MAINE DEPARTMENT OF TRANSPORTATION

GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER FROM MAINE DEPARTMENT OF TRANSPORTATION AND MAINE TURNPIKE AUTHORITY MUNICIPAL SEPARATE STORM SEWER SYSTEMS

STORMWATER MANAGEMENT PLAN

prepared for

MAINE DEPARTMENT OF TRANSPORTATION (MaineDOT)

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SECTION 1: INTRODUCTION

OVERVIEW OF REGULATORY PROGRAM

The General Permit (GP) for the Discharge of Stormwater from Maine Department of Transportation (MaineDOT) and Maine Turnpike Authority (MTA) Municipal Separate Storm Sewer Systems (MS4), or TS4 GP, was issued by the State of Maine Department of Environmental Protection (DEP) Bureau of Water Quality on August 18, 2021. The TS4 GP establishes the specific requirements that must be met by MaineDOT and MTA to obtain authorization to discharge stormwater directly to a MS4 or waters of the State other than groundwater, for discharges located in an Urbanized Area (UA) as determined by the inclusive sum of the 2000 and 2010 Decennial Census by the Bureau of Census. The TS4 GP becomes effective on July 1, 2022 and expires five years after that date but may be administratively continued if a new TS4 GP is not issued prior to the expiration date.

OBTAINING COVERAGE TO DISCHARGE

Pursuant to 40 C.F.R. §122.28(d)(2), the TS4 GP is part of a "two-step" general permit. As prescribed in Part I(B) of the TS4 GP, MaineDOT published public notice of MaineDOT's plans to file a Notice of Intent (NOI) to obtain coverage under the TS4 GP with DEP in the legal advertisement section of the Portland Press Herald and Bangor Daily News on September 16, 2021, and Lewiston Sun Journal on September 18, 2021, and also made the notice available on MaineDOT's official internet website. Additionally, a letter of notice was sent to all regulated small MS4s into which MaineDOT's MS4 discharges on September 14, 2021. Copies of these public notices have been included as **Appendix A**. A copy of MaineDOT's completed NOI form that was submitted to DEP has been included as **Appendix B**.

MaineDOT understands that once the DEP has deemed MaineDOT's NOI complete for processing it will provide the public with an opportunity for comment for a minimum of 30 calendar days. Following review of MaineDOT's NOI and any public comments, MaineDOT understands the DEP will establish the additional terms and conditions necessary to meet 40 C.F.R §122.34 by issuing a draft permittee specific DEP Order which will be subject to a formal 30-day public comment period. MaineDOT's authorization to discharge will become effective once DEP issues MaineDOT its final permittee specific DEP Order by June 30, 2022 establishing a list of required actions and a corresponding schedule of compliance. MaineDOT will then have 60 days to modify this SWMP, as applicable, to comply with the required actions and schedule specified in the final permittee specific DEP Order.

STORMWATER MANAGEMENT PLAN

This Stormwater Management Plan (SWMP or Plan) has been prepared to satisfy the requirements of the TS4 GP, including descriptions of how MaineDOT will implement the six Minimum Control Measures (MCMs), set forth in Part IV(C) of the TS4 GP, and how MaineDOT will implement the requirements for discharges to impaired waters of Part IV(E) of the TS4 GP. **Section 2** of this SWMP describes how MaineDOT will implement Best Management Practices (BMPs) to meet the

six MCMs, the persons or positions responsible for implementing each BMP, and the date by which each BMP will be implemented. In addition to addressing the six MCMs, **Section 3** of this Plan describes how MaineDOT manages, or plans to manage, direct stormwater discharges to impaired waters.

PLAN MODIFICATIONS

Within 60 days of the issuance of the DEP's final permittee-specific Order, MaineDOT will update this SWMP to include how it will meet all requirements of the DEP Order. A summary of the comments received during the public comment periods and corresponding changes to the SWMP made in response to the comments will be included as **Appendix C**. The modified SWMP will be submitted to DEP along with a narrative explaining how the SWMP was modified to be consistent with the TS4 GP and permittee specific DEP Order. A copy of MaineDOT's permittee specific DEP Order will be included as **Appendix D**.

MaineDOT will keep the SWMP current, as required by Part IV(B)2 of the TS4 GP. A copy of MaineDOT's current SWMP will be posted on its official internet website along with contact information for the person responsible for maintaining the Plan. Administrative updates to the SWMP will be summarized in the annual report following the update. Changes to BMPs that are required to comply with the TS4 GP or the final permittee specific DEP Order will be made available for public comment. Should MaineDOT wish to modify the schedule or BMPs established in the permittee specific DEP Order, MaineDOT will file an application with DEP that includes a justification for the request for modification.

PLAN AVAILABILITY

This SWMP was developed for, and will be maintained by, the MaineDOT. The primary location of this document is MaineDOT Headquarters at 24 Child Street in Augusta. A copy of the SWMP will be provided upon request by any of the entities listed in Part IV(B)1 of the TS4 GP and is available to the public on MaineDOT's internet website.

MINIMUM CONTROL MEASURES

This SWMP establishes a program of BMPs and Measurable Goals (MGs) for each of the six MCMs:

1. Education/outreach program;
2. Public involvement and participation;
3. Illicit discharge detection and elimination program;
4. Construction site stormwater runoff control;
5. Post-construction stormwater management in new development and redevelopment; and
6. Pollution prevention/good housekeeping for facility operations.

Section 2 of this SWMP addresses how MaineDOT will implement each of the six MCMs by (1) establishing MGs for which BMPs will be evaluated; (2) identifying the person(s) or position(s)

responsible for implementing each BMP; and (3) establishing a date for BMP implementation, as appropriate.

SHARING RESPONSIBILITY

As applicable, this SWMP and subsequent annual reports will identify BMPs that will be implemented by a third party. MaineDOT understands that any failure to implement the BMP by the third party remains the responsibility of the permittee.

In the event that a BMP or MCM is the responsibility of a third party under a qualifying State or federal program (i.e., under another NPDES or MEPDES permit), MaineDOT will reference the qualifying program and identify the corresponding BMPs in the SWMP. MaineDOT understands that it is responsible for implementation if the third party fails to perform and that annual confirmation of BMP implementation by the third party is required.

Interconnections to other regulated small MS4s have been identified to date as part of the previous MS4 permit. MaineDOT will continue to cooperate with host MS4 communities that operate an interconnected MS4 system with MaineDOT, if discharges impact one another. Where appropriate, a description of the respective responsibilities of the MaineDOT and interconnected MS4s under the MCM elements of the permit is provided in this SWMP.

DISCHARGES TO IMPAIRED WATERS

The TS4 GP includes requirements for discharges to impaired waters with an EPA approved total maximum daily load (TMDL) or designated as an Urban Impaired Stream (UIS). **Section 3** of this SWMP addresses compliance with these requirements.

RECORD KEEPING

MaineDOT will maintain this SWMP and the associated records required by the TS4 GP for at least three (3) years following expiration of the TS4 GP, or longer if requested by the Department or the USEPA. A copy of the SWMP and associated records will be maintained at MaineDOT Headquarters and will be made available to the public upon written request at reasonable times during regular business hours.

ANNUAL COMPLIANCE REPORT

In accordance with Part IV(G) of the TS4 GP, MaineDOT will electronically submit an Annual Compliance Report on or before September 15 of each permit year. The Annual Compliance Report will include the content specified in Part IV(G), a. through e. and will be submitted electronically via email to DEP at the following address:

MS4 Program Manager
Department of Environmental Protection
17 State House Station
Augusta, Maine 04333-0017
e-mail: Holliday.Keen@maine.gov

In the event that comments are received as a result of DEP's review of the annual report, MaineDOT understands that the specified changes to the report must be submitted to the Department within 60 days of the receipt of the comment(s).

SECTION 2: MINIMUM CONTROL MEASURES (MCMs)

MCM 1 – EDUCATION AND OUTREACH PROGRAM

Goals:

1. Raise awareness that polluted stormwater runoff is one of the most significant sources of water quality problems in Maine's waters;
2. Motivate staff and contractors to use BMPs which reduce polluted stormwater runoff; and
3. Reduce polluted stormwater runoff as a result of increased awareness and utilization of BMPs.

BMP 1.1 – RAISE AWARENESS

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT's stormwater education and outreach program will focus on Bureau of Maintenance & Operations (M&O) employees and Bureau of Project Development (PD) field staff and contractors that are responsible for constructing and maintaining MaineDOT infrastructure. MaineDOT will provide annual M&O employee training intended to raise awareness that polluted stormwater runoff is one of the most significant sources of water quality problems in Maine's waters. In addition, MaineDOT will emphasize the importance of stormwater pollution prevention during preconstruction meetings and site walks with PD construction field staff and contractors.

Measurable Goal 1.1a – MaineDOT will continue providing its annual M&O employee stormwater awareness and good housekeeping training that includes information on the effects of polluted stormwater runoff in Permit Year (PY) 1 through 5. The number and duration of training sessions, the type and content of the training, and the number of employees trained will be summarized in MaineDOT's Annual Compliance Report.

Measurable Goal 1.1b – The importance of stormwater pollution prevention will be reviewed with PD field staff and contractors prior to the start of new construction projects with an acre or more of disturbance in the MS4 UA. This review will be documented in the preconstruction meeting notes which will be retained in each construction project's records. A summary of new projects with an acre or more of disturbance in the MS4 UA during the PY will be included in MaineDOT's Annual Compliance Report.

BMP 1.2 – BMP ADOPTION TO REDUCE POLLUTED RUNOFF

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT will continue the existing education and outreach efforts established during the previous permit cycle. MaineDOT will provide annual training designed to motivate its M&O employees to use BMPs to minimize stormwater pollution.

The use of BMPs by PD contractors is required under Section 656 of MaineDOT's Standard Specifications and applies to all construction contracts, regardless of the size of the area disturbed. Standard Specification 656 also requires the contractor to prepare the Soil Erosion and Water Pollution Control Plan (SEWPCP) and the writer to be Maine DEP Certified in Erosion Control Practices or an equivalent program, or licensed as a Professional Engineer, Landscape Architect, or Soil Scientist to help ensure that appropriate BMPs are selected for each project. Additionally, a project environmental coordinator is assigned to each construction project to oversee the installation and maintenance of erosion and sedimentation control BMPs.

Measurable Goal 1.2a – As part of the annual M&O employee stormwater awareness training, the proper application of BMPs will be addressed, as well as the environmental and regulatory consequences of failing to use BMPs correctly at project sites. M&O staff will be trained annually, and the number of training sessions and trained employees will be summarized in MaineDOT's Annual Compliance Report.

Measurable Goal 1.2b – A summary of new PD projects in the MS4 UA with an acre or more of disturbance during the PY will be included in MaineDOT's Annual Compliance Report. Each SEWPCP will be kept on file with the project records.

BMP 1.3 – REPORT PROGRESS

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT's progress in continuing education and outreach efforts will be assessed and reported to DEP in accordance with the specified schedule in the TS4 GP for process and impact indicator assessments. Progress will be reported annually for process indicators and in years 1 (background), 3, and 5 for impact indicators. MaineDOT will include a review of the process and impact indicators in its fifth Annual Compliance Report.

Measurable Goal 1.3a – MaineDOT will provide annual M&O employee stormwater awareness training intended to motivate staff to use and properly apply BMPs to minimize stormwater pollution. The process indicator for MaineDOT's annual M&O employee training will be the number of employees trained and the impact indicator will be spot inspection reports by the Regional Environmental Coordinator and/or the Stormwater Engineer of maintenance projects within the MS4 UA.

Measurable Goal 1.3b – MaineDOT will conduct on-site erosion and sedimentation control inspections for active construction projects and record observations made during the site visit as

well as complaints or concerns received about the construction site. Progress will be reported annually for process indicators and in years 1 (background), 3, and 5 for impact indicators. MaineDOT will include a review of the process and impact indicators in its fifth Annual Compliance Report. The process indicator for this goal will be the number of new projects in the MS4 UA with an acre or more of disturbance during the PY and the impact indicator will be the observations made during the on-site erosion and sedimentation control inspections and complaints/concerns received about construction sites such as the installation and maintenance of BMPs, the need for corrective actions, and whether any violation letters with reduction in payment were given to the contractors by MaineDOT.

MCM 2 – PUBLIC INVOLVEMENT AND PARTICIPATION

Goals:
Involve MaineDOT's community including various departments or facilities, and when applicable, involve regulated small MS4 communities, in both the planning and implementation process of improving water quality and reducing stormwater quantity via the stormwater program.

BMP 2.1 – PUBLIC NOTICE REQUIREMENT

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT will maintain its Rules of Procedures for Adjudicatory Hearings (Chapter 100) and comply with the public notice requirements of the Maine Freedom of Access Act (FOAA).

Measurable Goal 2.1 – When MaineDOT involves stakeholders in the implementation of the TS4 GP, the meetings and attendance will be documented and reported annually.

BMP 2.2 – COORDINATE WITH REGULATED COMMUNITIES

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT will maintain close communication with MS4 communities and their respective Stormwater Coordinators, primarily through participation in the Interlocal Stormwater Working Group (ISWG), Bangor Area Stormwater Working Group (BASWG), and the Southern Maine Stormwater Working Group (SMSWG) meetings. MaineDOT distributes our Three-Year Work Plan annually to all Municipal MS4 Program Managers to solicit input for potential stormwater BMP implementation associated with all MaineDOT construction projects. Additionally, MaineDOT remains involved with the evolving management requirements of UIS watersheds both within and outside of the UA. MaineDOT communicates periodically, through participation in local stormwater group meetings and involvement as a stakeholder with the Maine DEP and host municipalities, regarding watershed management planning efforts within MaineDOT's right-of-way.

Measurable Goal 2.2 – MaineDOT attendance at local and regional stormwater meetings will be documented and reported annually.

MCM 3 – ILLICIT DISCHARGE DETECTION AND ELIMINATION (IDDE)

Goals:
Implement and enforce a program to detect and eliminate illicit discharges and non-stormwater discharges in MaineDOT's stormwater systems.

