



# Recommended Best Management Practices for Bacteria

## Total Maximum Daily Load Fact Sheet

### About Bacteria as an Indicator

Water quality degradation due to bacteria pathogen pollution is a major concern in the United States. Bacteria coliforms live in the intestines of warm-blooded animals (humans, pets, farm animals, and wildlife). Fecal coliform bacteria are a kind of coliform associated with human or animal wastes. *Escherichia coli* (*E. coli*) are part of the group of fecal coliforms. Coliforms generally do not pose a danger to people or animals, but they indicate the presence of other disease-causing bacteria, such as those that cause typhoid, dysentery, hepatitis A, and cholera. Both coliforms and disease-causing bacteria live in water, but unlike coliforms, disease-causing bacteria generally do not survive long enough in the water, outside the body of animals, to be detected. Sampling and testing for the presence of disease-causing bacteria is therefore difficult; instead, scientists and public health officials consider the presence of coliforms as an indicator of disease bacteria in recreational, drinking, and flood waters.

Fecal coliform and *E. coli* bacteria originate in human, pet, livestock, and wildlife waste. Amounts tend to be lower in forested and wetland-rich areas and higher in agricultural and more heavily populated urbanized areas. Pathways include direct routes to surface waters (illicit septic systems connections, wastewater treatment facility discharge points, cross connections, and urban stormwater systems), spills or runoff from mismanaged animal waste, runoff or movement through soil from agricultural lands that receive manure applications, runoff of wildlife droppings, and direct deposition into waterways by wildlife or grazing animals. Manure management practices including manure storage and pretreatment (e.g. composting), timing and rate of application, and application method, all have the potential to reduce bacteria contamination of surface and groundwater. Bacteria levels do not necessarily decrease as a watershed develops from rural to urban. Instead, urbanization usually generates new sources of bacteria.

### Sources of Bacteria

The primary sources of bacteria coliforms, fecal coliform, and *E. coli* are:

- **Household, Small Flow On-site (SFOSTS) and Commercial Sewage Treatment System Effluent**

Household, Small Flow On-site, and commercial sewage treatment systems (STS)<sup>1</sup> are needed to treat wastewater in areas that are not accessible to a sanitary sewer. Many of these existing systems may not be capable of properly treating sewage leaving the property because of the system has reached its useful life, antiquated design, or system malfunction (operation and maintenance). Proper system sizing and design, STS owner education, and operation inspections

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1 - STS also includes home sewage treatment systems (HSTS) as referenced by the MS4 NPDES OHQ000003.

and maintenance of systems are essential to help prevent future contamination to waterways and public health nuisances. The possibility of direct or indirect exposure to human waste increases considerably when an STS is not functioning properly. Human waste contains high amounts of pathogens/bacteria that often lead to illness upon exposure. Proper functioning of STS is important to limit the environmental impact of human waste. The most commonly identified impact from failing STSs has been contamination to surface water, particularly in areas with large numbers of discharging STSs.

- **Wastewater**

Properly designed, operated, and maintained sanitary sewer systems are meant to collect and transport all of the sewage that flows into a publicly owned treatment works (POTW) facility. However, occasional unintentional discharges of raw sewage from municipal sanitary sewers occur in almost every system. These types of discharges are called sanitary sewer overflows (SSOs). SSOs have a variety of causes, including but not limited to blockages, line breaks, sewer defects that allow storm water and groundwater to overload the system, lapses in sewer system operation and maintenance, power failures, inadequate sewer design, etc.

- **Storm Water**

Traditional drainage systems concentrate runoff from land surfaces and remove it as quickly as possible by a system of gutters, curbs, pipes, sewers, ditches, and channels. The result is large amounts of fast-moving and sometimes highly polluted water discharging into local streams and rivers, causing erosion, flooding, and unstable stream channels. In urbanized areas, bacteria pollution in stream waters comes from failing or malfunctioning STS, cross-connections, infiltration and inflow (I & I), improper solid waste management, and pet waste. As a result, untreated sewage along with storm water is discharged directly into rivers and streams. Storm water runoff also picks up bacteria pollution as it travels overland from domestic pets, wildlife, farm animals, and agricultural land uses.

### **Best Management Practices that Address Bacteria TMDLs**

The following summarizes BMPs your community will be required to include in your revised Storm Water Management Program (SWMP) to meet the minimum performance standards of NPDES Permit #OHQ000003. Furthermore, it suggests means by which a community can tailor their SWMP to specifically address the Bacteria TMDL.

