must be provided: information on crop rotation, phosphorous removal by crop harvest, manure application information (methods, dates, location of field, acreage, application rates), and current soil test lab results.[332]

Kansas

The agency requires administrative record keeping of management plans and certification.

Massachusetts

The NPDES permit requires submission of annual reports to the EPA. Records of monitoring and nutrient management practices must be maintained for at least 5 years.

Michigan

The state requires permittees to maintain records of historical land applications of waste including soil analysis results. As part of this requirement, permittees must measure the background levels of nutrients at application sites prior to the first application of CAFO waste. Cumulative pollutant loading rates were defined for CAFOs to limit loading of total nitrogen, ammonia nitrogen as N, and total phosphorous as P.[333] Soil fertility, cropping, yield, and application records reflect the determination of sufficient cropland available for appropriate utilization of manure nutrients without resulting in excess nutrient application to soils. Nutrient monitoring is helpful in anticipating where manure rates may need to be reduced and when additional land areas may be needed. [334]

Minnesota

The agency respondent noted that “crop available nitrogen available from previous applications must be subtracted from allowable rate. Phosphorus additions are tracked over a six-year period for land near waters and land with high soil phosphorus.”[335] To create adaptive capacity the regulation states "the manure management plan must be reviewed by the owner each year and adjusted for any changes in the amount of manure production, manure nutrient test results, fields available for receiving manure, crop rotations, or other practices which affect the available nutrient amounts or crop nutrient needs on fields receiving manure."[336] CAFOs and AFOs must retain records for manure applications for six years when applying to special protection areas, such as drinking water supply management areas, and three years for all other applications.[337]

Missouri
Record requirements included data for manure storage operational monitoring, application events (including weather and soil conditions, rates, and plant available nitrogen), manure nutrient monitoring, field soil test monitoring, and land application operational monitoring (on a field by field basis).[338]

Nebraska
CAFO operators must maintain production and land application records for five years, including inspection and corrections.[339] Records are maintained of the nutrient value in the wastes which is used to calculate the application rate. Results of soil sampling will indicate the amount of carry-over, if any, which will affect subsequent application rates. The respondent noted a "need to define cumulative pollutant loading rate" for nutrients.[340]

New Hampshire
The state does require a record of waste-to-land applications that occur over time.[341]

New Jersey
The state does require a record of waste-to-land applications that occur over time.

North Carolina
Permittees must measure background levels of soil nutrients, zinc and copper prior to the first application of waste. The agency has developed annual limits for loading, but "no lifetime loading restriction."[342] Waste application records demonstrate compliance with agronomic rates for N and P.[343] Records taken during application sessions, timed no more than 120 minutes apart, exhibit controlled application. Should the operators' compliance come into question, the Director may require automatic shutoff devices, open flow meters, and flow totalizers.[344] The agency requires permittees to maintain a minimum of a three year record for soil and waste analysis, rain gauge readings, freeboard levels, irrigation and land application events, past inspection reports and operational reviews, animal stocking records, records of additional nutrient sources applied (including but not limited to sludges, unused feedstuff lechate, milk waste, septage and commercial fertilizer), cropping information, waste application equipment testing and calibration, and records of removal of solids to off-site locations.[345]

North Dakota
CAFOs are required to maintain five years of records including the current nutrient management plan; the date manure was applied to each field, as well as the crops grown and expected yields of these fields; weather conditions at the time of application; test results for manure and soil, and type of test used; rate of manure, nitrogen and phosphorus application and calculations showing how this was determined; total nitrogen and phosphorous applied to each field; method of manure application; inspection of manure application equipment; measures used to prevent manure from impacting water (e.g., setbacks, buffers).[346]

Ohio
Operating records must be maintained for a minimum of five years to include manure storage details, storm water conveyances, vegetative cover, insect and rodent control plans, disposal of dead livestock, sale of manure, water line inspections, record of infractions, corrective efforts and explanation. Application details should include the date, rate, quantity and method, in addition to characterization of

manure, equipment used, site description, soil survey map, soil test results, soil conditions including available water capacity, documentation of setbacks, periodic observations of drain outlets for liquid manure flow, use of drain outlet plugs, and the temperature and weather conditions 24 hours before and after application. Determination of manure application rates must be supported by a cropping schedule, targeted and actual crop yield, results of nitrogen leaching risk assessment procedure and phosphorous soil test assessment, annual projected nutrient budget for nitrogen and phosphorus for each site, and implementation of BMPs to reduce nitrogen or phosphorus runoff.[347]

The historical record is used to inform the status of the cumulative pollutant loading rate by requiring a statement of the number of years needed to reach 150 ppm Bray P1 or equivalent if manure application rates exceed the phosphorous crop removal rates.

Records are used to assess compliance with regulation, informing enforcement measures as in the case of frozen/snow-covered application. Operators must submit explanation of and sampling results for the prohibited discharge. If the ammonia nitrogen level in a water quality sample is determined to be 26 mg/L or greater in the discharge at the point it enters waters of the state, then additional surface application of manure to frozen and/or snow covered ground is prohibited on the field where the runoff event occurred. Repeated violations revoke the right to winter applications for the length of the operator's permit.[348]

<u>Oregon</u>
Records are required to exhibit compliance with maintenance of N and P in soils at or below target levels. If soil levels of nutrients are increasing or above target levels, CAFO/AFO operators are required to modify their Animal Waste Management Plan and nutrient application rates.[349] The respondent indicated that the agency has developed cumulative nutrient loading rates for total nitrogen and total phosphorous as P, but these were not quantified or verified by research.[350]

<u>Texas</u>
Cumulative pollutant loading rates are note used for tracking nutrients. The respondent reported that records of land application are required, but that they do not have any bearing on future land application. Land application is based on soil and waste analyses, coupled with the nutrient needs of the crop.[351] Nutrient management plans and documentation of implementation must be maintained and made available to the director upon request for five years.[352]

<u>Washington</u>
CAFOs must keep a detailed operating record, as described in the EPA section, for five years.[353]

8.4.6 BMPs

<u>EPA</u>
CAFO permits applications must include a requirement to implement a nutrient management plan (NMP) including the best management practices (BMPs) necessary to meet the requirements of effluent limitations and standards, and to 1) ensure adequate storage and maintenance of facilities, 2) ensure proper management of mortalities, 3) divert clean water from production area, 4) prevent direct contact of animals with waters of the U.S., 5) ensure proper handling of chemicals and contaminants, 6) implement

site-specific conservation practices including buffers to control pollutants, 7) establish protocol for testing of manure, litter, process wastewater, and soil, 8) establish land application protocols to ensure appropriate agricultural utilization of nutrients, and 9) keep records to document the implementation of each of the stated requirements.[354]