BMP 3.1 –IDDE PLAN

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT has developed an IDDE Plan (**Appendix E**) to address any discharge that is not uncontaminated groundwater, water from a natural resource, or an allowable non-stormwater discharge. The IDDE Plan addresses illicit discharges in the following four components: 1) procedures for prioritizing watersheds, 2) procedures for tracing the source of an illicit discharge, 3) procedures for removing the source of the discharges, and 4) procedures for program evaluation and assessment.

Measurable Goal 3.1 – MaineDOT has developed and implemented the IDDE Plan and will review and update periodically, as needed, to reflect changes to the program. MaineDOT will summarize any changes made to the IDDE Plan over the course of the PY in its annual report.

BMP 3.2 – MAINTAIN MAPS

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT maintains a map of its storm sewer system within the UA, the MS4 map hereafter. The MS4 map includes layers showing the locations of stormwater catch basins, ditches, and outfalls; the flow direction, the interconnection points to other MS4s, and the name of the receiving water for each outfall. Each stormwater asset is uniquely identified to facilitate control of potential illicit discharges, and to ensure proper operation and maintenance of these structures.

Measurable Goal 3.2 – MaineDOT MS4 map will be reviewed annually and updated, as needed, to reflect modifications in infrastructure (e.g., infrastructure removal/installation, more accurate mapping data, etc.). MaineDOT will summarize mapping changes made over the course of the PY in its annual report.

BMP 3.3 – DRY WEATHER OUTFALL INSPECTION PROGRAM

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT's IDDE Plan (**Appendix E**), outlines the conditions under which dry weather outfall inspections will be conducted and how they will be documented.

Measurable Goal 3.3 – MaineDOT will conduct visual dry weather outfall inspections on 100% of its identified outfalls during the 5-year term of the TS4 GP, except those outfalls meeting the condition in Part IV(C)(3)(c)(vi)(1) which are associated with roadway drainage in undeveloped areas with no dwellings and no sanitary sewers are exempt from visual dry weather inspection. The

number of outfalls inspected each year and cumulatively over the permit cycle will be reported in MaineDOT's annual reports.

BMP 3.4 – WET WEATHER ASSESSMENT

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT's IDDE Plan (**Appendix E**), includes information on the wet weather assessment that MaineDOT will perform.

Measurable Goal 3.4 – In accordance with Part IV(C)(3)(d) of the TS4 GP and prior to June 30, 2027, MaineDOT will perform a wet weather assessment for the potential for illicit discharges during wet weather events. Following the wet weather assessment, MaineDOT's IDDE Plan will be updated to include a brief description of the data and process used to perform the assessment, the list of outfalls identified for wet weather monitoring, the rationale for including these outfalls, and the timing and frequency of wet weather monitoring to be completed during the next permit cycle. Once the wet weather assessment is completed, the updated IDDE Plan with the results of the wet weather assessment will be provided with the MaineDOT's annual report.

BMP 3.5 – ALLOWABLE NON-STORMWATER DISCHARGES

Responsible Party: MaineDOT Stormwater Engineer

Measurable Goal 3.5 – If the MaineDOT identifies any allowable non-stormwater discharges as significant contributors of pollutants to the MS4, then the MaineDOT will implement measures and/or cooperate with responsible dischargers to control these sources so they are no longer significant contributors of pollutants. The MaineDOT will identify in its annual report if it has identified any of these sources as a significant contributor of pollutants to the MS4.

MCM 4 – CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

Goals:
Continue to implement and enforce MaineDOT's program of construction site stormwater runoff control in accordance with the MOA to minimize or eliminate pollutants in stormwater runoff from construction activities that result in disturbed area of greater than or equal to one acre.

BMP 4.1 – CONSTRUCTION SITE RUNOFF PROGRAM

Responsible Party: MaineDOT Stormwater Engineer

MaineDOT's Standard Specification 656 – Temporary Soil Erosion and Water Pollution Control will be the primary means by which the MaineDOT implements its construction site runoff program to adhere to the MOA. These measures will be implemented on an ongoing basis as construction projects are initiated, continued, and completed throughout the MS4 permit cycle.

Measurable Goal 4.1a – To comply with Part IV(C)(4)(a)(i and iv) of the TS4 GP, Standard Specification 656 will be a required provision of all MaineDOT contracts and solicitations

involving soil disturbance. Standard Specification 656 requires the use of erosion and sediment control best management practices (BMPs) at construction sites consistent with the minimum standards outlined in Appendix C *Erosion and Sedimentation Control, Inspections and Maintenance and Housekeeping* of the TS4 GP (Maine DEP Chapter 500 Stormwater Management Rules Basic Standards). Standard Specification 656 also requires adherence to the current edition of the *MaineDOT Best Management Practices for Erosion and Sedimentation Control*. Standard Specification 656 includes requirements for construction site operations to control waste such as discarded building materials, concrete truck wash-outs, chemicals, litter, and sanitary waste at construction sites that may cause adverse impacts to water quality. As part of MaineDOT's annual report, MaineDOT will identify construction projects within the UA with one acre or more of disturbed area where Standard Specification 656 was applied.

Measurable Goal 4.1b – As required by Part IV(C)(4)(a)(ii and iii) of the TS4 GP, MaineDOT assigns an Environmental Construction Support (ECS) member, overseen by the Surface Water Quality Unit, to each construction project administered from the MaineDOT State Office. Similarly, for projects administered by the MaineDOT Regional Offices, including non-contracted maintenance activities, the Regional Environmental Coordinators (REC) oversee construction activity. The ECS/REC assist both the Environmental Office Permitting Unit and the project design team regarding all permit requirements and potential surface water impacts of the project through the design process. When a project contract is awarded, the ECS/REC assists the project Resident Engineer in ensuring the contractor is in compliance with this specification and the MOA. Before construction begins the contractor is required to submit their SEWPCP for review by the ECS/REC. The approval of the SEWPCP by the Resident is contingent on the recommendation of the ECS/REC. In MaineDOT's annual report, MaineDOT will provide a summary of new projects in the MS4 UA with an acre or more of disturbance during the PY that required contractors to provide a SEWPCP.

Measurable Goal 4.1c – To address the requirements of Part IV(C)(4)(a)(v) of the TS4 GP, the ECS/REC typically attend the project Pre-construction Meeting and when needed, a site walk with the contractor and Resident to highlight critical elements of the SEWPCP. Routine erosion and sedimentation control inspections are completed by the ECS/REC and an inspection report is completed. If there is non-compliance with the SEWPCP the Resident has the authority to suspend work and enforce financial penalties. The contractor is required inspect and monitor all controls and keep a written log of performance, failure, and any corrective actions for all controls in place. All pertinent information is recorded in the Resident's project file.

A minimum of three erosion and sediment control inspections will be completed during the active earth-moving phase of construction. One of the three inspections will be conducted at project completion to ensure that the site reached permanent stabilization and all temporary erosion and sediment controls have been removed.

Routine erosion and sediment control inspection reports are kept in the Environmental Office project file for at least three years following the expiration of the MS4 General Permit. MaineDOT's annual report will include a summary of the projects in the MS4 UA with an acre or more of disturbance during the PY that required erosion and sediment control inspections.

MCM 5 – POST-CONSTRUCTION STORMWATER MANAGEMENT

Goals:
To implement and enforce a program for managing post-construction stormwater runoff from new development and redevelopment projects that discharge to the MS4 or directly to waters of the State. The program encompasses a combination of structural or non-structural BMPs, and control measures to ensure long-term operation and maintenance of on-site BMPs and that BMPs are adequately functioning as intended, including annual inspections and requirements for corrective actions.

BMP 5.1 – IMPLEMENTATION OF STRUCTURAL OR NON-STRUCTURAL BMPS

Responsible Party: MaineDOT Stormwater Engineer

Measurable Goal 5.1a – For new development projects, redevelopment projects, and projects of a common plan of development or sale that disturb greater than or equal to one acre within the UA, MaineDOT will follow the guidelines and standards specified in the most current MOA with the following additional requirement for linear projects:

> A linear portion of a project shall meet Chapter 500 General Standards to the extent practicable as determined through consultation and agreement by DEP if all of the following conditions are met.
>
> Linear portion of the project
>
> - Disturbs one acre or more,
> - Is in the urbanized area,
> - Discharges into an MS4 or directly discharges into the waters of the state,
> - Is not located in the direct watershed of a "lake most at risk from new development" or in the watershed of an urban impaired stream,
> - Increases existing impervious area by one acre or more.

As part of MaineDOT's Annual Report, the cumulative number, location, and type of structural post-construction stormwater BMPs located within the UA or collecting runoff from the UA will be reported. New stormwater BMPs that were completed and went into service during the PY will also be identified.

Measurable Goal 5.1b – MaineDOT's program of non-structural BMPs includes employee training, public/ community outreach, outfall inspections, catch basin cleaning, and street sweeping as detailed under the discussion of MCM's 1, 2, 3, and 6 in this SWMP. Additionally, MaineDOT intends to develop a comprehensive "Post-Construction Stormwater Management Manual" that will address planning, design, operation, and maintenance of MaineDOT's post-construction

stormwater treatment measures. MaineDOT will review the state-of-the-art practices (e.g. low impact development, green infrastructure, sustainability) to incorporate them into the manual. The timeline for manual development and implementation is as follows: complete a first draft of the manual in PY2; review and revise the manual in PY3; and publish the finalized manual in PY4. MaineDOT's annual report will summarize the progress made during the previous PY on the development and implementation of the manual.

BMP 5.2 – ANNUAL INSPECTIONS OF POST-CONSTRUCTION STORMWATER TREATMENT BMPS

Measurable Goal 5.2a – MaineDOT will complete annual inspections of post-construction stormwater treatment BMPs located within the UA, or that collect runoff from within the UA. The annual inspections will be completed by qualified MaineDOT staff or consultants that are knowledgeable on the design, operation, and maintenance of the BMPs. The inspections will evaluate the condition of inlets and outlets, slope stability, vegetative cover, hydrologic function and drainage, and sediment accumulation. MaineDOT's annual report will summarize the findings of post-construction BMP inspections completed during the subject PY.

Measurable Goal 5.2b – If, based on the findings of the annual BMP inspections, corrective actions are needed, they will be completed within 60 days of the date the deficiency was identified. If addressing the deficiency requires more lead time than 60 days, an expeditious schedule will be established to complete the maintenance. Corrective actions implemented during the PY will be summarized in MaineDOT's annual report.

MCM 6 – POLLUTION PREVENTION / GOOD HOUSEKEEPING

Goals:
Reduce pollutant runoff from MaineDOT's roads, other paved surfaces, infrastructure, and facilities through the development and implementation of an operation and maintenance (O&M) program within the UA.

BMP 6.1 – INVENTORY OF OPERATIONS AND OPERATION AND MAINTENANCE PROCEDURES

Responsible Party: MaineDOT Stormwater Engineer

Measurable Goal 6.1 – MaineDOT operates state roads, highways, bridges, a visitor center, two regional offices, and nine maintenance/storage lots within the UA. Therefore, potential pollutant sources are generally limited to spills associated with vehicular accidents, litter, and MaineDOT deicing operations. The MaineDOT has developed an inventory of potential pollutant sources and associated operations which is summarized in its MCM 6 Written Procedures (**Appendix F**), which includes Operations and Maintenance (O&M) procedures that are implemented in policies and Standard Operating Procedures (SOPs) to reduce stormwater pollution. As part of MaineDOT's adaptive approach to stormwater management, MaineDOT will review its MCM 6 Written Procedures annually and identify new potential pollutant sources and any procedural modifications that are warranted over the course of the PY in its annual report.

BMP 6.2 – ANNUAL EMPLOYEE TRAINING

Responsible Party: MaineDOT Stormwater Engineer

Measurable Goal 6.2 – As discussed in **BMP 1.1**, MaineDOT's annual employee training program addresses stormwater pollution prevention and erosion and sediment control. MaineDOT's training program also incorporates construction and post-construction inspection and O&M requirements. MaineDOT will create new training material on the O&M of the post-construction stormwater measures in PY4 and start using this material for the training of its employees in PY5. The number and duration of training sessions, the type and content of the training, and the number of employees trained will be summarized under **BMP 1.1** in MaineDOT's Annual Compliance Report.

BMP 6.3 – STREET SWEEPING

Responsible Party: MaineDOT Maintenance and Operations

Measurable Goal 6.3 – The MaineDOT will conduct annual street-sweeping to remove grit and fines associated with winter road maintenance activities each spring after snow-melt. MaineDOT generally reuses the collected sweepings as construction fill material. MaineDOT will provide a summary of street sweeping that was completed within the UA during the PY as part of its annual report.

BMP 6.4 – CATCH BASIN INSPECTION AND CLEANING

Responsible Party: MaineDOT Maintenance and Operations

Measurable Goal 6.4 – MaineDOT will implement a program that includes inspection and catch basin cleanout, as needed, within the entire UA. For those catch basins which can be accessed safely, inspections will be completed at least once every other year, and clean outs will be completed when sediment accumulation is greater than or equal to 50 percent of the sump filled. MaineDOT will record catch basin inspection and cleanout information in its tracking database (MATS) and will summarize the number of catch basins inspected and cleaned during the PY in each annual report.

Catch basin sediment will be managed in accordance with Maine DEP regulations regarding beneficial reuse. MaineDOT may either reuse the collected sediment as construction fill material or dispose of the material in accordance with current State rules. MaineDOT generally reuses the recovered catch basin sediment as construction fill material.