#### **MCM 1: Public Education and Outreach BMPs**

Your program must reach at least 50% of your population. To do so, your community is required to implement more than one mechanism and target at least 5 different storm water themes or messages over the permit term, at least one of which must be targeted to the development community.

<b>To address Bacteria, choose at least one of the following themes:</b>
<ul style="list-style-type: none"><li>• Protection and maintenance of natural vegetative buffers along waterways</li><li>• Management of manure and pet wastes</li><li>• Reduction of impervious surfaces and the increase of on-site infiltration</li><li>• Composting and management of grass clippings and yard wastes</li><li>• Operation &amp; Maintenance of discharging and non-discharging sewage treatments systems</li><li>• Open or illegal dumping</li></ul>

## MCM 2: Public Participation and Involvement

Your program shall include a minimum of five public involvement activities over the permit term.

To address Bacteria, implement at least one of the following activities:
<ul style="list-style-type: none"><li>• Identify locations for riparian restoration activities, engage the public in the planting of native vegetation</li><li>• Storm drain stenciling</li><li>• Establish “pick-up pet waste” stations for residents on public property, parks, city buildings, cemeteries, etc.</li><li>• Host agricultural best management practices workshops for manure management and application</li><li>• Work with local health department to educate property owners on sewage treatment system operation and maintenance</li><li>• Open or illegal dumping</li><li>• Establish public reporting mechanism (complaint hotline, webpage, etc.) to identify non-compliance from construction sites,</li></ul>

## MCM 3: Illicit Discharge Detection and Elimination (IDDE)

*All communities should have an applicable IDDE code in place and have developed an MS4 map, as required by previous generations of the MS4 permit.*

Required BMPs that directly address Bacteria:
<ul style="list-style-type: none"><li>• Maintain and continue updating the MS4 map on an annual basis (i.e., outfalls, names and locations of surface waters that receive discharges from those outfalls, catch basins, pipes, ditches, flood control facilities (retention/detention ponds), post-construction water quality BMPs and private post-construction water quality BMPs which have been installed to satisfy Ohio EPA’s NPDES Construction Storm Water general permit and/or your local storm water management code requirements)</li></ul>
<ul style="list-style-type: none"><li>• Work with local health department to routinely inspect Sewage Treatment Systems<sup>1</sup> (STS) to ensure the proper operation and maintenance</li></ul>
<ul style="list-style-type: none"><li>• Develop and maintain a list and map of STS that discharge to your MS4; work with the local health department to identify and prioritize solutions to failing STS</li></ul>
<ul style="list-style-type: none"><li>• Work with your local health department to eliminate illicit discharges from failing sewage treatment systems (i.e., installation of sanitary sewer, convert to on-lot STS (non-discharging), or replacement of STS with coverage under residential NPDES permit (discharging))</li></ul>
<ul style="list-style-type: none"><li>• Develop, implement, and eliminate confirmed cross connections that are contributing to illicit discharges</li></ul>
<ul style="list-style-type: none"><li>• Based upon data collected from previous screenings, establish a prioritization schedule for ongoing dry-weather screening of outfalls</li></ul>
<ul style="list-style-type: none"><li>• Develop an IDDE plan that clearly defines the department(s) and/or agency(s) responsible for investigating and resolving confirmed sources of illicit discharges</li></ul>
<ul style="list-style-type: none"><li>• Develop an enforcement escalation plan that outlines how your community will address illicit discharges<ul style="list-style-type: none"><li>○ Clearly define escalation enforcement roles between affected agencies</li><li>○ Work with local health department to identify and eliminate failing sewage treatment systems</li><li>○ Establish timeframes for investigation and elimination</li></ul></li></ul>
<ul style="list-style-type: none"><li>• Document in the SWMP how community emergency spill response and cleanup plans are communicated and coordinated between applicable agencies and/or departments</li></ul>

<ul style="list-style-type: none"> <li>• Train street, service, public works, building, and parks and recreation staff to identify sources of illicit discharge</li> </ul>
<p><b>BMPs that will enhance your community’s ability to address Bacteria:</b></p>
<ul style="list-style-type: none"> <li>• Establish an IDDE surveillance plan focused on sources of Bacteria such as: <ul style="list-style-type: none"> <li>○ Sewage treatment systems</li> <li>○ Cross-connections</li> <li>○ Infiltration and Inflow (I &amp; I)</li> <li>○ Animal waste (agricultural and pet)</li> <li>○ Grass clippings and yard waste</li> </ul> </li> </ul>
<ul style="list-style-type: none"> <li>• Establish a schedule for regular meetings or other communications between third-party service providers (e.g., health department, SWCD, etc.) and the MS4 manager</li> </ul>
<ul style="list-style-type: none"> <li>• Ensure that your IDDE surveillance program includes commitments to perform annual dry weather screening in areas where at least one previous test indicated elevated bacteria levels</li> </ul>
<ul style="list-style-type: none"> <li>• Perform at least one screening of all outfalls per permit term</li> </ul>

1 - STS also includes home sewage treatment systems (HSTS) as referenced by the MS4 NPDES OHQ000003.