Best management practices (BMPs) for land application of manure, litter, and process wastewater include the requirement for NMPs based on a field-specific assessment of the potential for nitrogen and phosphorus transport from the field and that addresses the form, source, amount, timing, and method of application of nutrients on each field to achieve realistic production goals, while minimizing nitrogen and phosphorus movement to surface waters. Application of waste must minimize P and N transport from the field to surface waters in compliance with the technical standards for nutrient management established by the Director. Such technical standards for nutrient management shall include transport potential and consideration of multi-year phosphorus application on fields that do not have a high potential for phosphorus runoff to surface water, phased implementation of phosphorus-based nutrient management, and other components, as determined appropriate by the Director. Manure must be analyzed a minimum of once annually for nitrogen and phosphorus content, and soil analyzed a minimum of once every five years for phosphorus content. The results of these analyses are to be used in determining application rates for manure, litter, and other process wastewater. The operator must periodically inspect equipment used for land application of manure, litter, or process wastewater. Applications must be set back 100 feet from any down-gradient surface waters, open tile line intake structures, sinkholes, agricultural well heads, or other conduits to surface waters. As a compliance alternative, the CAFO may substitute the 100-foot setback with a 35-foot wide vegetated buffer where applications of manure, litter, or process wastewater are prohibited; or the operator may demonstrate that the setback or buffer is not necessary because implementation of alternative conservation practices or field-specific conditions will provide pollutant reductions equivalent or better than the reductions that would be achieved by the 100-foot setback.[355]

Additional measures

Several effluent limitation guidelines require that operators engage in an additional set of management requirements:[356]

- *Visual inspections.* There must be routine visual inspections of the CAFO production area. At a minimum, the following must be visually inspected:
    - Weekly inspections of all storm water diversion devices, runoff diversion structures, and devices channelling contaminated storm water to the wastewater and manure storage and containment structure;
    - Daily inspection of water lines, including drinking water or cooling water lines;
    - Weekly inspections of the manure, litter, and process wastewater impoundments; the inspection will note the level in liquid impoundments as indicated by the depth marker.
- *Depth marker.* All open surface liquid impoundments must have a depth marker which clearly indicates the minimum capacity necessary to contain the runoff and direct precipitation of the 25-year, 24-hour rainfall event. New structures subject to effluent limitations must include a depth marker which clearly indicates the minimum capacity necessary to contain the maximum runoff and direct precipitation associated with the design storm used in sizing the impoundment for no discharge.

- *Corrective actions.* Any deficiencies found as a result of these inspections must be corrected as soon as possible.
- *Mortality handling.* Mortalities must not be disposed of in any liquid manure or process wastewater system, and must be handled in such a way as to prevent the discharge of pollutants to surface water, unless alternative technologies pursuant to voluntary alternative performance standards and approved by the Director are designed to handle mortalities.

EPA Region 6 (AR, LA, NM, OK, TX and 66 Tribes)
EPA has the authority to impose Best Management Practices (BMPs) as permit conditions to ensure that technology-based effluent limitations are properly implemented in permits.[357]

EPA Region 7 (IA, KS, MO, NE, and 9 Tribal Nations)
No specific listing.

California*
California has one State Water Resources Control Board, and nine Regional Water Quality Control Boards that are watershed based, semi-autonomous units which each set standards, issue waste discharge requirements, determine compliance and take enforcement actions.[358] CAFOs are managed under USEPA regulations (40 CFR Section 122.23) as point source discharges and must secure coverage under an NPDES permit. All other confined animal feeding facilities are considered non-point sources and must comply with waste discharge standards in the California Code of Regulations. Recommended practices which may be helpful in achieving compliance with statewide standards include: construction of lined liquid manure storage structures with capacity for a 25-year, 24-hour frequency storm event, covering dry manure, composting, diversion of clean water from production area, and development and implementation of a nutrient management plan.[359]

Connecticut
The state Department of Environmental Protection website links to a 1993 document titled "Manual of BMPs for Agriculture: Guidelines for Protecting Connecticut's Water Resources."[360] In the 2003 "Technical Report on the Impact of General Permit on Concentrated Animal Feeding Operations in Connecticut,"[361] it was determined that there is insufficient land under the control of the farms for agronomic application rates. Since the proposed DEP General Permit limits land application of manure to agronomic rates the DEP is considering alternatives to land application in order to maintain current production rates. Off-farm utilization of surplus nutrients in other market sectors is explored in the 2005 "Feasibility Study for Alternative Technologies and Utilization for Managing Dairy and Poultry Manure."[362]

Florida
In areas with identified or designated nutrient-related water quality impairment, an assessment must be completed of the potential for nitrogen and/or phosphorus transport from the field using tools such as the Leaching Index (LI) and/or Phosphorus Index. Information on the Florida P-Index tool is available.[363] To protect air quality by reducing nitrogen and particulate emissions, the agency urges tillage within 24 hours of application or application timed to minimize volatilization. The agency also recommends using nitrification inhibitors, urease inhibitors (to slow ammonia volatilization) and slow or controlled release

fertilizers to more closely match nutrient release with plant uptake. Operators might also modify the chemistry of the manure by modifying the animal's diet to reduce nutrient content (e.g. adding alum to waste, feeding high phytase corn to poultry, switching to a pasture based grazing system, grow more on-site feed, or reducing the amount of phosphorous in the feed ration.)[364]

Georgia

The state has a separate set of rules for swine feeding operations which include a more robust monitoring regime. Permits for existing operations with more than 3,000 AU will contain specific requirements for monitoring the storage lagoon effluent to be land applied, and for the ground water monitoring wells. This will usually consist, at a minimum, of semiannual monitoring of the effluent for Total Kjeldahl Nitrogen (TKN) and Nitrate Nitrogen (NO3 –N) as well as semiannual monitoring of the wells for TKN and NO3-N. Monitoring may be required to determine soil phosphorus adsorption, sodium adsorption ratio, cation exchange capacity, and cumulative loading of copper and zinc. Permits for operations expanding to more than 3,000 AU require quarterly effluent monitoring for BOD5, TSS, TKN, NH3, NO3 and pH. Monitoring wells will be sampled quarterly for specific conductivity, NO3, pH and depth to ground water. Monitoring will also be required to determine soil phosphorus adsorption, sodium adsorption ratio, cation exchange capacity, and cumulative loading of copper and zinc.[365]

Indiana

Indiana Administrative code requires a minimum acreage for manure application based on agronomic rates for potentially available nitrogen provided by a laboratory soil and manure test, or not to exceed 105 pounds of potentially available nitrogen per acre per year for confined feeding operations in the absence of test results.[366] Solid manure that is staged for land applications must be covered and applied to site within 90 days, with the caveat that manure cannot be staged at all within 300 feet of surface waters of the state, drainage inlets, including water and sediment control basin, or water wells unless there is a barrier or surface gradient that re-routes runoff. Staging is also prohibited on waterways and areas with a slope greater than 6%, unless runoff is controlled. There is no prohibition on applications to fields regarding slope.[367] Liquid manure must be applied in accordance with a department approved spray irrigation plan with installation of devices to detect pressure loss due to leaks and requiring a shut-down. Spray irrigation must not be applied to any land that has less than twenty inches of topsoil above the bedrock. Spray irrigation in a floodplain must be specifically addressed in the plan and approved by the commissioner. Liquid or solid manure must not be applied to highly erodible land unless there is a residue protection or cover crop or the application is in accordance with a conservation plan. Also, manure application equipment must not operate on a public road.[368] The IDEM retains the authority to require additional BMPs, monitoring, or other protective measures, if determined to be necessary to protect human health or the environment.[369]