BMP 6.5 – STORMWATER INFRASTRUCTURE INSPECTION AND PRIORITIZATION

Responsible Party: MaineDOT Maintenance and Operations

Measurable Goal 6.5 – Inspections of the MaineDOT infrastructure, excluding the post-construction stormwater BMPs (see BMP 5.2), are conducted regularly by MaineDOT's Maintenance and Operations crews. These inspections include observation of MaineDOT-owned infrastructure, including conveyance structures and outfalls. A list of repairs and upgrades are then addressed by MaineDOT Highway Maintenance. Repairs are prioritized by severity of the

condition and criticality of the infrastructure. MaineDOT will summarize stormwater infrastructure maintenance, including repair and replacement, completed within the UA during the PY as part of its annual report.

BMP 6.6 – STORMWATER POLLUTION PREVENTION PLANS (SWPPPs)

Responsible Party: MaineDOT Stormwater Engineer

Measurable Goal 6.6 – The MaineDOT currently operates two vehicle maintenance facilities within the UA, one in Bangor and one in Scarborough. The SWPPPs for these facilities will be updated to meet the requirements of the TS4 GP no later than June 30, 2022. MaineDOT will review its SWPPPs annually and summarize any changes made over the course of the PY in its annual report.

SECTION 3: DISCHARGES TO IMPAIRED WATERS

Table 3-1 summarizes the impaired waters in the UA that receive point source discharges from the MaineDOT. The table includes each water body's location, Total Maximum Daily Load (TMDL), UIS, watershed management plan (WMP) year, and EPA category as listed in the Final 2016 Maine Integrated Water Quality Report (Report) and Appendices [a.k.a. Maine 305(b) Report and 303(d) list]. Note that the DEP did not issue a 2018 or 2020 Report, rather DEP will be issuing a combined 2018/2020/2022 Report.

There are five general EPA categories in the Report:

- Category 1: Attaining all designated uses and water quality standards, and no use is threatened.
- Category 2: Attains some of the designated uses; no use is threatened; and insufficient data or no data and information is available to determine if the remaining uses are attained or threatened (with presumption that all uses are attained).
- Category 3: Insufficient data and information to determine if designated uses are attained (with presumption that one or more uses may be impaired).
- Category 4: Impaired or threatened for one or more designated uses, but does not require development of a TMDL report.
    - 4-A means a TMDL has already been completed
    - 4-B means other pollution control measures will address impairment
    - 4-C means the impairment is not caused by a pollutant
- Category 5: Waters impaired or threatened for one or more designated uses by a pollutant(s), and a TMDL report is required
    - 5-A means the water is impaired by pollutants other than those listed in 5-B through 5-D
    - 5-B means the water is impaired for bacteria only, and a TMDL is required
    - 5-C means the water is impaired by atmospheric deposition of mercury
    - 5-D means the water is impaired by legacy pollutants

To reduce the impact that stormwater has on the waterbodies listed in **Table 3-1** and their associated TMDLs and WLAs, the MaineDOT will implement the MCMs and BMPs included in this SWMP. Section 3.1 addresses non-UIS waters with EPA-approved TMDLs, Section 3.2 addresses non-UIS waters without EPA Approved TMDLs, and Section 3.3 addresses UIS waters.

Table 3-1 – Impaired Waters Summary

Waterbody	Location	TMDL	UIS[1]	WMP Year	EPA Category
Androscoggin River	Auburn	Bacteria 2009[2]	No	None	4-A
Arctic Brook	Bangor	IC TMDL 2012[3]	Yes	2016	4-A
Colley Wright Brook	Windham	Bacteria 2009	No	None	4-A and 5-A
Concord Gully Brook	Freeport	IC TMDL 2012	Yes	2013 Watershed Survey	4-A and 5-A
Cousins River	Yarmouth	None	No	None	5-B-1(a)
East Branch Piscataqua River	Cumberland	None	No	None	2 and 3
Frost Gully Brook	Freeport	Bacteria 2009 IC TMDL 2012	Yes	None	4-A
Goosefare Brook	Saco	IC TMDL 2012 Bacteria 2013[4] Goosefare 2003[5]	Yes	2016	4-A
Inkhorn Brook	Westbrook	Bacteria 2009	No	None	4-A and 5-A
Kenduskeag Stream	Bangor	Bacteria 2009	No	None	2 and 4-A
Little Androscoggin River	Auburn	None	No	None	2
Long Creek	South Portland	LC GP[6]	Yes	2009	4-B
Mosher Brook	Gorham	Bacteria 2009	No	None	4-A
Nasons Brook	Westbrook	IC TMDL 2012	Yes	None	4-A
No Name Brook	Sabattus	Bacteria 2009	No	None	4-A and 5-A
Norton Brook	Cumberland	None	No	None	3
Otter Brook	Windham	Bacteria 2009	No	None	4-A and 5-A
Otter Stream	Milford	Bacteria 2009	No	None	4-A
Penjajawoc Stream	Bangor	None	Yes	2008	5-A
Penobscot River	Veazie	Bacteria 2009	No	None	4-A, 4-B, and 5-D

[1] DEP Chapter 502 Direct Watersheds of Lakes Most at Risk from New Development and Urban Impaired Streams

[2] Maine Statewide Bacteria TMDL. Report # DEPLW-1002 approved by EPA on September 28, 2009.

[3] Maine Statewide Impervious Cover TMDL. Report # DEPLW-1239, approved by EPA on September 27, 2012.

[4] Maine Statewide Bacteria TMDL: 2013 Freshwater Addendum. Report # DEPLW-1254, approved by EPA on September 22, 2014.

[5] Goosefare Brook TMDL. Approved by EPA on September 29, 2003.

[6] The Long Creek watershed does not have a TMDL and is instead regulated under separate DEP General and Individual Permits (#MEG190000 dated 4/15/15 and DEPLW-1167 dated 6/7/10, respectively).

Waterbody	Location	TMDL	UIS[1]	WMP Year	EPA Category
Piscataqua River	Eliot	None	No	None	5-A
Portsmouth Harbor (Spruce Creek)	Kittery	None	No	2014 (Spruce Creek)	5-A and 5-B-1
Presumpscot River	Westbrook	Presumpscot 1998[7]	No	None	2 and 4-A
Red Brook	Scarborough	IC TMDL 2012	Yes	2011	4-A and 5-D
Royal River	Yarmouth	None	No	None	2 and 5-B-1(a)
Sabattus River	Sabattus	None	No	None	2 and 5-A
Souadabscook Stream	Hampden	None	No	None	3
Sucker Brook	Bangor	IC TMDL 2012	Yes	2014 Watershed Survey	4-A and 5-A
Sunkhaze Stream	Milford	None	No	None	2
Tannery Brook	Gorham	None	No	2005 Watershed Survey	3
Tributaries of the Scarborough River and Scarborough Marsh (Beaver Brook, Finnerd Brook, and Nonesuch River)	Scarborough	Bacteria 2009	No	None	3 and 5-B-1
York River	York	Bacteria 2009	No	2018 (Stewardship Plan)	5-B-1

3.1 IMPAIRED WATERS WITH EPA-APPROVED TMDLS

The TS4 GP states that if the waterbody to which a point source discharge drains is impaired and has an EPA approved TMDL, then the SWMP must contain clear, specific and measurable BMPs to comply with the TMDL waste load allocation ("WLA") and any implementation plan. The TS4 GP does not authorize a direct discharge that is inconsistent with the WLA of an approved TMDL. EPA approved TMDLs prior to the issuance date of the TS4 GP, can be found at https://www.epa.gov/tmdl/region-1-approved-tmdls-state#tmdl-me. The TS4 GP does not authorize a new or increased discharge of storm water to an impaired waterbody that contributes to the impairment at a detectable level.

[7] Presumpscot River TMDL. Approved by EPA on November 30, 1998.

The Androscoggin River, Colley Wright Brook, Frost Gully Brook, Inkhorn Brook, Kenduskeag Stream, Mosher Brook, No Name Brook, Otter Brook, Otter Stream, Penobscot River, Tributaries of the Scarborough River and Scarborough Marsh, and York River identified in **Table 3-1** are all included in the Bacteria 2009 TMDL. The Bacteria 2009 TMDL does not specifically identify the sources of the bacteria impairments but encourages communities to pursue an action plan that is based on investigation of the source. MaineDOT is already required to conduct investigations of potential illicit discharges under MCM 3.

The Bacteria 2009 TMDL document also requires that all sources of bacteria that are prohibited (such as failed septic systems or illicit discharges) be removed and requires that any sources of bacteria from allowed discharges (such as the MS4 permitting program) be restricted to concentrations equal to the water quality criteria. MaineDOT is already required to complete these activities under MCM 3.

Therefore, implementation of the MCM 3 IDDE elements of the TS4 GP (conducting outfall inspections, sampling outfalls during dry weather flow, and completing IDDE investigations to eliminate any bacterial sources), meet the requirement for clear, specific, and measurable BMPs to comply with the Bacteria 2009 TMDL.

As shown in **Table 3-1**, a TMDL report was prepared for the Presumpscot River in 1998. The document establishes TMDLs for biological oxygen demand (BOD) and total suspended solids (TSS) for a 6.5-mile portion of the lower Presumpscot River. The water quality impairments related to the established TMDLs are non-attainment of dissolved oxygen (DO) standards due to BOD loadings in the river, and aquatic life standards due to TSS loadings in the river. The report shows that a pulp and paper facility is responsible for the predominant share of BOD loading to the river and TSS discharges from the facility's outfall. The TMDL report does not identify stormwater as a cause or contributing factor to the water quality impairments, so no action is proposed beyond implementation of the MCMs and BMPs identified in this SWMP.

3.2 IMPAIRED WATERBODIES WITHOUT EPA-APPROVED TMDLS

The MaineDOT discharges to 11 water bodies identified in the 2016 Report that do not have EPA-approved TMDLs and are non-UIS: Cousins River, East Branch Piscataqua River, Little Androscoggin River, Norton Brook, Piscataqua River, Portsmouth Harbor, Royal River, Sabattus River, Souadabscook Stream, Sunkhaze Stream, and Tannery Brook.

The Little Androscoggin River and Sunkhaze Stream are designated as EPA category 2 which means that the waterbodies attain some of the designated uses; no use is threatened; and insufficient data or no data and information is available to determine if the remaining uses are attained or threatened (with presumption that all uses are attained). Therefore, no additional action is proposed by MaineDOT at this time, although MaineDOT will implement the MCMs and BMPs identified in this SWMP, which are beneficial to water quality.

The East Branch Piscataqua River, Norton Brook, Souadabscook Stream, and Tannery Brook are designated as EPA category 3 (insufficient data, presumed impaired for aquatic life use).

MaineDOT will consult with DEP on the status of these waterbodies and will implement the MCMs and BMPs identified in this SWMP to help improve water quality.

Piscataqua River has been designated as EPA category 5-A (marine life use support). MaineDOT will consult with DEP on the status of this waterbody and will implement the MCMs and BMPs identified in this SWMP to help improve water quality.

Portsmouth Harbor has been designated as EPA category 5-A (marine life use support) and 5-B-1 (bacteria). MaineDOT will consult with DEP on the status of Portsmouth Harbor, and will implement the MCM 3 IDDE elements of the TS4 GP (conducting outfall inspections, sampling non-exempt outfalls during dry weather flow, and completing IDDE investigations to identify bacterial sources), to help address the bacteria impairment.

Sabattus River has been designated as EPA category 5-A (nutrient/eutrophication biological indicators, dissolved oxygen, and benthic-macroinvertebrate bioassessments). MaineDOT will consult with MEDEP on the status of this waterbody and will implement the MCMs and BMPs identified in this SWMP to help improve water quality.

Cousins River and Royal River have been designated as EPA category 5-B-1(a) (elevated fecal indicators). MaineDOT will consult with DEP on the status of the Cousins and Royal Rivers, and will implement the MCM 3 IDDE elements of the TS4 GP (conducting outfall inspections, sampling non-exempt outfalls during dry weather flow, and completing IDDE investigations to identify bacterial sources), to help address the elevated fecal indicators.

3.3 URBAN IMPAIRED STREAM BMPS

MaineDOT infrastructure is located within eight UIS watersheds within the UA, including: Arctic Brook, Concord Gully Brook, Frost Gully Brook, Goosefare Brook, Nasons Brook, Penjajawoc Stream, Red Brook, and Sucker Brook. Long Creek is regulated under a separate permit and therefore not regulated under the TS4 GP. This SWMP proposes at least three specific structural or non-structural BMPs for each of these eight UIS watersheds for inclusion in MaineDOT's permittee-specific DEP Order. MaineDOT's proposed UIS BMPs are identified in **Appendix G**.

SECTION 4: GENERAL REQUIREMENTS

The TS4 GP requires that this SWMP be certified by either a principal executive officer or ranking elected official. This section provides the necessary certification.

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

David Gardner
Director
MaineDOT Environmental Office

APPENDIX A – Public Notice
(Attached)

Appendix A. Public Notice

A.1 Public Notice in the Newspapers

As prescribed in Part I(B) of the TS4 GP, MaineDOT published public notice (see the notice in *italic* below) of MaineDOT's plans to file a Notice of Intent (NOI) to obtain coverage under the TS4 GP with DEP in the legal advertisement section of the Portland Press Herald and Bangor Daily News on September 16, 2021, and Lewiston Sun Journal on September 18, 2021, and also made the notice available on MaineDOT's official internet website: https://www.maine.gov/mdot/env/

MaineDOT Stormwater Engineer sent an electronic copy of the public notice to an e-mail group of more than 90 recipients on 9/28/21. The recipients were in the DEP distribution list for the 2022 State and Federally Owned MS4 General Permit.