**MCM 4: Construction Site Runoff**

*All communities should have an applicable construction runoff control code in place as required by previous generations of the MS4 permit.*

<p><b>Required BMPs that directly address Bacteria:</b></p>
<ul style="list-style-type: none"> <li>• Update your existing construction runoff control code to meet or exceed the requirements of the NPDES Construction General Permit (OHC000004), including the federal effluent limitations in Part II</li> </ul>
<ul style="list-style-type: none"> <li>• Protect and maintain wetlands in their natural states - wetlands filter nitrogen as well as other nutrients and pollutants</li> </ul>
<ul style="list-style-type: none"> <li>• Protect and maintain natural vegetative buffers to filter storm water runoff</li> </ul>
<ul style="list-style-type: none"> <li>• Ensure portable toilets are maintained and emptied without spills</li> </ul>
<ul style="list-style-type: none"> <li>• Establish a standard operating procedure to respond to complaints</li> </ul>
<p><b>BMPs that will enhance your community’s ability to address Bacteria:</b></p>
<ul style="list-style-type: none"> <li>• Ensure proper storage of landscape materials on construction sites</li> </ul>
<ul style="list-style-type: none"> <li>• Develop an enforcement escalation plan that outlines how and when your community will address noncompliance with approved erosion, sediment and non-sediment control plans</li> </ul>
<ul style="list-style-type: none"> <li>• Require MS4 compliance inspectors to provide a written report of findings to construction site operators for every site inspection; the report would summarize compliance and non-compliance matters</li> </ul>

## MCM 5: Post-Construction Runoff Control

All communities should have an applicable storm water management code in place as required by previous generations of the MS4 permit.

<b>Required BMPs that directly address Bacteria:</b>
<ul style="list-style-type: none"><li>• Update your existing storm water management code to meet or exceed the requirements of NPDES OHC000004, including the federal effluent limitations in Part II</li></ul>
<ul style="list-style-type: none"><li>• Ensure the most current post-construction BMP standards are required to be utilized (e.g., Rainwater &amp; Land Development)</li></ul>
<ul style="list-style-type: none"><li>• Complete Storm Water Pollution Prevention Plan (SWP3) reviews and approvals prior to construction commencement<ul style="list-style-type: none"><li>○ Ensure SWP3 includes an executed Maintenance Agreement and Long-Term Maintenance Plan for post-construction BMPs</li><li>○ Review 100% of SWP3s where the larger common plan of development/sale disturbs one or more acres.</li></ul></li></ul>
<ul style="list-style-type: none"><li>• Conduct monthly site inspections throughout construction, as well as a final site inspection to ensure correct implementation of post-construction BMPs in the approved SWP3</li></ul>
<ul style="list-style-type: none"><li>• Establish a program to ensure long-term maintenance of post-construction BMPs, including a protocol for enforcement escalation of your storm water management code</li></ul>
<ul style="list-style-type: none"><li>• Prior to commencing earth disturbing activities, ensure 100% of applicable sites have a fully executed Maintenance Agreement for the site, including an approved Maintenance Plan for each post-construction BMP</li></ul>
<b>BMPs that will enhance your community's ability to address Bacteria:</b>
<ul style="list-style-type: none"><li>• Select post construction BMPs that eliminate or minimize bacteria, such as bioretention and constructed wetlands (as recommended by ODNR's Rainwater Manual)</li></ul>
<ul style="list-style-type: none"><li>• Allow or require vegetative practices around storm water management ponds that discourage waterfowl</li></ul>
<ul style="list-style-type: none"><li>• Develop an enforcement escalation plan that outlines how and when your community will address noncompliance with approved storm water management plans</li></ul>
<ul style="list-style-type: none"><li>• Require MS4 compliance inspectors to provide a written report of findings to construction site operators for every site inspection; the report would summarize compliance and non-compliance matters and establish a deadline for corrective action</li></ul>
<ul style="list-style-type: none"><li>• Consider adopting any of the following planning and development codes:<ul style="list-style-type: none"><li>○ Conservation development</li><li>○ Riparian and wetland setbacks</li><li>○ Downspout disconnections (redirect flow to rain gardens, rain barrel systems, open vegetated channels and/or filter strips)</li></ul></li></ul>
<ul style="list-style-type: none"><li>• Incentivize the following within existing developed areas:<ul style="list-style-type: none"><li>○ Retrofitting of storm water management ponds to function as constructed wetlands</li><li>○ Implement practices that deter waterfowl around storm water ponds</li></ul></li></ul>
<ul style="list-style-type: none"><li>• Require an applicable community department (e.g., service, engineering) to annually inspect public and private post-construction BMPs, or require private property owners to submit an annual maintenance report. Ensure corrective actions are performed as needed by the applicable party</li></ul>