Iowa

Per Iowa Code 459.312(10)2b, published in 2003, the Department of Natural Resources was required to develop a state comprehensive nutrient management strategy.[370] The plan was to include a budget for the maximum volume, frequency, and concentration of nutrients for each watershed that addresses all significant sources of nutrients in a water of this state on a watershed basis, the assessment of the available nutrient control technologies required to identify and assess their effectiveness, and the development and adoption of administrative rules to establish a numeric water quality standard for phosphorus.

Inputs for budget calculation include commercial fertilizer, manure, atmospheric deposition, legume fixation, human waste and industrial waste. Outputs include: harvest, fertilizer and manure volatilization, crop volatilization, stream loads and denitrification. As of 2005, inputs and outputs for 68 major watersheds. The results of the budget calculation are to inform the overall nutrient strategy including assessment of the impact of nutrients on Iowa waters, evaluation of effectiveness of nutrient control strategies, development and adoption of nutrient water quality standards, and development of an implementation plan to identify methods and costs of meeting adopted nutrient standards.[371] The United States Department of Agriculture National Soil Tilth Laboratory published “Assessments of Practices to Reduce Nitrogen and Phosphorous Nonpoint Source Pollution of Iowa’s Surface Waters” in 2004.[372]

The agency has not developed cumulative pollutant loading rates for nutrients.[373] At this time the DNR has chemical Water Quality Standards for each of the three classes of designated use waters. [374] Operations using anaerobic lagoons or other earthen manure structures must maintain a minimum of two feet of “freeboard” at all times, meaning the liquid level of the structure must never get within two feet of overflowing. Upon closure of an operation, the owner is responsible for removing and properly disposing of all manure from storage structures.[375]

<u>Kansas</u>
CAFOs must be located 200 feet away from and down gradient from surface water drinking water supplies unless adequate provisions are made to prevent contamination from surface or sub-surface drainage from the CAFO reservoirs. CAFOs should not be located in the 100 year, 24-hour floodplain without adequate protection.[376]

<u>Massachusetts</u>
The EPA is the permitting authority in Massachusetts and thus implements the CAFO regulations at livestock operations that meet the definition of a "Large" or "Medium" CAFO and at designated small and medium operations with water quality impacts. EPA is the authority that will designate medium and small facilities as CAFOs should the facility be determined to be a significant contributor of pollutants to surface waters. The Department of Agricultural Resources (MDAR) has developed a cooperative agreement with EPA regarding the implementation of the CAFO rule. EPA will generally focus on permit development and issuance. MDAR will assist farmers in determining whether their operations meet EPA's regulatory definitions of a CAFO. MDAR is directly providing outreach and education to AFO operators on both EPA's regulatory CAFO program and the availability of technical and financial assistance programs which can help farmers to better protect water quality.

Most of the state’s livestock operations typically would be considered as small or medium operations. For small and medium AFOs, EPA favors an approach, other than NPDES permitting to help medium and small AFOs avoid having conditions that would result in those facilities being defined or designated as CAFOs. For example, the voluntary development and implementation of a Comprehensive Nutrient Management Plan (CNMP) prepared in accordance with the CNMP Technical Guidance issued by NRCS should in most circumstances help operations avoid having conditions that could result in their being defined or designated as a medium or small CAFO. EPA's approach is documented in an agreement between EPA and USDA relative to the implementation of the CAFO rule.[377]

The state offers a set of managerial BMPs: 1) avoid manure application to frozen soils, or if necessary only spread on sod-covered fields; 2) avoid manure application to saturated soils and areas prone to flooding; 3) avoid manure application on sloped lands, near wetlands, or within 200 feet of water source unless it can be immediately incorporated. Incorporate all manure within 72 hours of application; 4) test soils and manure to determine nutrient needs, application should not exceed needs; 5) create a composting site to shrink the weight and volume of the manure, decrease odor and amount of pathogens; 6) install and maintain buffer areas. Structural BMPs encourage covered manure storage with capacity for 2-6 months of manure; 2) control of runoff by grading or filling to direct runoff to a controlled outlet such as a settling basin; 3) installation of grass strips and waterways as natural filters; 4) installation of fencing and/or stream crossings to prevent livestock from accessing water resources; 5) construction of stream crossings, diversions or terraces, and grassed waterways.[378]

<u>Michigan</u>
The Michigan legislature passed the Michigan Right to Farm Act in 1981 which requires the establishment of Generally Accepted Agricultural and Management Practices (GAAMPs).Agricultural producers who voluntarily follow these practices are provided protection from public or private nuisance litigation under the Right to Farm Act. These practices include regular soil sampling, utilization of Michigan State University fertilizer recommendations, manure analysis (percent dry matter, ammonium N, and total N, P, K), N- and P-based agronomic rates, uniform application to reduce ponding, use of conservation practices to mitigate for slope runoff risk, avoiding application to frozen or snow-covered soils, record keeping for manure analyses, soil test reports, and rates of manure application for individual fields. Manure should not be applied to soils within 150 feet of surface waters or to areas subject to flooding unless the operator incorporates the surface applied material within 48 hours or engages in conservation practices ensuring protection against runoff and erosion losses to surface waters. Lastly, where application of manure is necessary in the fall rather than spring or summer, operators should apply to manure to medium or fine rather than to coarse textured soils; delay applications until soil temperatures fall below 50°F; and/or establish cover crops before or after manure application to help remove NO3-N by plant uptake.[379]

<u>Minnesota</u>
Manure management plans require a description of protective measures taken to minimize the risk of surface water and ground water contamination when applying manure in a floodplain, special protection area, soils with less than three feet above limestone bedrock, drinking water supply management areas where the aquifer is designated vulnerable under Chapter 4720, and land within 300 feet of all surface tile intakes, sinkholes without constructed diversions, and uncultivated wetlands. The agency notes “protective measures include, but are not limited to, soil and water conservation measures, timing of application, methods of application."[380] Also, animals of a CAFO or of a facility capable of holding 1,000 or more animal units must not be allowed to enter waters of the state.[381]

Missouri
Irrigation systems must have automatic shut-off devices in case of pressure loss and/or an operator on-site at all times during operation to monitor application equipment.[382] Field specific assessments of potential N & P transport are required and there are number of storage design standards.[383]