MaineDOT Public Notice for the NOI for Coverage under the 2022 Transportation MS4 General Permit:

"*The Maine Department of Transportation (MaineDOT) will file a Notice of Intent (NOI) to comply with the Maine General Permit for the Discharge of Stormwater from Maine Department of Transportation and Maine Turnpike Authority Municipal Separate Storm Sewer Systems issued 8/18/2021 (MER043000 W008162-5Y-B-R) and an associated Stormwater Management Plan (SWMP) with the Maine Department of Environmental Protection (DEP). The NOI and SWMP will be filed on or before October 1, 2021. A copy may also be seen at the MaineDOT Headquarters and on the MaineDOT Environmental Office webpage: https://www.maine.gov/mdot/env/.*

The DEP will review the submittal and assess if it is complete for processing within 15 calendar days of submittal. Once it has been deemed complete for processing, it will be made available on the Maine DEP website for 30-day public comment: https://www.maine.gov/dep/comment/index.html. A request for public hearing or request that the Board of Environmental Protection assume jurisdiction over this application must be received by the DEP, in writing, no later than 20 days after the application is found acceptable for processing. Requests must indicate the interest of the person filing the request and specify the reasons why a hearing is warranted. Unless otherwise provided by law, a hearing is discretionary and may be held if the Commissioner or the Board finds significant public interest or there is conflicting technical information.

The NOI and SWMP are also available for viewing at the DEP Office in Augusta by scheduled appointment during normal business hours during the pandemic. Written public comments or requests for information may be made to the Division of Water Quality Management, Department of Environmental Protection, State House Station #17, Augusta, ME 04333- 0017; telephone (207) 592-6233 and must reference MaineDOT MER043000."

A.2 Letter of Notice to the Regulated Small MS4 Permittees

MaineDOT Stormwater Engineer sent an electronic letter of notice to the regulated small MS4 permittees on 9/14/21 using the e-mail addresses of the permittees' primary contacts in MaineDOT database. The Stormwater Engineer also attended September meetings of ISWG and SMSWG and made announcements on the MaineDOT NOI to obtain coverage under the 2022 TS4 GP.

The e-mail messages included a PDF attachment of the following letter of notice:

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
16 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0016

Janet T. Mills
GOVERNOR

Bruce A. Van Note
COMMISSIONER

MEMORANDUM

To: Nested MS4 Municipalities
From: Kerem Gungor, Stormwater Engineer
Date: September 14, 2021
Re: Notification of Intent to File for Stormwater Discharge Authorization Under Transportation MS4 Permit

---

The Maine Department of Transportation (MaineDOT) maintains a stormwater system that is regulated under the *General Permit for the Discharge of Stormwater from Maine Department of Transportation and Maine Turnpike Authority Municipal Separate Storm Sewer Systems* (Transportation MS4 Permit). Your municipality is a regulated small MS4 which intersects with MaineDOT's MS4 system (nested MS4 system), and MaineDOT's MS4 system may include interconnections with your municipality's MS4 system or stormwater outfalls discharging to shared water resources. As required by the Transportation MS4 Permit, by way of this letter MaineDOT is providing notice of its intent to file for authorization to discharge stormwater under the new (2022) Transportation MS4 Permit on or before October 1, 2021. A copy of MaineDOT's Notice of Intent and Stormwater Management Plan will be made available at this link on or before October 1, 2021: https://www.maine.gov/mdot/env/.

MaineDOT will publish its MS4 map online on or before October 1, 2021. The MS4 map will be regularly updated. Your municipality will receive a separate notification regarding the launch date of the online map and its access instructions.

MaineDOT also maintains an Illicit Discharge Detection and Elimination policy and procedure that includes notification to nested MS4s of illicit discharges from MaineDOT's property or MS4 system into municipal MS4 systems or shared water resources. If an illicit discharge is discovered by MaineDOT staff during an inspection or routine maintenance, we will contact the nested MS4's Stormwater Coordinator or other MS4 contact and work with the nested MS4 to eliminate the source of the illicit discharge and coordinate cleanup, as needed. In the case of a spill emergency outside of normal business hours, we will contact the nested MS4's Stormwater Coordinator or other MS4 contact the following business day.

We ask that if an illicit discharge into MaineDOT's MS4 system or shared water resources is discovered by your municipality during normal business hours, that you please contact MaineDOT's Stormwater Engineer Kerem Gungor at 207-592-3489 or Kerem.Gungor@maine.gov. In the event of a spill emergency that has the potential to affect MaineDOT's MS4 or shared water resources contact the MaineDOT Radio Room in Augusta at 624-3339. Please forward this request to any municipal first responders or other staff who may coordinate spill response efforts with MaineDOT. Please contact me if you have any questions and thank you for your cooperation.

APPENDIX B – Notice of Intent (NOI)
(Attached)

NOTICE OF INTENT TO COMPLY WITH MAINE GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER FROM MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4)

PLEASE TYPE OR PRINT IN *BLACK INK ONLY*

PERMITTEE INFORMATION					
MS4 Entity	Maine Department of Transportation			Permittee ID #	MER043002
Name and title of chief elected official or principal executive officer	David Gardner, Environmental Office Director				
Mailing Address	16 State House Station				
Town/City	Augusta	State	Maine	Zip Code	04333-0016
Daytime Phone	207-592-2471	Email	David.Gardner@maine.gov		
PRIMARY CONTACT PERSON FOR OVERALL STORMWATER MANAGEMENT PROGRAM (if different than PEO/CEO)					
Name and Title	Kerem Gungor, Stormwater Engineer				
Mailing Address	16 State House Station				
Town/City	Augusta	State	Maine	Zip Code	04333-0016
Daytime Phone	207-592-3489	Email	Kerem.Gungor@maine.gov		
STORMWATER MANAGEMENT PLAN (SWMP)					
Urbanized Area (sq. mi.)	N/A; transportation entity located in 30 municipalities. See Attachment A				
I have attached our updated SWMP with ordinances, SOPs, forms. ☐					
Name of streams, wetlands, or waterbodies to which the regulated small MS4 discharges (*attach additional sheets as necessary*): See Attachment B					
List of impaired waterbodies that receive stormwater from the regulated small MS4 (*attach additional sheets as necessary*): See Attachment C					

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature of Permittee		Date	09/30/2021

This NOI registration form must be filed with the Department at the following address:

Stormwater Program Manager
Maine Department of Environmental Protection
Bureau of Water Quality
17 State House Station
Augusta ME 04333-0017
Rhonda.Poirier@maine.gov

OFFICE USE ONLY							
Date Recieved		Staff		Date Accepted		Date Not Accepted	

Attachment A

Under the Transportation MS4 permit, MaineDOT is responsible for the drainage assets it maintains on the interstate highways, roads within the MS4 area and outside the Urban Compact areas, and other select road segments agreed to with individual municipalities; as well as park and ride and maintenance lots within the MS4 areas. MaineDOT has developed an online map that displays all drainage assets, direction of flow and locations of outfalls within its storm sewer system.

A link to the online MS4 map can be found at https://www.maine.gov/mdot/env/ under the Surface Water Quality Unit section.

Attachment B

NAMED WATERBODY	TOWN
ALEWIFE BROOK	Cape Elizabeth
ALLEN-RANGE BROOK	Freeport
ANDROSCOGGIN RIVER	Auburn
ARCTIC BROOK	Bangor
BACK COVE	Portland
BEAVER BROOK	Scarborough
BRANDY BROOK	Gorham
CASCO BAY	Freeport
CHENERY BROOK	Cumberland
CHICKERING CREEK	Kittery
CLARK POND	South Portland
COFFIN BROOK	Berwick
COLLEY WRIGHT BROOK	Windham
CONCORD GULLY BROOK	Freeport
COUSINS RIVER	Yarmouth
DRISCOLL BROOK	South Berwick
DUNSTAN RIVER	Scarborough
EAST BRANCH PISCATAQUA RIVER	Cumberland
FERGUSON BROOK	Berwick
FORE RIVER	Portland
FROST GULLY BROOK	Freeport
GOOSEFARE BROOK	Saco
GREAT CREEK	Eliot
GREAT WORKS RIVER	South Berwick
HIGHLAND LAKE	Westbrook
HYDE BROOK	Windham
INKHORN BROOK	Westbrook
KENDUSKEAG STREAM	Bangor
LAMBERT POINT STREAM	Freeport
LIBBY BROOK	Kittery
LITTLE ANDROSCOGGIN	Auburn
LITTLE RIVER	Gorham
LONG CREEK	South Portland
MEADER BROOK	Falmouth
MEADOW STREAM	Bangor
MERRILL BROOK	Freeport
MILL BROOK	Scarborough
MILL BROOK	Cumberland
MILL BROOK	Westbrook
MILL CREEK	Falmouth
MOOSE BROOK	Auburn
MORTON BROOK	Falmouth

NAMED WATERBODY	TOWN
MOSHER BROOK	Gorham
MOULTON BROOK	York
NASONS BROOK	Westbrook
NO NAME BROOK	Sabattus
NONESUCH RIVER	Scarborough
NORTON BROOK	Cumberland
OTTER BROOK	Windham
OTTER STREAM	Milford
PENJAJAWOC STREAM	Bangor
PENOBSCOT RIVER	Veazie
PISCATAQUA RIVER	Eliot
PLEASENT RIVER	Windham
PRESUMPSCOT ESTUARY	Portland
PRESUMPSCOT RIVER	Westbrook
RED BROOK	South Portland
REEDS BROOK	Hampden
ROYAL RIVER	Yarmouth
SABATTUS POND	Sabattus
SABATTUS RIVER	Sabattus
SALMON FALLS RIVER	Berwick
SHOREYS BROOK	Eliot
SKITTERYGUSSETT CREEK	Falmouth
SOUADABSCOOK STREAM	Hampden
SOUTHSIDE BROOK	York
SPINNEY CREEK	Eliot
SPRUCE CREEK	Kittery
STILLWATER RIVER	Old Town
STONEY BROOK	Hampden
STURGEON CREEK	Eliot
SUCKER BROOK	Bangor
SUNKHAZE STREAM	Milford
TANNERY BROOK	Gorham
TAYLOR BROOK	Auburn
UNNAMED MARSH	Bangor
YORK RIVER	York

Attachment C

Waterbody	Location	TMDL	UIS[1]	WMP Year	EPA Category
Androscoggin River	Auburn	Bacteria 2009[2]	No	None	4-A
Arctic Brook	Bangor	IC TMDL 2012[3]	Yes	2016	4-A
Colley Wright Brook	Windham	Bacteria 2009	No	None	4-A and 5-A
Concord Gully Brook	Freeport	IC TMDL 2012	Yes	2013 Watershed Survey	4-A and 5-A
Cousins River	Yarmouth	None	No	None	5-B-1(a)
East Branch Piscataqua River	Cumberland	None	No	None	2 and 3
Frost Gully Brook	Freeport	Bacteria 2009 IC TMDL 2012	Yes	None	4-A
Goosefare Brook	Saco	IC TMDL 2012 Bacteria 2013[4] Goosefare 2003[5]	Yes	2016	4-A
Inkhorn Brook	Westbrook	Bacteria 2009	No	None	4-A and 5-A
Kenduskeag Stream	Bangor	Bacteria 2009	No	None	2 and 4-A
Little Androscoggin River	Auburn	None	No	None	2
Long Creek	South Portland	LC GP[6]	Yes	2009	4-B
Mosher Brook	Gorham	Bacteria 2009	No	None	4-A
Nasons Brook	Westbrook	IC TMDL 2012	Yes	None	4-A
No Name Brook	Sabattus	Bacteria 2009	No	None	4-A and 5-A
Norton Brook	Cumberland	None	No	None	3
Otter Brook	Windham	Bacteria 2009	No	None	4-A and 5-A
Otter Stream	Milford	Bacteria 2009	No	None	4-A
Penjajawoc Stream	Bangor	None	Yes	2008	5-A
Penobscot River	Veazie	Bacteria 2009	No	None	4-A, 4-B, and 5-D
Piscataqua River	Eliot	None	No	None	5-A
Portsmouth Harbor (Spruce Creek)	Kittery	None	No	2014 (Spruce Creek)	5-A and 5-B-1
Presumpscot River	Westbrook	Presumpscot 1998[7]	No	None	2 and 4-A
Red Brook	Scarborough	IC TMDL 2012	Yes	2011	4-A and 5-D

[1] MEDEP Chapter 502 Direct Watersheds of Lakes Most at Risk from New Development and Urban Impaired Streams

[2] Maine Statewide Bacteria TMDL. Report # DEPLW-1002 approved by EPA on September 28, 2009.

[3] Maine Statewide Impervious Cover TMDL. Report # DEPLW-1239, approved by EPA on September 27, 2012.

[4] Maine Statewide Bacteria TMDL: 2013 Freshwater Addendum. Report # DEPLW-1254, approved by EPA on September 22, 2014.

[5] Goosefare Brook TMDL. Approved by EPA on September 29, 2003.

[6] The Long Creek watershed does not have a TMDL and is instead regulated under separate DEP General and Individual Permits (#MEG190000 dated 4/15/15 and DEPLW-1167 dated 6/7/10, respectively).

[7] Presumpscot River TMDL. Approved by EPA on November 30, 1998.

Waterbody	Location	TMDL	UIS[1]	WMP Year	EPA Category
Royal River	Yarmouth	None	No	None	2 and 5-B-1(a)
Sabattus River	Sabattus	None	No	None	2 and 5-A
Souadabscook Stream	Hampden	None	No	None	3
Sucker Brook	Bangor	IC TMDL 2012	Yes	2014 Watershed Survey	4-A and 5-A
Sunkhaze Stream	Milford	None	No	None	2
Tannery Brook	Gorham	None	No	2005 Watershed Survey	3
Tributaries of the Scarborough River and Scarborough Marsh (Beaver Brook, Finnerd Brook, and Nonesuch River)	Scarborough	Bacteria 2009	No	None	3 and 5-B-1
York River	York	Bacteria 2009	No	2018 (Stewardship Plan)	5-B-1

APPENDIX C – Public Comments and Summary of Changes to SWMP
(Attached)

Appendix C

During the period of October 1, 2021, through June 8, 2022, the MaineDOT made its initial SWMP available on its official website for public review and comment. No comments were received during the comment period.

Based on feedback received from the Maine Department of Environmental Protection (DEP) in a meeting that took place on November 3, 2021, several changes were made to Appendix G – Urban Impaired Stream BMP Compliance Strategy, and the document was re-submitted to DEP on December 3, 2021. DEP provided feedback on the revised language and additional changes were made to Appendix G – Urban Impaired Stream BMP Compliance Strategy. The document was re-submitted to DEP on December 23, 2021.