## **MCM 6: Pollution Prevention & Good Housekeeping**

*As required by previous generations of the MS4 permit, all applicable community-operated facilities should have an SWPPP developed in accordance with the requirements of Ohio EPA's Industrial Storm Water General Permit.*

<b>Required BMPs that directly address Bacteria:</b>
<ul style="list-style-type: none"><li>• Update and implement facility SWPPPs to reflect minimum requirements of the Ohio EPA General NPDES Permit for Storm Water Associated with Industrial Activities (OHR000005)<ul style="list-style-type: none"><li>○ Perform inspection requirements<ul style="list-style-type: none"><li>▪ quarterly routine facility inspections, quarterly visual assessment of storm water discharges, and an annual comprehensive site inspection with annual report</li></ul></li></ul></li></ul>
<ul style="list-style-type: none"><li>• Complete an annual training for applicable employees on any combination of the topics listed below</li></ul>
<ul style="list-style-type: none"><li>• Maintain and operate community owned sewage treatment systems</li></ul>
<ul style="list-style-type: none"><li>• Ensure community-sponsored portable toilets are maintained and emptied without spills</li></ul>
<ul style="list-style-type: none"><li>• Your community is required to implement Pollution Prevention &amp; Good Housekeeping practices at the following municipally-operated facilities:<ul style="list-style-type: none"><li>○ Streets, roads and highways</li><li>○ Municipal parking lots</li><li>○ Maintenance and storage yards, including, but not limited to, municipal composting facilities and leaf collection yards</li><li>○ Golf courses, parks, and related maintenance facilities</li><li>○ Waste transfer stations, compost facilities, solid waste facilities (e.g. municipal solid waste (MSW) landfills, and construction and demolition (C&amp;D) landfills)</li><li>○ Marinas</li><li>○ Fleet and/or maintenance shops</li><li>○ Salt/sand storage locations</li><li>○ Snow disposal areas</li></ul></li></ul>
<b>BMPs that will enhance your community's ability to address Bacteria:</b>
<ul style="list-style-type: none"><li>• Programs which can be implemented to address Bacteria from the above sources include:<ul style="list-style-type: none"><li>○ Street and parking lot sweeping</li><li>○ Catch basin cleaning</li><li>○ Ditch cleaning or trash collection program for open channel MS4s</li><li>○ Waste storage in lidded or covered containers</li><li>○ Protection of catch basins and other appropriate catch basin inlets when conducting road repairs, waterline repairs, and other maintenance activities of the Service Department or Department of Public Works</li><li>○ Establish wash stations directed to sanitary sewers or utilize dry cleanup methods for lawn care equipment, golf carts, and other community vehicles and equipment used in parks and golf course maintenance</li><li>○ Locate snow disposal areas where there are wide vegetative buffers or within berms</li></ul></li></ul>
<ul style="list-style-type: none"><li>• At community-owned and operated facilities (maintenance garages, golf courses, parks, community gardens, cemeteries, etc.) maintain, protect and restore permanent natural vegetative buffers between developed areas and water resources</li></ul>
<ul style="list-style-type: none"><li>• Establish "pick-up pet waste" stations for residents on public property, parks, community buildings, cemeteries, etc.</li></ul>

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| <ul style="list-style-type: none"><li>• Relocate stockpiles of waste materials and erodible materials away from stream banks and steep slopes and/or install appropriate sediment controls around such materials</li></ul> |
| <ul style="list-style-type: none"><li>• Implement a road-kill program and properly store collected carcasses or take to a compost facility licensed to accept</li></ul>  |