Nebraska
Nutrient management plans are required and BMPs are listed in Chapter 12.[384] Operators using an irrigation distribution system must submit a plan for Department approval with details of the type and location of mechanical devices to be installed. The plan must indicate whether or not there are any water source connections (such as well heads or surface water diversions), show the location of the water source, indicate whether or not the system will be completely disconnected from the water source when the irrigation system is used for land application, and detail the type and location of all piping and mechanical devices.[385]

New Hampshire
By legislative mandate the state agricultural advisory board, the commissioner of environmental services, the US NRCS, and the New Hampshire agricultural experiment station, the university of New Hampshire cooperative extension and other appropriate agencies were required to publish best management practices for handling manure, agricultural compost, and commercial fertilizer. These BMPs are not included in the legislation, however if the state suspects improper manure handling and can link the problem to a failure to use the BMPs, the commissioner will determine who is responsible for such handling, identify the changes required to comply with the BMPs, notify the individual, and require a plan for compliance if the corrections are not made within 10 days. If the individual does not comply the health officer for the municipality and the commissioner of environmental services will be contacted to take action "as their authority permits."[386] The "Manual of Best Management Practices (BMPs) for Agriculture in New Hampshire: Nutrient Best Management Practices for Agricultural Nonpoint Source Pollution" was revised in July 2008.[387]

New Jersey
The state adopted the Natural Resource, Agriculture, and Engineering Service "Field Guide to On-Farm Composting"[388] by reference as the agricultural management practice for on-farm compost operations on commercial farms.[389]

North Carolina
Waste discharge to surface waters is prohibited except when controlled by BMPs in accordance with NRCS standards and approved by the Division of Water Quality and adequately prevent discharge.[390] Additional permitting documentation is available from the NC Division of Water Quality.[391] In 1993 the North Carolina Water Quality Nondischarge Rules require Certified Animal Waste Management Plans (CAWMP) for all farms meeting the definition of a feedlot.[392] The CAWMP must include 1) a waste utilization plan (WUP) with the amount of plant available nitrogen (PAN) produced and utilized by the facility, 2) the method which waste is applied to the disposal fields (e.g. irrigation, injection), 3) a map of application fields, 4) soil series, 5) crops grown, 6) realistic yield expectation (RYE) for every crop in the plan, 7) the PAN applied to each field, 8) waste application windows, 9) required NRCS standard specifications, 10) site schematic, 11) emergency action plan, 12) insect control checklist with best

management practices noted, 13) odor control checklist with BMPs noted, 14) mortality control checklist, 15) lagoon/storage pond capacity documentation, 16) operation and maintenance plan.

The Lagoon Conversion Program, signed into law in August 2007, is a component of the Agricultural Cost Share Program providing up to 90% of cost share to convert existing swine lagoon and sprayfield systems to innovative animal waste management systems. Performance standards include substantially eliminating nutrient and heavy metals in soils and groundwater. [393] The permit application for "Innovative Animal Waste Management System Permit" requires information on the operations design capacity (i.e. number and type of animal), acreage available and required for application as listed in the CAWMP, number of lagoons/ponds, presence of subsurface drains within 100 feet of application fields and if they are under the waste management system, and a Department of Water Quality official classification of down-slope surface waters which overflow from the facility would flow toward.[394]

North Dakota

The state has a dedicated funding program to support operators in initiating BMPs called the North Dakota Livestock Waste Management State Revolving Fund Program.[395]

Ohio

Ohio's land application rules are very sophisticated, with detailed regulation on file as administrative code.[396] Manure management plans are required that minimize loss and spillage of manure. BMPs are required to divert clean water from the production area and to reduce nutrient runoff by crop rotation, cover crop or residue management. To avoid surface application of manure to frozen or snow covered ground, operators must ensure manure storage capacity by November of each year for a minimum of one hundred twenty to one hundred eighty days. The Ohio State University Extension offers a number of land application BMPs.[397]

Oregon

Liquid manure irrigation systems should have delivery mains buried wherever practicable to minimize the amount of pipe exposed to the hazards of surface damage and failure. Manure slurry delivery pipelines crossing streams or gullies should be permanently placed with adequate protection from streamflow hazards and/or braced to prevent excessive bending stress in the pipe.[398] The Oregon Department of Agriculture oversees an Agricultural Water Quality Program that addresses agricultural water quality issues by developing watershed-based Agricultural Water Quality Management Areas for which a local advisory committee (LAC) is created to involve local farm operators with problem identification and solutions.[399] The Department of Agriculture also has specific rules regarding enforcement including violation ratings to inform civil penalty fees.[400]

Texas

Operators must use backflow prevention devices in irrigation systems. Application rates in the 100-year flood plain are limited by the hydrologic needs of the crop. Irrigation practices must minimize ponding or puddling of wastewater on the site, prevent tailwater discharges, and prevent the occurrence of nuisance conditions. Any CAFO operator who engages in land application of waste must develop and implement a nutrient management plan (NMP) in accordance with the Natural Resources Conservation Service Code

590 Practice Standard. The plan must include site-specific nutrient management practices that ensure appropriate agricultural utilization of nutrients in the manure, litter, or wastewater.[401]

Washington

Nutrient management plans are required for all permitted CAFOs and should conform with the USDA NRCS Field Office Technical Guide or equivalent BMPs. The NMP must include BMPs necessary to implement applicable effluent limitations and standards, ensure adequate storage of manure, mortality management, divert clean water from the production area, prevent animal contact with surface waters, proper chemical management, installation of conservation practices to control runoff, testing and monitoring protocols, expression of application rate determination, and record keeping.[402]

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Afterword

The goal of this research effort has been to document and benchmark the wet weather regulations and policies of individual state, super-state, and federal environmental agencies within the United States. The active participation and cooperation of knowledgeable agency personnel within the state, super-state, and federal environmental organizations in responding to the survey questionnaires provided essential information to achieve this goal. . While the individual survey participants are too numerous to list even by the corresponding division within each agency, the research team acknowledges, commends and sends special thanks to those agencies and their professional staff who participated in each survey, as documented in the introductory section of Chapters 1-8 of this Report.

To carry out this research initiative, the creation of electronic surveys became necessary because of several problems associated with a solely Internet based research effort. For example, due to variations in organization and presentation, it was found to be time consuming to scan individual state environmental agencies' web pages. Furthermore, it is often uncertain whether the information posted to such web pages constitutes the most updated and current version of a given permit or regulatory practice.

Another substantial and frequent limitation arose in the form of an observed discontinuity between the survey results and information contained in an agency's current permit. Possible explanations for this disparity include misunderstood questions, incorrect entry to questions (causing the respondent to be automatically directed to skip subsequent questions), as well as respondents who were not correctly identified as being the most knowledgeable about a given wet weather regulatory issue.