Due to staffing changes at MaineDOT, certain changes were made to the SWMP text and Appendix G – Urban Impaired Stream BMP Compliance Strategy. These changes are summarized in the attached letter from David Gardner (MaineDOT) to Gregg Wood (DEP) dated April 8, 2022.

During the period of May 3, 2022, through June 6, 2022, the DEP solicited comments on the draft MaineDOT-specific DEP order, which included Appendix G – Urban Impaired Stream BMP Compliance Strategy dated April 5, 2022. The DEP did not receive any comments that resulted in substantive changes to the draft MaineDOT-specific DEP order, and the order was finalized on June 7, 2022.

STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
16 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0016

Janet T. Mills
GOVERNOR

Bruce A. Van Note
COMMISSIONER

April 8, 2022

Gregg Wood, Director
Division of Water Quality Management
Maine Department of Environmental Protection
17 State House Station
Augusta, ME 04333

Dear Gregg:

The Maine Department of Transportation (MaineDOT) has reviewed the preliminary draft Department of Environmental Protection Order providing the MaineDOT coverage under the MS4 Transportation General Permit for stormwater discharges and has the following comment: it states the MS4 GP was issued by the department on April 18, 2021, it was actually issued on August 18, 2021 as stated in your cover letter.

In addition, MaineDOT's engineer and principal author and administrator of our Stormwater Management Plan, Kerem Gungor, has taken a position at Maine DEP. MaineDOT would like to take advantage of the timing and make some changes to and resubmit the SWMP. The following is a summary of the revisions and justification:

- Kerem had proposed both the Post-construction BMP manual and the Smart Chloride System BMP in anticipation of starting both projects the first year of the permit cycle. We expect to replace Kerem soon with a qualified Environmental Engineer, but that is not a certainty, so we have adjusted the schedule of accomplishments for both BMPs.
- We also feel it prudent to remove the post-construction training element from BMP1.1 and Appendix G. As demonstrated in over 20 years of being part of the training cadre for the Nonpoint Source Training Center, we recognize the value partnering with DEP in providing this resource to the people of Maine. We anticipate following through with this training program and partnership but cannot ensure it will occur within this permit cycle.
- We revised each of the BMPs under MCM1 to clarify which bureaus will be targeted and replaced the requirement of written exams for our M&O employees. MaineDOT's Regional Environmental Coordinators will participate in the training and will extend that to the field with spot inspections of maintenance work.
- Finally, we replaced Rhonda Poirier's email address with Holiday Keen's on page 3 of the SWMP.

For ease of review the following are the specific sections revised:

Appendix G. Urban Impaired Stream BMP Compliance Strategy

- BMP A.2 Smart Chloride Mitigation System – postponed each item in the implementation schedule by one year:
    - Permit Year (PY) ~~1~~ 2: Site evaluation and selection, SCMS design

- PY ~~2~~ 3: SCMS construction
- PY ~~3 thru 4~~ 4 and 5: SCMS operation and maintenance, development of new SCMS configurations, and public education and outreach.

- BMP B.2 Post-construction Treatment Planning, Design and Maintenance Training - Deleted

SWMP –

- BMP 1.1 – RAISE AWARENESS
  - Removed Post-construction Treatment Planning, Design and Maintenance Training.
  - Clarified which MaineDOT bureaus would be targeted in each measurable goal
- BMP 1.2 - BMP ADOPTION TO REDUCE POLLUTED RUNOFF
  - Clarified which MaineDOT bureaus would be targeted in each measurable goal
- BMP 1.3 – REPORT PROGRESS
  - Clarified which MaineDOT bureaus would be targeted in each measurable goal
  - Changed impact indicators for M&O employees from written exams to spot inspections
- BMP 5.1 – IMPLEMENTATION OF STRUCTURAL OR NON-STRUCTUAL BMPS
  - Postpone each phase of the Post-construction Stormwater Management Manual development from PY1 thru 3, to PY2 thru 4.

Sincerely

David Gardner, Director
Environmental Office

cc: Holliday Keen, Maine DEP
Peter Newkirk, MaineDOT stormwater consultant

APPENDIX D – Permittee Specific DEP Order
(Attached)

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JANET T. MILLS
GOVERNOR

MELANIE LOYZIM
COMMISSIONER

June 7, 2022

Mr. David Gardner
Environmental Office Director
Maine Department of Transportation
16 State House Station
Augusta, Maine 04333-0016
e-mail: *david.gardner@maine.gov*

RE: Municipal Separate Storm Sewer System (MS4) General Permit #MER043000
Final - MER043002

Dear Mr. Gardner:

Enclosed please find a copy of your **final** MEPDES permit and Maine WDL which was approved by the Department of Environmental Protection. Please read this permit/license and its attached conditions carefully. Compliance with this permit/license will protect water quality.

Any interested person aggrieved by a Department determination made pursuant to applicable regulations, may appeal the decision following the procedures described in the attached DEP FACT SHEET entitled "*Appealing a Commissioner's Licensing Decision*."

If you have any questions regarding the matter, please feel free to call me at 287-7693. Your Department compliance inspector copied below is also a resource that can assist you with compliance. Please do not hesitate to contact them with any questions.

Thank you for your efforts to protect and improve the waters of the great state of Maine!

Sincerely,

Gregg Wood
Division of Water Quality Management
Bureau of Water Quality

Enc.

cc: Holliday Keen, DEP/CMRO
Damien Houlihan, USEPA
Newton Tedder, USEPA
Alison Moody DEP/SMRO
Nathan Chien, USEPA
Lori Mitchell, DEP/CMRO
Richard Carvalho, USEPA

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION
AUGUSTA, ME 04333

DEPARTMENT ORDER

IN THE MATTER OF

MAINE DEPARTMENT OF TRANSPORTATION	)	MUNICIPAL SEPARATE STORM
AUGUSTA, KENNEBEC COUNTY, MAINE	)	SEWER SYSTEM
MER043002	)	MER041000
	)	**GENERAL PERMIT COVERAGE**
APPROVAL	)	**RENEWAL**

The Department of Environmental Protection (Department/DEP) has considered the Notice of Intent submitted by the MAINE DEPARTMENT OF TRANSPORTATION (MDOT/permittee), with supportive data, agency review comments and other related materials on file for coverage under the Municipal Separate Storm Sewer System (MS4) General Permit (GP), #MER043000, issued by the Department on August 18, 2021, and FINDS THE FOLLOWING FACTS.

The permittee submitted a Notice of Intent (NOI) with an initial Stormwater Management Plan (SWMP) to the Department on September 30, 2021 that were made available for a 30-day public comment period on the Department's website at https://www.maine.gov/dep/comment/comment.html?id=4463193. No public comments were received on the NOI or the initial SWMP. The Department has reviewed the initial SWMP document and made the determination that the document is consistent with and fully articulates what is required to meet the MS4 GP standard. Pursuant to Part IV(B) of MS4 GP issued by the Department on August 18, 2021, the permittee must update the initial SWMP within 60 days of the effective date of this DEP permittee specific order or within 60 days of the final resolution to an appeal of this DEP permittee specific order. The final plan must be submitted to the Department and will be posted on the Department's website.

The permittee must fully implement the Best Management Practices in accordance with their associated schedules of compliance, as established in the Modified Stormwater Management Plan that is in effect at the time any schedule for compliance is due.

The permittee has agreed to comply with all terms and conditions of the MS4 General Permit, #MER043000, dated August 18, 2021. Operated in accordance with the Municipal Separate Storm Sewer System (MS4) General Permit, #MER043000, the discharges identified by the permittee will not have a significant adverse effect on water quality or cause or contribute to the violation of the water quality standards of the receiving water.

Impaired Waters

The MDOT has point source discharges to Arctic Brook, Concord Gully Brook, Frost Gully Brook, Goosefare Brook, Nasons Brook, Penjajawoc Brook, Red Brook and Sucker Brook which are classified as an Urban Impaired Streams in Maine DEP Rule Chapter 502. To address the impairments, the permittee must fully implement all actions, schedules and milestones established in Appendix G, *Urban Impaired Stream BMP Compliance Strategy*, in the April 5, 2022 revised initial SWMP and any revisions reflected in the Modified Stormwater Management Plan required by Part IV(B). Appendix G is attached to this Order.

THEREFORE, the Department GRANTS the MAINE DEPARTMENT OF TRANSPORTATION, coverage under the Municipal Separate Storm Sewer System (MS4) General Permit, #MER043000, issued by the Department on August 18, 2021, subject to the terms and conditions therein.

This DEP permittee specific order becomes effective on July 1, 2022 and expires at midnight five (5) years after that date. If the GP is to be renewed, this DEP permittee specific order will remain in effect and enforceable until the Department takes final action on the renewal.

DONE AND DATED AT AUGUSTA, MAINE, THIS 7 DAY OF June, 2022.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: _____
for Melanie Loyzim, Commissioner

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

The Notice of Intent was received by the Department on September 30, 2021.

The Notice of Intent was accepted by the Department on October 14, 2021.

FILED

JUNE 7, 2022

State of Maine
Board of Environmental Protection

Date filed with Board of Environmental Protection: ___

This Order prepared by GREGG WOOD, BUREAU OF WATER QUALITY

MER043002 6/6/2022

RESPONSE TO COMMENTS

During the period of May 3, 2022 through the effective date of this final agency action, the Department solicited comments on the draft MEPDES permit. The Department did not receive any comments that resulted in any substantive changes to the draft permit. Therefore, the final permit is being issued as drafted.

APPENDIX G. Urban Impaired Stream BMP Compliance Strategy

This document explains MaineDOT's strategy to comply with the additional best management practice (BMP) requirement of the new transportation municipal separate storm sewer system (TS4) permit for the urban impaired stream (UIS) watersheds.

1. TS4 Permit Requirement

Part IV.E.3 of the TS4 permit requires MaineDOT to propose and fully implement at least three structural or non-structural BMPs or equivalent measures in the UIS watersheds where the Department operates a point source:

"If the waterbody to which a point source covered by this GP discharges is an Urban Impaired Stream (UIS) (Appendix B of this permit) the permittee must propose and fully implement at least three structural or non-structural BMPs or other equivalent measures to be considered for inclusion in the permittee specific DEP Order, unless the Department has determined the MS4 discharge is not causing or contributing to the impairment. The BMPs must address a specific impairment from the MS4 discharge within the UA and be clear, specific and measurable. Structural or nonstructural BMPs may selected from a) MCMs 1-6, b) an existing Department approved Watershed Management Plan, or c) BMPs in Appendix D, BMPs for Discharges to Urban Impaired Streams, of this GP or more specifically developed by the permittee. For receiving waters impaired in whole or in part by nutrient loading, including UISs covered by the Impervious Cover TMDL, permittees may propose measures designed to reduce loads into the MS4 system. The permittee specific DEP Order will set forth those measures the permittee must take, and may include, in whole or in part, the measures proposed by the permittee."

2. The Urban Impaired Streams and Priority Stressors

MaineDOT operates (maintains) TS4 outfalls in eight UIS watersheds (**Table 1**). MaineDOT must propose and fully implement BMPs in these watersheds to comply with the new TS4 permit. Land use/land cover, MaineDOT impervious cover and outfall metrics for each UIS watershed is given in **Attachment 1**.

DEP Division of Environmental Assessment (DEA) has provided MaineDOT the pririty stressors based on the best available data (**Table 1**).

Chloride is the most common stressor prioritized by DEP DEA across the UIS watersheds.

Table 1. Summary of the UIS Watershed Priority Stressors

UIS Watershed	Town	Environmental Stressors Prioritized by DEP*	WBMP Available?
Arctic Brook	Bangor	DO, Chloride, Habitat/Flow	Yes
Concord Gully	Freeport	Chloride, Habitat/Flow	Yes
Frost Gully Brook	Freeport	Flow/Habitat Instability	-
Goosefare Brook	Saco	Chloride, Nutrients, Habitat	Yes
Nasons Brook	Westbrook, Portland	Habitat, Chloride**	-
Penjajawoc Stream	Bangor	DO, Chloride	Yes
Red Brook	Scarborough, South Portland	Habitat/Flow, Habitat/Crossings, Chloride	Yes
Sucker Brook	Bangor, Hampden	Chloride, DO/Nutrient Enrichment	-

*: As provided by DEP Division of Environmental Assessment (2021).
**: MaineDOT has no plow crew in Nasons Brook watershed and does not contribute to the chloride input to the watershed.
DO: Dissolved Oxygen
IC: Impervious Cover
TMDL: Total Maximum Daily Load
WBMP: Watershed-based Management Plan

3. Stormwater BMPs for the Urban Impaired Stream Watersheds

Operational priorities of and resources available to MaineDOT may change over the course of the permit cycle. Therefore, MaineDOT proposes a flexible approach rather than a highly prescriptive one to address the BMP requirement given in Part IV.E.3 of the TS4 permit. The proposed flexible approach considers the uncertainty associated with the number, scope, and schedule of the MaineDOT construction projects which will be completed in each urban impaired stream (UIS) watershed during the permit cycle. The proposed approach also aims to ensure that MaineDOT contributes to the full implementation of clear, specific, and measurable best management practices (BMPs) by the end of the permit cycle.

MaineDOT has created a list of BMP alternatives targeting the priority stressors in the UIS watersheds (**Table 2**). MaineDOT proposes to fulfill its BMP requirement in each UIS watershed through implementation of three of these BMP alternatives before the end of the permit cycle (i.e. 7/1/2027).

MaineDOT will evaluate its BMP implementation progress for each UIS watershed by the end of PY3. If the evaluation results indicate that MaineDOT will not be able to meet the permit requirement (i.e. minimum three BMPs) in certain UIS watershed(s) by the end of the permit cycle, MaineDOT will propose to (a) implement new BMPs which are not listed in **Table 2,** and/or (b) fund eligible BMPs to be implemented by other entities by the end of the permit cycle. The proposal will be submitted to DEP as a permit modification request.

Table 2. Stormwater Best Management Practices for the Urban Impaired Stream Watersheds.

A. Structural Best Management Practices			
#	BMP	Project Type	Target UIS Stressor(s)
A.1.a	New Treatment Measure	O	All Except Chloride
A.1.b	New Small Footprint Measure	O	Nutrients, Dissolved Oxygen
A.2	Smart Chloride Mitigation System	N	Chloride
A.3	Stream Crossing Upgrade	O	Habitat
B. Non-structural Best Management Practices			
B.1	Street Sweeping	N	Nutrients, Dissolved Oxygen
B.2	Winter Salt Application	N	Chloride
B.3	Stream Channel Restoration	N	Habitat

Abbreviations:
Project Type: Opportunistic (O) stands for the BMPs linked to the projects in the current or future MaineDOT work plans. New (N) stands for the BMPs developed to address the TS4 permit requirements.

Table 3 summarizes the BMPs that MaineDOT intends to implement for each UIS watershed. It must be noted that the potential BMPs given for a UIS watershed are designed to address the specific priority stressors. Emboldened potential BMPs are those most likely to be implemented in the watershed.

Table 3. Summary of the UIS Watershed BMP Implementation.

UIS Watershed	Environmental Stressors Prioritized by DEP*	Potential BMPs for the Watershed (from Table 2)
Arctic Brook	DO, Chloride, Habitat/Flow	A.1**, **A.2**, A.3, B.1, **B.2**, B.3
Concord Gully Brook	Chloride, Habitat/Flow	**A.1**, **A.2**, **B.2**, B.3
Frost Gully Brook	Flow/Habitat Instability	A.1, A.3, B.3
Goosefare Brook	Chloride, Nutrients, Habitat	**A.1**, **A.2**, A.3, B.1, **B.2**, B.3
Nasons Brook	Habitat, Chloride***	A.1, **A.2**, A.3, B.3
Penjajawoc Stream	DO, Chloride	**A.1**, **A.2**, B.1, **B.2**
Red Brook	Habitat/Flow, Habitat/Crossings, Chloride	A.1, **A.2**, **A.3**, **B.2,** B.3
Sucker Brook	Chloride, DO/Nutrient Enrichment	A.1**, **A.2**, B.1, **B.2**

*: As provided by DEP Division of Environmental Assessment (2021).
**: Small footprint treatment measure can be implemented.
***: MaineDOT has no plow crew serving Nasons Brook watershed and does not contribute to the winter salt/chloride input to the watershed. So, B.2 is not included in the "Potential BMPs for the Watershed (from Table 2)" column for Nasons Brook watershed.
DO: Dissolved Oxygen

Explanations for the BMPs given in **bold**:
A.1: MaineDOT projects in the current work plan which will include a new post-construction treatment measure (see **Table 4**).

A.2: Smart chloride mitigation system (SCMS) will be implemented in one of the seven chloride-impaired UIS watersheds. However, DEP indicated that MaineDOT could receive one BMP credit for each of the watersheds with a chloride impairment considering the *"know-how"* generated by the first SCMS can be used for the development of new BMPs in the chloride impaired UIS watersheds (MaineDOT-DEP meeting dated 9/13/2021).

B.2: "Winter Salt Application Report", which will be submitted with the annual TS4 report, will include the winter salt application rates for the pavement maintained by MaineDOT in the chloride impaired UIS watersheds.

A. Structural Best Management Practices

A.1 New Treatment Measure

MaineDOT proposes the following to count towards the fulfillment of the UIS BMP requirement:

a. New treatment measures constructed to comply with minimum control measure 5 (MCM5) or with the UIS BMP requirement:

"New treatment measure" refers to a new structural measure constructed in an UIS watershed within the permit cycle to mitigate the impact of the stormwater discharges from a developed area that is under the control of MaineDOT. These measures typically provide water quality and channel protection volume to mitigate the downstream impact of the stormwater. MaineDOT plans on constructing new treatment measures for the projects which are in its current work plan (2021-2022-2023) and given in **Table 4**. MaineDOT may also choose to partner with another entity to construct a new treatment measure.

Table 4. MaineDOT Projects Including New Treatment Measures (Work Plan: 2021 thru 2023).

UIS Watershed	WIN#	Project Description	Construction	
			Begin Date (Forecast)	End Date (Forecast)
Goosefare Brook	023274.00	Park & Ride Expansion	04/10/2023	08/18/2023
Penjajawoc Stream	018595.10	Diverging Diamond Interchange (Hogan Rd-I95)	06/09/2024	10/21/2026
Concord Gully Brook	023627.00	I-295 Exit 20 Bridge	11/17/2021	11/07/2024

b. New small footprint measures opportunistically constructed with the maintenance projects:

"New small footprint measure" refers to a new structural measure including high rate filter media with demonstrated "Total Suspended Solids (TSS)" and "Total Phosphorus (TP)" removal performance. A recent study on the "International Stormwater BMP Database" has shown that the high rate filter media supporting plants (high rate biofiltration) significantly reduce the TSS and TP concentrations using three statistical methods (see **Attachment 3**). MaineDOT can consider the high rate biofiltration measures for the UIS watersheds with sediment related priority stressors (i.e. dissolved oxygen, nutrients) (see **Table 3**). The high rate biofiltration measures can be implemented in Arctic Brook and Sucker Brook watersheds for these watersheds do not have any projects with new treatment measure in the current MaineDOT work plan. MaineDOT will consult with and obtain the approval of DEP prior to the construction of the small footprint measures.

A.2 Smart Chloride Mitigation System

MaineDOT has developed a novel smart chloride mitigation system (SCMS) concept which will be implemented in one of the seven UIS watersheds where chloride has been identified as a priority stressor (**Table 3**). The SCMS will utilize continuous monitoring adaptive control (CMAC) consisting of sensors, actuated valves or gates to detain chloride-rich stormwater from impervious surfaces treated with winter salt and gradually release it to minimize its adverse impact on the freshwater stream habitat. In other words, the SCMS will be designed to flush the winter salt from the stream watershed with minimum salinity impact on the habitat. Details of the SCMS are provided in **Attachment 2**.

MaineDOT proposes to fully implement one pilot SCMS in an area which is under the full control of the Department by the end of the permit cycle. The park & ride lots have emerged as likely candidates for the pilot SCMS in the cursory review of the winter salt treated impervious areas in MaineDOT right-of-way. The ultimate location will be determined based on the results of a multi-criteria site evaluation and selection process. If no feasible site can be identified in the seven UIS watersheds where MaineDOT maintains outfalls, MaineDOT may select a site in another UIS watershed in consultation with DEP.

MaineDOT proposes the following implementation schedule for SCMS BMP:

- Permit Year (PY) 2: Site evaluation and selection, SCMS design
- PY3: SCMS construction
- PY 4 and 5: SCMS operation and maintenance, development of new SCMS configurations, and public education and outreach.

MaineDOT had a meeting with DEP on the SCMS on 9/13/21: DEP indicated that MaineDOT could receive one BMP credit for each of the UIS watersheds (see **Table 3**) with chloride impairment considering the *"know-how"* generated by the first SCMS can be used for the development of new BMPs in the chloride impaired UIS watersheds. Therefore, MaineDOT proposes to receive one BMP credit for each chloride impaired UIS watershed for the full implementation of the SCMS.

A.3 Stream Crossing Upgrade

MaineDOT has developed and successfully implemented a range of design approaches to remove fish and aquatic organism passage barriers when upgrading its stream crossings. These include hydraulic and geomorphic-based designs, and may follow MaineDOT's Habitat Connectivity Design (HCD) guidance in areas covered by the Maine Atlantic Salmon Programmatic Consultation (MAP). MaineDOT proposes that its stream crossing upgrade projects which removes fish and aquatic organism barriers count toward the fulfillment of the BMP requirement for the habitat impaired UISs (**Table 3**). MaineDOT currently has two stream crossing upgrade projects in its current work plan (**Table 5**). Both are retrofits of existing large culverts intended to provide fish passage for brook trout and therefore will likely require a hydraulic design approach. This may include weir/baffles to the inside of the culvert and building either a concrete pool-weir fishway or geomorphic-based roughened channel at the outlet. Similar projects in the future work plans (e.g. 2022-2023-2024) will be considered towards the fulfillment of the BMP requirement. Potential upstream and downstream geomorphological effects of the stream crossing upgrade projects will be assessed to ensure that the projects will not negatively impact the stream habitat.

Table 5. MaineDOT Stream Crossing Upgrade Projects in the UIS Watersheds (Work Plan 2021-2022-2023).

UIS Watershed	WIN#	Project Description	Construction	
			Begin Date (Forecast)	End Date (Forecast)
Red Brook	023601.00	Culvert Rehabilitation to I-295 Northbound/Red Brook Bridge	10/18/2022	01/24/2023
	020535.00	Aquatic Organism Passage Restoration	10/18/2022	10/21/2026

B. Non-structural Best Management Practices

B.1 Street Sweeping

MaineDOT "Maintenance & Operations" sweeps state and state-aid highways typically once a year in accordance with its level-of-service guidance document. Sweeping is a source control BMP that removes coarser sediment and sediment-bound nutrients from impervious surfaces before they are washed off by surface runoff. Road intersections with high traffic counts and long queues have higher concentrations of fine sediment and exhaust particulate and are considered pollutant "hot spots." To effectively remove the fine particulate requires the use of regenerative vacuum sweepers.

In addition to scheduled sweeping, the Department proposes to provide regenerative vacuum sweeping of road intersections and sections hot spots, to be pre-approved by DEP, when antecedent dry periods exceed two weeks.

B.2 Winter Salt Application

MaineDOT proposes to track and report its winter salt application for the UIS watersheds for which chloride has been identified as a priority stressor (**Tables 2 & 3**). The winter salt application rates coupled with the Accumulated Winter Season Severity Index (AWSSI) (https://mrcc.purdue.edu/research/awssi/indexAwssi.jsp) will be reported for the UIS watersheds with the annual report. To increase the temporal resolution of the salt application rates, MaineDOT will track the amount of the salt applied by its own crews and its contractors for each storm in the UIS watersheds (**Attachment 4**). The application rates will be both reported on a seasonal "per lane mile" and "per impervious area" basis. High-resolution GIS data will be used to calculate the impervious area served by each crew and contractor. MaineDOT will include its average statewide salt application rates and the average statewide salt application rates of neighboring state DOTs to put the MaineDOT's UIS watershed salt application rates into context. Salt application data of the other state DOTs will be obtained from the Clear Roads "Annual Survey of State Winter Maintenance Data" (https://clearroads.org/winter-maintenance-survey/). The annual UIS watershed salt application data to be reported by MaineDOT can be used to determine the baseline salt/chloride input to a UIS watershed and potential salt/chloride hot spots if coupled with the data from the other winter salt applicators (e.g. towns, contractors).

MaineDOT is currently in the process of reviewing the latest generation of spreader controls that are on the market. Currently, MaineDOT's fleet of 400 plow trucks is about two-thirds outfitted with a generation of spreader controls known as *Cirus SpreadSmart,* and about one-third are outfitted with a much older generation of spreader controls from the 90's known as *Compu-Spread CS-230AC* units. Being an older generation of spreader control, the *CS-230AC* units are much more complicated to calibrate and have a spread-rate variability of approximately 10%. Newer spreader controls, like the *Cirus* units, provide a much more automated calibration process and reduce the variability of the spread rate to approximately 2%. Over the course of the permit cycle, MaineDOT intends to swap over the last remaining *CS-230AC* units to a current-generation spreader control that will improve the accuracy of the salt application data. MaineDOT will provide the number of spreader control upgrades for the plow crews serving the UIS watersheds in the annual reports.

In this permit cycle, MaineDOT will implement *Automatic Vehicle Location (AVL)* technology to increase the spatial resolution of the salt application data in one of the UIS watersheds where it has a relatively high winter maintenance footprint (**Attachment 4**): Red Brook or Sucker Brook. MaineDOT will equip the plow trucks of its Scarborough or Bangor crew (#71404 or #71103) by the end of PY2. MaineDOT will submit its salt application data with finer spatial resolution for Red Brook or Sucker Brook watershed starting with PY3 annual report.

MaineDOT will evaluate the baseline winter salt application data by the end of PY5 to assess the need for additional winter maintenance BMPs to be implemented in the UIS watersheds in the following permit cycle.

B.4 Stream Channel Restoration

MaineDOT proposes to restore the UIS reaches within its right-of-way. The stream restoration projects will be considered for the UIS under the stress of habitat degradation (**Tables 2 & 3**). MaineDOT can opportunistically develop a restoration project to be coupled with another project in its work plan. The restoration project development will follow the "General Stream Restoration Techniques" given under Attachment D of the 2022 Transportation MS4 permit. Upon identification of an UIS reach for restoration, MaineDOT will promptly contact DEP to obtain its approval and develop the restoration project in consultation with DEP.

Attachment 1. Land Use/Land Cover, MaineDOT TS4 Metrics of the Urban Impaired Stream Watersheds

Urban Impaired Stream	Watershed Area (sq. mi)	NLCD 2016 Developed Area	NCLD 2016 Impervious Area	Percent of the Watershed's Total Impervious Area (NLCD 2016)				MaineDOT Impervious Area (ac)	MaineDOT TS4 Outfalls
				Primary Roads	Secondary Roads	Tertiary Roads	Non-Road		
Arctic Brook	1.16	71%	29%	5%	7%	37%	52%	9.8	11
Concord Gully	0.88	56%	25%	4%	13%	19%	64%	9.1	2
Frost Gully Brook	2.54	29%	6%	10%	24%	26%	40%	11.7	7
Goosefare Brook	5.62	52%	18%	4%	12%	25%	60%	28.6	15
Nasons Brook	1.13	60%	32%	2%	11%	9%	78%	12.5	5
Penjajawoc Stream	8.61	29%	13%	5%	6%	24%	65%	37.6	14
Red Brook	2.96	32%	12%	15%	21%	8%	56%	50.4	17
Sucker Brook	2.75	72%	32%	10%	7%	13%	71%	52.1	26

NLCD 2016: National Land Cover Database Year 2016 Data. The land cover and imperviousness data were minimally processed by MaineDOT to obtain the percentages given in the table. https://www.mrlc.gov/data

Primary Roads: Interstates and other major roads.
Secondary Roads: Non-interstate highways.
Tertiary Roads: Any two-lane road.
Non-Road: Impervious area other than roads.