The Research Team hopes that the information compiled in this Report will be of use and value not only to the Water Bureau of the State of Michigan but to other agencies and organizations who are addressing wet weather issues throughout this country and elsewhere in the world. This compendium Report is designed to facilitate the exchange of information, knowledge, and experience directed to the application of rules, regulations and policies designed to mitigate adverse environmental impacts of wet weather flows to surface waters. Please note that any errors or incorrect information presented in this document remain the responsibility of the Research Team.

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WET WEATHER CATEGORIES
The benchmarking questions are ranked by priority (HIGHEST {HHH}, SECOND PRIORITY {HH}, and THIRD PRIORITY {H}).

FIRST PRIORITY (HHH)

1. Urban Living Work Group

The benchmarking questions are ranked by priority (HIGHEST {HHH}, SECOND PRIORITY {HH}, and THIRD PRIORITY {H}). Within each priority, the Urban Living Work Group's questions are separated into the four categories of wet weather discharges occurring in urban areas. They are: (A) Combined Sewer Overflows (CSOs); (B) Sanitary Sewer Overflows (SSOs); (C) Industrial Storm Water; and (D) Municipal Storm Water.

A. Combined Sewer Overflows (no highest priority issues)

B. Sanitary Sewer Overflows (no highest priority issues)

C. Industrial Storm Water

- What unit(s) of government in your state or sub-state jurisdictions enforces industrial storm water permits?

- Is the unit(s) of government in your state or sub-state jurisdictions that issue industrial storm water permits empowered to impose/require reduction of the quantity of industrial storm water discharges? If so:

  What are the techniques utilized to achieve the required reduction in the quantities of industrial storm water discharged? Please provide any relevant examples associated with the reduction of the quantity of industrial storm water discharges:

  Are new or innovative practices encouraged or required (i.e., Low Impact Development)

  How are Total Maximum Daily Load (TMDL) goals utilized in establishing controls to reduce the quantity of industrial storm water discharged?

  Please list any other examples utilized in your state or sub-state jurisdictions to reduce the quantity of industrial storm water discharged.

D. Municipal Storm Water

Please provide the following information for Municipal Separated Storm Water Discharges (MS4s).

- Monitoring
  - Do your MS4 permits contain monitoring requirements? If yes, please explain how those requirements were determined.
    - What pollutants are monitored?
    - What are the limits for the pollutants monitored?
    - What are the limits based on?
    - (Do they provide methodological guidance –specify analytical methods?
    - With regard to sample collection – do they recommend/use grab, composite, first flush, flow-weighted, or a variety depending on monitoring focus?
    - Is the monitoring a continuous requirement or do they have a target number, or bracketed time period (i.e. weekly, monthly) within which to get the data?
    - Do they have different seasonal requirements to deal with winter storms and sampling issues (in places with winter weather below freezing)?
    - Monitoring conducted by whom?
  - How are Total Maximum Daily Load (TMDLs) goals utilized to further control MS4 discharges beyond the 6 minimum measures? What pollutants are addressed through TMDLs (i.e., phosphorus, e. coli, etc?)
  - Are there additional monitoring requirements for the permittee if they discharge to TMDL water body? If yes, please describe.
  - How is the permittee-generated monitoring data used?
    - Why is it being used or not used?
    - Is additional sampling or follow up sampling required?
    - Are additional controls required based on the monitoring results?
- What is the state's involvement in the public education process?
- Please describe any monitoring that your state is performing to support or advance the Municipal Storm Water Program for unregulated communities.

2. Water Quality Based Effluent Limits (WQBELs)/Standards Work Group

Has the responsible state agency explored or implemented Water Quality Standards (WQS) and/or WQBELs for wet weather discharges? If so, please elaborate on the topics shown below:

- What water quality standards (WQS) apply to wet weather discharges (i.e., parameter specific standards such as dissolved oxygen, TSS, pH, metals, hydrocarbons, etc.)? If so, please provide examples of the application of water quality standards
- At what flows (in both receiving water and in discharge flows) do the WQS and/or the WQBEL standards apply to wet weather discharges?
- Do both acute and chronic WQBELs apply to wet weather discharges? If not, on what basis is the distinction made?
- Are Whole Effluent Toxicity (WET) -based limits applied to wet weather discharges? If so, please provide representative examples of the application of these WET –based limits.
- Are models used in developing wet weather limits? If so, which model(s)?
- What types of wet weather discharges are regulated? (i.e., agricultural, urban, industrial)?
- Are wet weather discharges regulated in all water bodies, both those that are attaining WQS, and those that are non-attaining?
- Are there any water bodies listed for non-attainment of standards due to wet weather discharges? If so, which standards and what type of water bodies.

- Other than water bodies listed for non-attainment do you know of documented resource impacts from wet weather discharges

3. Monitoring Work Group

Biggest issue across the board = lessons learned…technical, organizational, communication, etc. This applies to all the technical questions listed below.

States of interest

- States that consider wet weather issues in their permitting process (Concentrated Animal Feeding Operations [CAFOs], MS4, municipal) = CA, MO, OH, OR, SC, WI
- WI, MN, VA, NJ, NY, FL
- Other states that have done interesting wet weather work = PA and WA
- Two states require water protection plans for farms greater than ten acres = OH and KY; would like to know more about that
- How much wet weather sampling do the other U.S. EPA Region 5 states (MN, WI, IL, IN, OH) do?

- What types of monitoring (if any) is conducted by your agency or by regulated parties to assess the ambient water quality impacts of wet weather?

- Has your agency made any organizational changes (increased personnel, equipment or other technology) to effectively monitor wet weather discharges or to effectively monitor the effects of those discharges on ambient surface waters? How many FTEs does your agency devote to wet weather monitoring activities?

- Does your agency monitor the water quantity related environmental impacts (e.g. stream flashiness, channel morphology, in stream habitat) on ambient surface waters caused by wet weather discharges?

4. Land Application of Waste

Emphasize the Midwestern states because of the similar climate and soil conditions

- What are your agency's regulatory requirements in your state or sub-state (some super state organizations, Frank Baldwin to follow-up) jurisdictions to ensure control of the following applications?

  - Pathogens in the wastes applied to land
  - Agronomic rates for land application
  - Pollutant rates (e.g., metals) for land application
  - Pharmaceuticals that may be in land applied wastes

- Jurisdictional order to restrict land application of materials during rain events?

- What is the rainfall amount that does not authorize the application of wastes to land?

5. Earth Change Work Group

The Earth Change Committee is focusing on various *Soil Erosion and Sedimentation Control, Construction Storm Water, and NPS Programs.* Although each type of program has unique characteristics, they also have some commonalities. Our benchmarking questions relate to both performance-based and design criteria. We request the following benchmarking questions:

- What are your criteria for regulation of storm water discharges of the problem types identified above? Do you have existing or proposed legislation specifically addressing earth change programs (e.g., does your legislation address design standards, control measures, numeric limits, or performance of Best Management Practices (BMPs)?