Attachment 2. A "Smart" Stormwater System to Mitigate the Chloride Impact on the Urban Impaired Streams

EXECUTIVE SUMMARY

Chloride has been identified as a stressor impairing stream water quality in Maine. Salt application due to winter maintenance of the impervious surfaces (roads, parking lots, sidewalks) is the leading chloride source in the stream watersheds. Chloride is a challenging stormwater contaminant since

- Chloride cannot be removed by any of the existing stormwater treatment measures due to its high solubility,
- As opposed to most stormwater contaminants, stormwater infiltration into soil is not a removal mechanism for chloride. On the contrary, groundwater contaminated by chloride persistently elevates chloride concentrations in streams through baseflow,
- Chloride source control is a challenging endeavor due to the public safety, level of service concerns against reduced winter salt application.

Research on the export of winter salt (chloride) has shown that the highest chloride mass export from the source areas (e.g. roadways) occurs during winter and spring snowmelt/rain events: small surface runoff volume and very high chloride concentrations. Seasonal diversion and detention of high-chloride stormwater to mitigate the chloride impact on the stream habitat has been proposed and evaluated by the researchers and practitioners.

Main goal of the project is to mitigate the chloride impact on the stream habitats by implementing:

- A "smart" stormwater system that detain and release chloride-rich stormwater

"Smart" stormwater systems consist of sensors, actuated valves, and specialized software giving them "Continuous Monitoring Adaptive Control" capabilities. As opposed to conventional stormwater control measures, smart systems can continuously measure parameters of interest, analyze the monitoring data, and make autonomous decisions which ultimately deliver better performance or even achieve goals that their conventional counterparts cannot.

The proposed smart system mainly consists of a non-infiltrating detention basin equipped with flow gauges and specific conductance (easy-to-measure, proxy parameter for chloride) sensors. A "logic" customized for chloride mitigation will be developed for the system. Potential DOT application sites are park & rides, highway medians, and interchange infields.

Detailed discussion of the proposed smart system's schematics and the pilot application alternatives can be found in Section 2 and 3, respectively.

1. BACKGROUND AND OBJECTIVE

Chloride has been identified as a stressor impairing stream water quality in Maine. The Department of Environmental Protection (DEP) Chloride is a stressor in seven of the eight urban impaired streams (UIS) where MaineDOT operates "Municipal Separate Storm Sewer Systems (MS4)". Additional best management practices are required to address the chloride and other stressors in the UIS watersheds by the new transportation general MS4 permit which will go into effect on July 1, 2022.

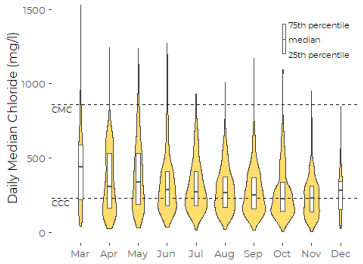
Salt application due to winter maintenance of the impervious surfaces (roads, parking lots, sidewalks) is the leading chloride source in the stream watersheds. Chloride is a challenging stormwater contaminant since

Chloride Trends in an Urban Impaired Stream in Maine: Long Creek

Long Creek is a unique urban impaired stream which has its own general permit issued by EPA under its residual designation authority. Long Creek Watershed Management District (LCWMD) is the entity specifically established to operate the general permit. Since 2010, LCWMD has been monitoring Long Creek main stem and its tributaries for various water quality parameters including specific conductance and chloride. Continuous specific conductance monitoring has generated a large data set reflecting temporal trend of specific conductance/chloride concentration in Long Creek main stem and its tributaries.

Following graph shows the daily median chloride concentrations estimated using automatic/continuous specific conductance measurements performed at various stations in the watershed. The blob width shows the number of observations for a given daily median chloride concentration: less observations/measurements are available for March and December as compared other months. Based on the figure, we can say:

- Daily median chloride concentration is generally high late winter/early spring and gradually decreases until fall indicating that road salt is partially flushed out of the watershed between the consecutive winter maintenance seasons,
- More than 50% of the daily median chloride concentrations exceed the chronic water quality criterion set for chloride (i.e. 230 mg L^{-1}) (see "CCC" line in the figure) indicating a persistent yearlong chloride stress on the stream biota,
- It is not uncommon that the daily mean chloride concentrations exceed the acute water quality criterion every month (i.e. 860 mg L^{-1}) (see "CMC" line in the figure),
- Even under the worst conditions (see "March" in the figure), approximately 25% of the daily median chloride concentrations are under the chronic water quality criterion (CCC) which indicates that a window of opportunity exists every month for releasing chloride-rich stormwater from a smart system (see the details for the proposed smart system below).



Aggregated Daily Mean Chloride Concentrations in Long Creek streams (Courtesy of Dr. Curtis Bohlen)

A Comprehensive Chloride Monitoring Case Study: Lake McCarrons Watershed (Minnesota)

A recent monitoring study on the roadway runoff provides very useful information on the chloride dynamics (Herb et al. 2017). Figures below are for the two monitoring sites in Lake McCarrons Watershed (MN) monitored for three field seasons (2015-2017):

- *County Road B:* 28-ac drainage area consisting of 0.5-mile county road and residential streets (curb-and-gutter roadway),
- *Highway 36 Ditch:* 12-ac drainage area consisting of ditches/swales adjacent to Highway 36 and its eastbound off-ramp.

Major findings are:

- There is a stark contrast between chloride retention behavior of the two study watersheds. Retention reported below is the "*percentage of applied road salt/chloride that is not observed in the surface runoff*":

Study Site	2015-2016 Field Season	2016-2017 Field Season
Curb-and-gutter Roadway (County Road B)	Road Salt Applied: 3,595 lbs (128 lbs/ac) Chloride Observed in Surface Runoff: 1,212 lbs (43 lbs/ac) Chloride Retention: **66%**	Road Salt Applied: 4,726 lbs (169 lbs/ac) Chloride Observed in Surface Runoff: 2,968 lbs (106 lbs/ac) Chloride Retention: **37%**
Highway Ditch (Highway 36)	Road Salt Applied: 6,233 lbs (519 lbs/ac) Chloride Observed in Surface Runoff: 375 lbs (31 lbs/ac) Chloride Retention: **94%**	Road Salt Applied: 9,012 lbs (751 lbs/ac) Chloride Observed in Surface Runoff: 556 lbs (46 lbs/ac) Chloride Retention: **94%**
Values reported in parentheses are chloride mass normalized by the area of the study watershed (Not impervious area or impervious roadway area)		

The highway ditch site consistently has a higher chloride retention than the curb-and-gutter roadway indicating that a significant amount (i.e. 94%) of road salt infiltrates into the ditch soil and does not appear in the concentrated ditch flow,

- Chloride retained in the ditch soil (shallow groundwater) can be exported in fall season (see "November Mean Chloride Load" in the bottom-right figure). Note that the November chloride peak was not due to new winter salt application. On the other hand, major chloride export occurs in winter season in the curb-and-gutter roadway (see "Mean Chloride Load" in the bottom-left figure),

Noteworthy Conclusions of the Researchers Pertinent to the Smart Chloride Mitigation Concept:

Section 6.3 of the report (Herb et al. 2017) includes statements supporting the smart chloride mitigation concept, although the authors did not specifically mention the application of a smart stormwater system, discussed herein. For instance, the authors state:

- *"The chloride management strategies examined in this study focused primarily on snowmelt capture, with the idea that capturing small amounts of snowmelt runoff with high chloride concentrations may be a relatively efficient method to mitigate chloride spreading from de-icers in the environment…."*
- *"….Chloride removal by diversion of saline runoff will be most effective (in terms of mass of chloride removed per volume of water) if implemented at the scale of a roadway, before runoff enters the drainage network (e.g., at County Road B)…..For example, a diversion of 0.1 inches of the most saline runoff at the County Road B site would remove 80% of surface runoff chloride from the site….."*

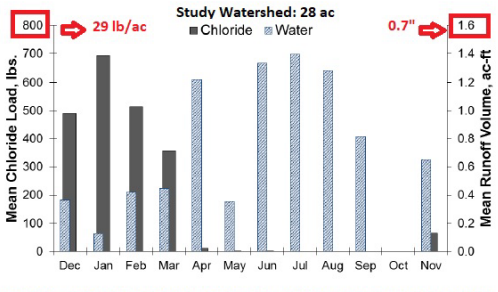


Figure 3-9. Mean monthly loading of chloride (lbs.; left axis) and water (ac-ft; right axis) observed at ***County Road B*** over two years of continuous monitoring Aug 1, 2015 – Jul 31, 2017. The lack of October runoff data is due to temporary removal of the weir for site maintenance.

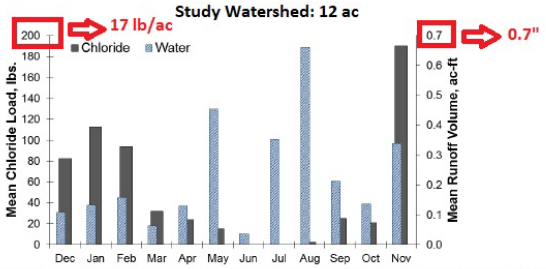


Figure 3-11. Mean monthly loading of chloride (lbs.; left axis) and water (ac-ft; right axis) observed at ***Highway 36 Ditch*** over two years of continuous monitoring Aug 1, 2015 – Jul 31, 2017.

- Chloride cannot be removed by any of the existing stormwater treatment measures due to its high solubility,

- As opposed to most stormwater contaminants, stormwater infiltration into soil is not a removal mechanism for chloride: chloride is neither retained by soil particles nor decomposes in the soil column. On the contrary, stormwater chloride contaminates groundwater after its infiltration. Elevated year-round chloride concentrations observed in the streams are due to the high-chloride groundwater baseflow in addition to the surface runoff (See text box below for the chloride trends in an urban impaired stream in Maine). Any stormwater measure aiming chloride mitigation must consider "chloride transport into groundwater via infiltration" as the surface runoff moves towards a stream or another surface water. This transport mechanism increases the chloride residence time in a watershed and results in chronic water quality problems for the chloride applied in a winter maintenance season is not "flushed out" of the watershed before the onset of the following winter maintenance season,

- Chloride source control is a challenging endeavor due to the public safety, level of service concerns against reduced winter salt application.

Therefore, there is a clear need for innovative end-of-pipe stormwater measures to mitigate the stress exerted on the stream water quality and habitats by elevated chloride levels.

Main goal of the project is to mitigate the chloride impact on the stream habitats by implementing:

- A "smart" stormwater system that detain and release chloride-rich stormwater

"Smart" stormwater systems consist of sensors, actuated valves, and specialized software giving them "Continuous Monitoring Adaptive Control (CMAC)" capabilities. As opposed to conventional stormwater control measures, smart systems can continuously measure parameters of interest, analyze the monitoring data, and make autonomous decisions which ultimately deliver better performance or even achieve goals that their conventional counterparts cannot (**Fig. 1**).

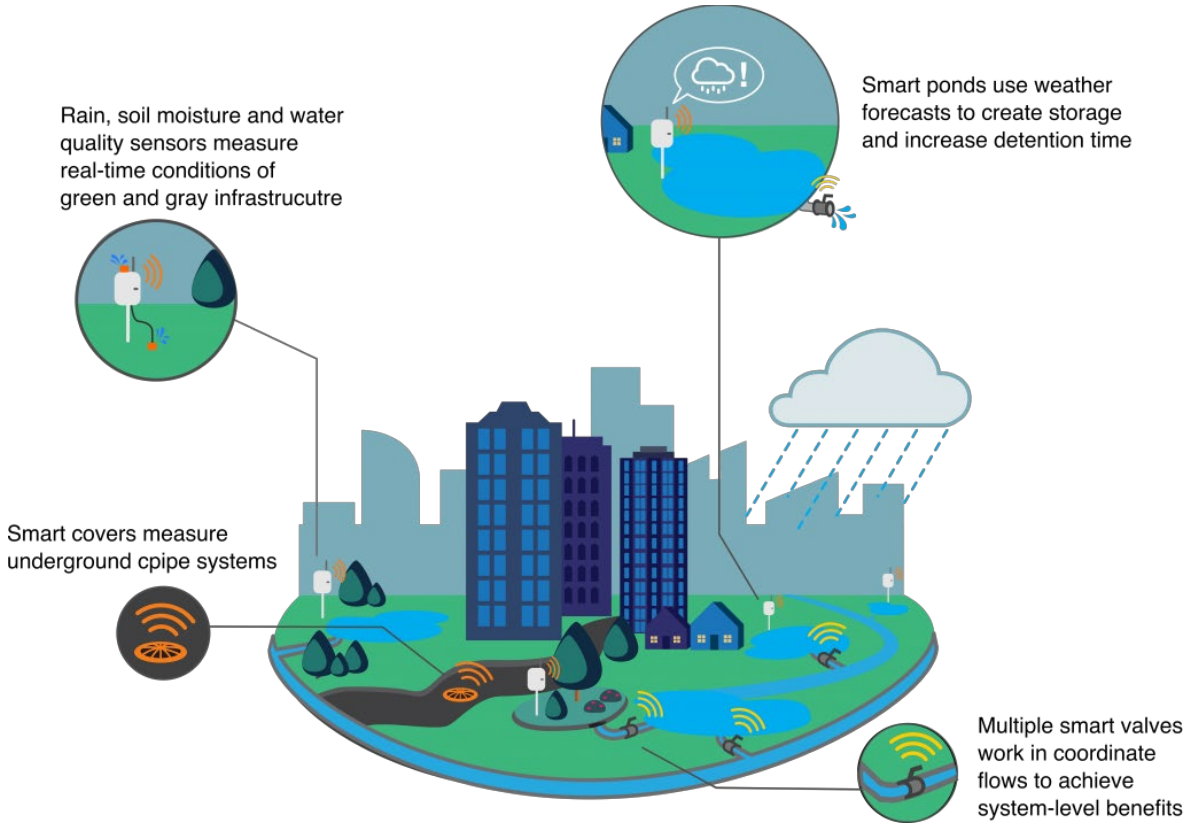


Figure 1. Potential applications of smart stormwater management (Reference: http://open-storm.org/workshop-cps2020/).