- Does your agency recommend or require specific BMPs? If so, how are the controls selected? How did you get to the point of requiring specific BMPs (e.g., do you have a listing of BMPs on applications submitted for your permits that the contractor or consultant must identify up front for the type of project, residential, industry, Concentrated Feedlot Operations CAFOs, etc.)?

- If your agency requires a listing of specific BMPs based on project development type, how do you assess the effectiveness of those BMPs?

- Does your agency require monitoring of wet weather discharges from earth change activities? If so, what parameters are monitored, who (regulatory agency or permittee) is responsible for the monitoring, and at what frequency?

- Does your agency use models or some other assessment tool(s) to determine what controls should be used on a site or to assess the expected results of proposed controls?

- Does you regulatory approach to specific earth change sites factor in watershed wide or receiving water effects?

SECOND HIGHEST PRIORITY (HH)

1. Urban Living Work Group

The benchmarking questions are ranked by priority (HIGHEST {HHH}, SECOND PRIORITY {HH}, and THIRD PRIORITY {H}). Within each priority, the Urban Living Work Group's questions are separated into the four categories of wet weather discharges occurring in urban areas. They are: (A) Combined Sewer Overflows (CSOs); (B) Sanitary Sewer Overflows (SSOs); (C) Industrial Storm Water; and (D) Municipal Storm Water.

A. Combined Sewer Overflows (no second priority issues)

B. Sanitary Sewer Overflows (no second priority issues)

C. Industrial Storm Water

- Permitting - U.S. EPA and National Pollutant Discharge Elimination System (NPDES) delegated states. (Information on the industrial and MS4 permits used by many states is on the Storm Water Authority Web site at: http://www.stormwaterauthority.org/library/library.aspx?id=188)
    - Does the state or substate agency use multi-sector general permits or different general permits for different industrial sectors? If so, what industrial sectors are covered? How do they divide the sectors? Are there distinctions in monitoring, required controls, inspection frequencies or other areas of the sector permits?
- How does the state oversee the program, with contractor inspection with state oversight of contractor, or does the state do this itself?
    - Monitoring for industrial storm water permits
        - For sector specific permits, are the monitoring requirements different?
        - What storm event requires sampling?
        - What parameters are monitored?
        - How are they monitoring?
            - What pollutants are monitored?
            - What are the limits for the pollutants monitored?
            - What are the limits based on?
            - Do they provide methodological guidance – specify analytical methods?
            - With regard to sample collection – do they recommend/use grab, composite, first flush, flow-weighted or a variety depending on monitoring focus?

        - Is the monitoring a continuous requirement or do they have a target number, or bracketed time period (i.e. weekly, monthly) within which to get the data?
        - Do they have different seasonal requirements to deal with winter storms and sampling issues (in places with winter weather below freezing)?
        - Monitoring conducted by whom?

    - How is the monitoring data subsequently used?
        - Why is it being used or not used?
        - Is additional sampling or follow-up sampling required?
        - Are additional requirements or controls proposed based on the monitoring results?

    - How is data reported?

    - What kind of data repository do they use?

    - Are controls or permit limits based on monitoring results?

    - Is the information gathered through this monitoring effort worth the human and financial cost of collection? If so, please provide an example. If it is not worth the cost, cite the reason the data is collected-for example, rule, tradition etc.

D. Municipal Storm Water

- Please identify funding Sources for municipalities in your jurisdiction

- Are unregulated storm water discharges within the MS4 areas addressed (such as commercial establishments with large parking lots) with direct discharge to surface waters?

- Is there a current program in place to implement a Statewide Illicit Discharge Elimination (IDEP); If so- what is its status? If not, is there an implementation plan currently being drafted? Or has this issue been previously considered and rejected?

- How are other six minimum measures achieved and/ or implemented? 1. Public Education Program (PEP); 2. Public Involvement /Participation Program (PIP); 3. Pollution Prevention/Good Housekeeping Plan (PPP); 4. A Construction Storm water Runoff Plan; and a 5. Post-Construction Storm water Runoff Plan

2. Water Quality Based Effluent Limits (WQBELs)/Standards Work Group

- Has the responsible state agency explored or implemented Water Quality Standards (WQS) and/or WQBELs for wet weather discharges? If so, please elaborate on the topics shown below:

  - <u>Do any technology based limits apply to wet weather discharges? Any examples?</u>

3. Monitoring Work Group

- Are you aware of whether or not your state or other states have identified surrogate or indicator measurements that might simplify monitoring (e.g., pebble counts in riffles rather than sampling suspended sediment)?
  - o *Michigan examples: Surrogates = pebble counts in riffles for sediment loadings*

- Monitoring design: how does your state or sub state jurisdiction accomplish the following: (a) match the timing of sample collection to the hydrograph? (b) What endpoints are most useful – chemical, biological, toxicological, physical/morphologic? (c) Which chemicals have been found to frequently exceed WQS under wet weather conditions? (d) Are they looking at "emerging contaminants" – pharmaceuticals, etc? (e) Do they do real-time, continuous monitoring with sondes? (f) How about toxicity testing?

Is your state or other states of which you have knowledge monitoring wet weather pollutant loads – and if so, how?

- Mechanics of monitoring:

  (a) Does your state or sub-state jurisdiction use contactors or in-house staff?

  (b) Does your state or sub-state jurisdiction use mobile labs?

  (c) How does your state or sub-state jurisdiction achieve effective communication between state staff and contractors?

- What are the annual wet weather monitoring costs? Are these costs increasing? Decreasing? Remaining the same? Please comment

- Source identification: How does your state distinguish between different wet weather sources contributing to a single stream (e.g., upland erosion vs. stream bank erosion as sources of sediment)?
  - o *For example, Michigan has done limited bacteria fingerprinting.*

4. Land Application of Waste

Emphasize the Midwestern states because of the similar climate and soil conditions

- During the winter, how does your state or sub-state jurisdictions address land application of wastes on frozen ground?

- Does your state or sub-sate jurisdiction allow land application of wastes on fields/acreage that is tiled? If so, how is the issue of tile discharge regulated?

5. Earth Change Work Group

The Earth Change Committee is focusing on various Soil Erosion and Sedimentation Control, Construction Storm Water, and NPS Programs. Although each type of program has unique characteristics, they also have some commonalities. Our benchmarking questions relate to both performance based and design criteria.

- In your state or sub-state jurisdictions, how is BMP effectiveness routinely determined if the BMPs are not specified up front in an application (e.g., agency studies, industry research, product specifications, etc.)?

- Is BMP effectiveness determined for non-permitted sites? If so, how is this measure of effectiveness determined?

- Does your state or sub-state jurisdictions require that contractors or "BMP installers" or those individuals responsible for monitoring BMPs take training or be certified to ensure that BMPs are installed correctly?

- If contractors or BMP installers are not certified how does the state ensure that BMPs are installed and maintained correctly.

- Does your state or sub-state jurisdictions make a distinction in your regulatory approach between wetlands and other water bodies? If so, please provide an example(s)

The earth change work group requests that the following agencies be contacted to gather answers to the benchmarking questions:

U.S.:

California
Colorado……………… (Nathan Moore; 303-692-3555)
Florida ……………….. (or Water Districts within the state)
Georgia………………. (Drew Zurow; 404-675-6240)
Maryland……………… (Richard Trickett; 410-537-3543)
Massachusetts

THIRD HIGHEST PRIORITY (H)

1. Urban Living Work Group

The benchmarking questions are ranked by priority (HIGHEST {HHH}, SECOND PRIORITY {HH}, and THIRD PRIORITY {H}). Within each priority questions are separated into the four categories of wet weather discharges occurring in urban areas. They are: (A) Combined Sewer Overflows (CSOs); (B) Sanitary Sewer Overflows (SSOs); (C) Industrial Storm Water; and (D) Municipal Storm Water.

A. Combined Sewer Overflows (CSOs)

- List of states with CSOs (go online to identify the states with CSO'S)
    - o For each identified state go to the state government web page: Obtain as much information as possible to address the following questions from the state environmental agency's web page.
        - ▪ Stage of control - what levels of control are CSOs in each state meeting?
        - Design/control standards - does the state follow U.S. Environmental Protection Agency's (U.S. EPA's) model or does the state have its own standards? If the state follows its own standards, what are they?
        - ▪ CSO Innovative practices, examples
        - Use of green infrastructure? In what context?
        - CSO Funding sources, please cite

B. Sanitary sewer overflows SSOs

Go to each state's environmental agency web site and check for SSOs. If nothing is reported, it does not necessarily mean that the state has no SSO policy and/or procedures.

- Has your state identified SSOs within your jurisdiction?

  IF SO
    - o Does the state issue permits for SSOs? If so what are the requirements that must be met prior to discharge (i.e. disinfection plus additional treatments)?
        - ▪ Disinfection
        - ▪ Treatment Requirements Please provide an example
    - o Does your state exercise SSO enforcement discretion above a certain size storm or utilize some other set level?
    - o Does the state require elimination of the SSO

    IF SO
        - ▪ Is the elimination tied to a specific storm event? If so, what is the magnitude of that storm event?

        - What is required is required for a SSO for a storm that is greater than the specific storm event identified above?

        - What is the schedule for elimination of SSOs in your state and what means (i.e. enforcement or permits) are utilized to compel the SSO to be reduced and subsequently eliminated?

    - What standards for reduction of SSOs inflow and infiltration are utilized in your state? **(**i.e. EPA has defined excessive inflow as > 275 gallons per capita per day (gpcd) during any storm event and excessive infiltration as >120 gpcd during periods with high groundwater flow in EPA Handbook: Sewer System Infrastructure Analysis and Rehabilitation, EPA 625/6-91/030, 1991)

- Blending – What is your state doing with regard to blending treated waste water with the mixture of storm water and raw sewage received at the POTW during storm events?
    - Is blending considered to be a permanent solution or a temporary solution?
    - Does the Blending operate with an interim (design standard) authorization?
    - If Blending is a temporary solution, is there a plan and schedule to eliminate blending in the future?

- Enforcing standards/requirements: Please list your state's enforcement standards and enforcement requirements for SSOs

- Funding sources: please identify your funding sources for addressing SSOs.

C. Industrial Storm Water
- What mechanisms, if any, does your state utilize to monitor and permit non-regulated entities (industrial categories not listed in CFR 122.26) as significant contributors to discharge of industrial storm water?
- Does your state Monitor Industrial Storm Water Discharges? If so what accuracy is associated with this monitoring?

D. Municipal Storm Water

- How does your state rank the relative importance of Illegal Discharge Elimination Programs (IDEP) vs. Public Education Programs (PEP) with regard to reducing pollution from municipal storm water discharges?

- Does your state utilize contractor inspection of municipal storm water discharges with state oversight of the contractor?

- Are unregulated communities addressed? Note: What constitutes unregulated communities?
    - Significant contributors
    - Smaller communities

2. Water Quality Based Effluent Limits (WQBELs)/Standards Work Group

Has the responsible state agency explored or implemented Water Quality Standards (WQS) and/or WQBELs for wet weather discharges? If so, please elaborate on the topics shown below:

- For example, what agency within your state enforces wet weather WQBEL compliance?
- For example, what agency within your state authors the permits?
- How are wet weather discharge flows established?
- How do you address exposure duration issues in the use of WQS and WQBELs for wet weather water quality control? For example, are four-hour exceedances of WQS acceptable but eight-hour exceedances not acceptable?
- Are there other regulations in your state (besides the NPDES Permit Program) that address wet weather discharges? If so, please cite.
- How do you impose WQBELs?

    a. through voluntary compliance,
    b. policy implementation, or
    c. standards-based regulation?

- Do you have statutory authority to derive and implement wet weather WQBELs?
- How is the issue of stream flashiness/excessive flow, addressed by WQS/WQBELs, if at all?

What were the major barriers and challenges in developing and implementing wet weather discharge regulation in your state? If so, please provide examples

What agencies to poll?

- U.S. EPA Region (all Regions 1-10?)
- U.S. EPA Headquarters
    - o U.S. EPA Urban Watershed Management Research:
  http://www.epa.gov/ednnrmrl/researchtopics/wetweatherflow/
- States: Great Lake States, Oregon, Washington, California
- Tribes (Which Tribes?)
- Environment of Canada (Canadian Agencies)Ministry of the Environment Ontario
- The European Union – efforts regarding wet weather
  http://cat.inist.fr/?aModele=afficheN&cpsidt=17395119

- How is Best Management Practice (BMP) effectiveness routinely determined if the BMPs are not specified up front in an application (e.g., agency studies, industry research, product specifications, etc.)?

- How is BMP effectiveness determined for non-permitted sites?

- Are contractors or "BMP installers" or those individuals responsible for monitoring BMPs required to take some sort of training or be certified in some way to ensure that BMPs are installed correctly?

- Does your state make a distinction in your regulatory approach between wetlands and other water bodies

3. Monitoring Work Group

Biggest issue across the board = lessons learned…technical, organizational, communication, etc. This applies to all the technical questions listed below.

- What other entities in your state are doing wet weather monitoring or have useful wet weather monitoring protocols – watershed groups, nonprofits, universities, professional organizations?

- Do they do Best Management Practices (BMP) performance (pollutant removal) or effectiveness (in stream benefits) monitoring, and how?

- Do they attempt to monitor wet weather impacts on wetlands?

- How do they manage their wet weather data, for optimal communication between all interested parties?

4. Land Application of Waste

Emphasize the Midwestern states because of the similar climate and soil conditions
List Minnesota, Wisconsin, Illinois, Indiana, Ohio, Iowa, Missouri: Others??

- How does your state address the historical or life history of a field that has received land application of waste?

- What does your state utilize in terms of BMPs to prevent subsequent discharge to receiving waters of land applied waste?

- What is recommended?

- What is mandated?

5. Earth Change Work Group

The Earth Change Committee is focusing on various Soil Erosion and Sedimentation Control, Construction Storm Water, and NPS Programs. Although each type of program has unique characteristics, they also have some commonalities. Our benchmarking questions relate to both performance based and design criteria. We request the following benchmarking questions:

- What compliance and enforcement options are available to your agency (i.e., what happens when a permittee violates the program requirements)?
- Have program responsibilities for earth change projects been delegated to other state departments or local government (cities, counties, commissions) agencies? If so how does your agency regulate these agencies?
- Does your agency partner or network with other agencies or programs to increase the overall effectiveness of your program

The earth change work group requests that the following agencies be contacted to gather answers to the benchmarking questions:

U.S.:

California
Colorado……………… (Nathan Moore; 303-692-3555)
Florida ……………….. (Or Water Districts within the state)
Georgia………………. (Drew Zurow; 404-675-6240)
Maryland……………… (Richard Trickett; 410-537-3543)
Massachusetts
N. Carolina
New Jersey…………… (Barry Chalofsky; 609-633-7021)
Texas
Washington

Canada:

British Columbia AND Vancouver

	Directors confirmed contacts	CSO	SSO	Ind SW Permit	Mun SW Permit	Monitoring
Alabama					incomplete	
Alaska				Y	Y	
Arizona		Y	Y			
Arkansas				Y		
California	Y	Y		Y	Y	Y
Colorado			incomplete*	Y	Y	
Connecticut	Y	Y	Y	Y	Y	incomplete
Delaware						
Florida	Y	Y	Y	Y	Y	Y
Georgia	Y	Y	Y			Y
Hawaii						
Idaho						incomplete
Illinois	Y				Y	
Indiana	Y	Y	Y	Y	incomplete	Y
Iowa	Y	Y	Y			
Kansas	Y		Y	Y		Y
Kentucky		Y	Y		Y	
Louisiana	Y	Y	incomplete	Y	Y	
Maine	Y	Y				
Maryland		Y				
Massachusetts	Y	Y	Y			Y
Minnesota		Y	Y	Y	Y	Y
Mississippi				Y	Y	
Missouri		Y	Y	Y	Y	Y
Montana	Y	Y	Y	Y	Y	
Nebraska				Y		
Nevada		Y	Y	Y	incomplete	
New Hampshire	Y	Y	Y-Region 1			Y
New Jersey	Y	Y	Y	Y		Y
New Mexico						Y
New York	Y	Y	Y			
North Carolina	Y		Y	Y	Y	Y
North Dakota		Y	Y	Y	Y	Y
Ohio	Y	Y	Y	Y	Y	Y
Oklahoma			Y		Y	
Oregon		Y	Y	Y	Y	
Pennsylvania						
Rhode Island		Y	Y	incomplete	Y	
South Carolina						
South Dakota						
Tennessee						
Texas	Y	Y	Y	Y	Y	
Utah					Y	Y
Vermont	Y			Y		
Virginia	Y	Y	Y	Y	Y	

*Incompletes are included in the total number of responses because the given agency responded to one or more of the survey questions.

	Directors confirmed contacts	CSO	SSO	Ind SW Permit	Mun SW Permit	Monitoring
Washington		Y	Y	Y	Y	Y
West Virginia		Y		Y	Y	
Wisconsin	Y	Y	Y			Y
Wyoming	Y	Y	Y			Y
EPA Region 1		Y	Y			
EPA Region 2						
EPA Region 3						
EPA Region 4			Y			
EPA Region 5			incomplete			
EPA Region 6			incomplete			
EPA Region 7						
EPA Region 8						
EPA Region 9		Y		incomplete	incomplete	
EPA Region 10						
EPA HQ			Y			
DRBC						
NEIWPCC						
SRBC						
IEC						
ORSANCO	Y					Y
Total	23	31	33	27	27	21

*Incompletes are included in the total number of responses because the given agency responded to one or more of the survey questions.

	Ind WQBEL	Mun WQBEL	Cons WQBEL	NPS Cons	Cons SW	Biosolids	Manure
Alabama							
Alaska							
Arizona						Y	
Arkansas							
California		Y					
Colorado							
Connecticut	Y	Y	Y		Y	incomplete	Y
Delaware							
Florida	Y	Y	Y	Y	Y	Y	Y
Georgia			incomplete	incomplete		Y	
Hawaii							
Idaho							
Illinois							
Indiana	incomplete	Y	Y	Y	Y		Y
Iowa				Y		Y	Y
Kansas	Y		Y	Y	Y	Y	Y
Kentucky			Y				
Louisiana	Y		Y	Y	Y	Y	
Maine				Y		Y	
Maryland							
Massachusetts					Y	Y	incomplete
Minnesota	Y	incomplete	Y	Y		Y	Y
Mississippi							
Missouri	Y	Y	Y	Y	Y	Y	
Montana	Y	Y	Y		Y	Y	
Nebraska							Y
Nevada	Y		Y	Y		incomplete	
New Hampshire			Y				Y
New Jersey				Y		Y	incomplete
New Mexico				Y			
New York						Y	
North Carolina	Y		Y	Y	Y	Y	Y
North Dakota	Y	Y	Y	Y	Y	incomplete	Y
Ohio		incomplete			Y	Y	Y
Oklahoma		Y					
Oregon	Y	Y	Y	Y	Y	Y	Y
Pennsylvania							
Rhode Island							
South Carolina							
South Dakota				Y			
Tennessee							
Texas	Y	Y	Y		Y	Y	Y
Utah			Y		Y		
Vermont	Y	Y	Y	Y	Y	Y	
Virginia	Y			Y	Y	Y	

*Incompletes are included in the total number of responses because the given agency responded to one or more of the survey questions.

	Ind WQBEL	Mun WQBEL	Cons WQBEL	NPS Cons	Cons SW	Biosolids	Manure
Washington	Y	incomplete	Y		Y	Y	incomplete
West Virginia							
Wisconsin	incomplete					Y	
Wyoming							
EPA Region 1							
EPA Region 2				Y			
EPA Region 3				Y			
EPA Region 4							
EPA Region 5							
EPA Region 6						Y	Y
EPA Region 7				incomplete			Y
EPA Region 8				incomplete		Y	Y
EPA Region 9	Y	Y	Y	incomplete	Y	Y	
EPA Region 10							Y
EPA HQ						incomplete	
DRBC							
NEIWPCC							
SRBC							
IEC							
ORSANCO							
Total	18	15	20	23	18	28	20

*Incompletes are included in the total number of responses because the given agency responded to one or more of the survey questions.