CMAC is an innovative stormwater management approach and an active area of research. As relative cost of CMAC components decrease, full-scale CMAC projects will be more common across the nation. Select (incomplete) list of the CMAC projects and their objectives are given below.

Project	Objective(s)
City of Ann Harbor (MI) Stormwater System*	• Flood mitigation • Water quality improvement • Cost reduction
Maryland Department of Transportation (MDOT) & Walmart "Public Private Partnership" (PPP)**	• Flood mitigation • Water quality improvement • Cost reduction • Water quality credit
Real-time Control Schemes for Bioretention Cells***	• Performance Enhancement
Conner Creek Watershed (Knox County, TN)***	• Investigation of site- and system-level barriers against smart stormwater management

City of Albany (NY), Bronx (NY), Hoboken (NJ), Kansas City (MO), Philadelphia (PA)**	• Combined Sewer Overflow (CSO) Mitigation
*: (http://open-storm.org/case-studies/) **: Opti Case Studies (https://optirtc.com/case-studies) ***: Jon Hathaway's Personal Research Webpage (Assoc. Prof @ UTK: http://hathaway.utk.edu/Research.html)	

Although smart stormwater systems have been used for flood and CSO mitigation, improving water quality treatment, they have yet to be used for mitigating the chloride resulting from winter deicing activities. Specifically, the "logic" required for the smart chloride system is currently unavailable and needs to be developed.

2. MAINEDOT STORMWATER BMP FRAMEWORK FOR CHLORIDE MITIGATION

New or retrofit post-construction stormwater best management practices (BMPs) that use CMAC to detain chloride-rich stormwater and mitigate its adverse impact on the downstream freshwaters. Potential application scenarios/configurations are shown below.

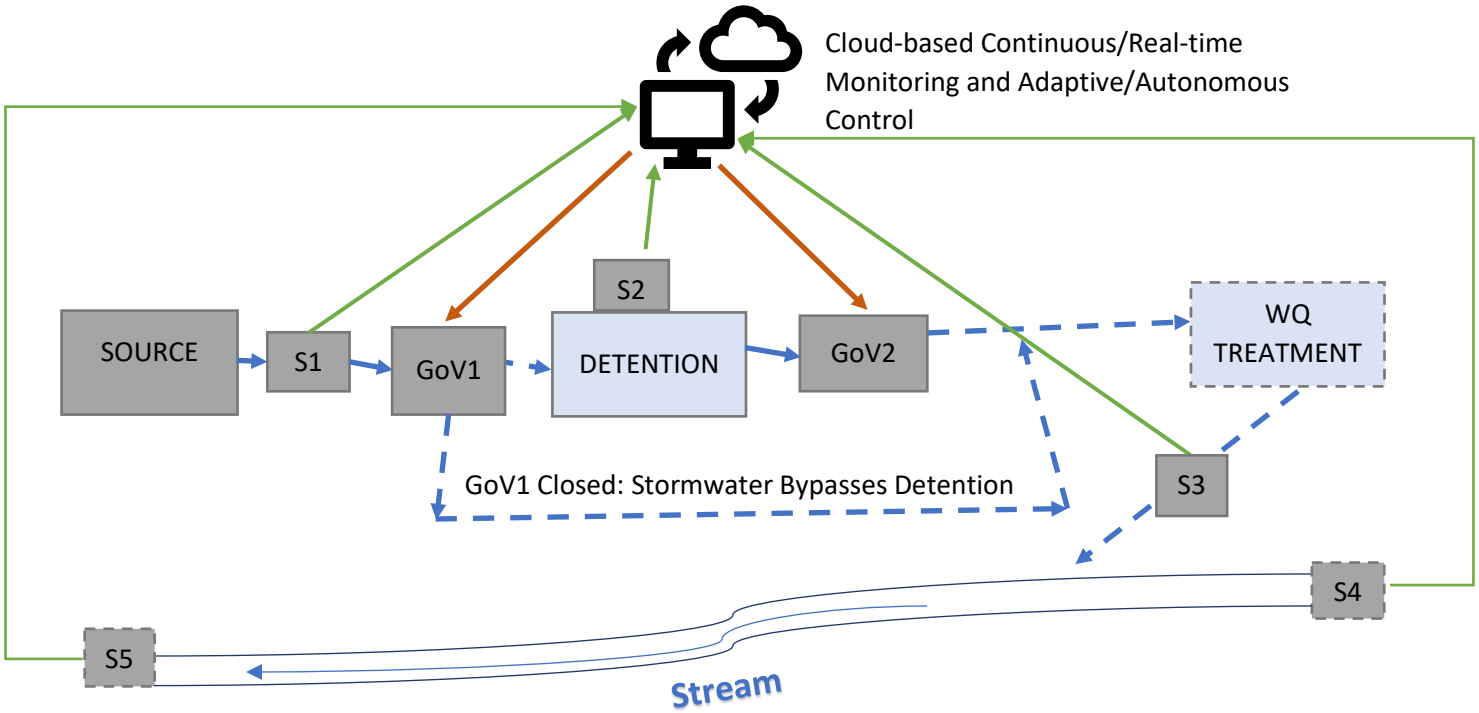


Figure 1. Smart Chloride Mitigation System Schematics.

Table 1. Smart Chloride Mitigation System Component Details.

DIAGRAM ITEM	DESCRIPTION	CRITERIA, LIMITATIONS ETC.
SOURCE	Deicer Treated Impervious Surfaces (i.e. Roads, Parking Areas, Sidewalks)	• Distance between the source and detention BMP or measure must be relatively small, • Source area must be sufficiently large to justify the cost of the smart system, • Sufficient detention volume must be available for storing chloride-rich stormwater: the smart system can be unfeasible for high "source area: detention area" • Source areas with closed stormwater drainage are preferred.
S1	Electrical Conductivity Sensor and Flow Gauge	• Stormwater sampling and analysis for chloride can be necessary to correlate "electrical conductivity" to "chloride concentration". • Based on the electrical conductivity input signal from S1, the logic will either open or close GoV1.
S2	Electrical Conductivity and Level Sensor (e.g. Pressure Transducer)	• If the level sensor indicates that the maximum water level is reached in the DETENTION measure, the logic will close GoV1. • Chloride mass in the DETENTION measure will be continuously monitored: chloride stratification (i.e. chloride concentration increasing with depth) in the DETENTION measure can be a limitation. • The logic will decide how much of the influent from the SOURCE will be blended with the stormwater based on S1 and S2 input signals. Hence, the smart system will deliver stormwater with "acceptable" electrical conductivity/chloride concentration downstream.
S3	Electrical Conductivity and Flow Gauge	• S3 will continuously monitor the flow and electrical conductivity/chloride concentration of the smart system effluent. • S1 and S3 data will demonstrate the chloride mitigation effectiveness of the smart system.
		• The logic can use S4 input signal to control GoV2 and release the detained stormwater if

S4	Electrical Conductivity and Flow Gauge on Stream Upstream the Smart System (OPTIONAL)	the stream conditions are amenable (i.e. high stream flow and/or low electrical conductivity). • This option can be unfeasible if the smart system and the receiving stream are relatively far from each other. • Stream channel accessibility (e.g. right-of-way) and environmental permitting requirements may limit S4 application.
S5	Electrical Conductivity and Flow Gauge on Stream Downstream the Smart System (OPTIONAL)	• S5 will be used to monitor the impact of the smart system outfall on the stream. S5 signals will not be necessarily used as an input for the logic. • Surface runoff, outfalls other than the smart system's outfall, and baseflow may also impact the flow rate and the electrical conductivity (i.e. challenge to isolate the impact of the smart system outfall).
GoV1	Actuated Gate or Valve	• The smart system will allow remote control of GoV1 (i.e. manual on/off) • GoV1 will be fully open or fully closed at a given time. GoV1 doesn't need to have the capability of being partially open.
GoV2	Actuated Gate or Valve	• The smart system will allow remote control of GoV2 (i.e. manual on/off). • GoV2 will have the capability of being open and adjusting the DETENTION outflow rate.
DETENTION	Detention Measure	• A stormwater measure (e.g. existing depression, extended dry detention basin, wetpond) with sufficient storage volume for high electrical conductivity/chloride inflows from the source. • Depending on the site soil characteristics, the detention measure may require a liner to minimize infiltration into the soil.
WQ TREATMENT	Structural Water Quality Treatment BMP (or Measure)	• Conventional stormwater treatment measure to retain and treat the "water quality volume" • The measure can be designed to infiltrate where applicable and appropriate.

3. PILOT APPLICATION ALTERNATIVES FOR SMART CHLORIDE MITIGATION

Following factors have been considered for the development of the pilot application alternatives for smart chloride mitigation:

- The pilot application must be in an urban impaired stream (UIS) watershed where MaineDOT will be required to implement additional stormwater BMPs in accordance with the new transportation general MS4 permit (henceforth, TS4 permit),
- MaineDOT has full access to and control over the project area,
- The pilot application must not conflict with other MaineDOT projects in the work plan,
- Source (deicer applied impervious) area of the pilot application must be sufficiently large to justify the cost of the smart system,
- The pilot application must not be very complex to minimize maintenance and operation problems,
- The pilot application must be flexible to expand the monitored and/or controlled water quality parameters beyond electrical conductivity/chloride,
- Hardware (e.g. sensors, valves) of the pilot application must operate under extreme weather conditions (particularly freezing temperatures) with minimal maintenance,
- Minimum grade must be available for positive drainage of the detained stormwater,
- The pilot application must provide the data to develop low-cost/simpler systems which can be applied more widely.

3.1 PILOT APPLICATION FOR THE NON-LINEAR SOURCE AREAS

Potential application areas are MaineDOT maintenance and park & ride lots within the UIS watersheds (**Table 2**). Maine Department of Environmental Protection has identified chloride as a major stressor for all the UIS watersheds given in **Table 2**. There is only one MaineDOT maintenance lot in the UIS watersheds:

- Bangor Maintenance Facility in the watershed of Penjajawoc Stream.

Table 2. MaineDOT Owned Park and Ride (P&R) Lots in the Urban Impaired Stream Watersheds.

UIS Watershed	Town	P&R Name	Maintenance Responsibility	Winter Maintenance
Concord Gully	Freeport	North	Town of Freeport	Town of Freeport
Sucker Brook	Bangor	Odlin Rd	MaineDOT	MaineDOT
Nasons Brook	Westbrook	Larrabee Rd	City of Westbrook	City of Westbrook
Red Brook	South Portland	Exit 45	MaineDOT	MaineDOT
Goosefare Brook	Saco	Industrial Park Rd	MaineDOT	Contracted
No P&R lots in Frost Gully Brook, Arctic Brook, and Penjajawoc Stream UIS watersheds.				

A potential application of smart chloride mitigation system (SCMS) for a nonlinear source area is shown in **Fig. 2**. Scope of the SCMS work will be limited to the construction of stormwater conveyances, detention basin, and auxiliary structures (e.g. solar panel, control panel box) to the maximum extent practicable. Regrading of the road inslopes and backslopes will be avoided to the maximum extent practicable. Existing

impervious area (e.g. driveways, parking areas) will not be disturbed to allow the continuity of the services. New stormwater conveyances will consist of swales strategically located to capture the chloride-rich snowmelt both from the snow piles and from the impervious surfaces. The swales will be impermeable to eliminate the infiltration of chloride-rich stormwater into the shallow groundwater and maximize the amount of chloride captured by SCMS. In other words, the impermeable swales will be designed to capture most of the chloride applied on the impervious surface during winter season and direct it to SCMS. The chloride-rich stormwater detained by SCMS will be gradually released during higher flow storm events which will presumably generate low-chloride stormwater. Furthermore, it is expected that the open stormwater conveyance (e.g. swales, ditches) soil will be saturated during the higher flow events and the stormwater travel time to the stream through the open conveyance will be relatively short. Under these conditions, minimal amount of the chloride released from SCMS will infiltrate into shallow groundwater as it is conveyed downstream and most of the released chloride will be discharged into the stream. Therefore, chloride from SCMS source area will not contaminate the groundwater and contribute to the base flow chloride load which results in elevated yearlong chloride concentrations in the streams.

Depending on the distance between SCMS outlet and UIS, a simple or complex control logic will be used:

- **Simple Control Logic:** This logic is more appropriate for the applications that do not have a direct outfall to the streams. A fixed electrical conductivity (EC) value (i.e. maximum allowable EC (MAX)) will be set for the autonomous control. The fixed value will be chosen in consultation and with the approval of the Maine Department of Environmental Protection (DEP). An on-site monitoring study may need to be performed prior to the SCMS installation to correlate the EC to chloride concentration.

If Electrical Conductivity (EC) @ S1 > MAX then "Open GoV1 & Fill Detention: GoV2 Closed" (See **Fig. 1**)

If EC @ S1 ≤ MAX then "Close GoV1 & Open GoV2" (See **Fig. 1**)

&

Adjust GoV2 with EC Feedback from S3 to keep EC @ S3 ≤ MAX

- **Complex Control Logic:** This logic is more appropriate for the applications that has a direct outfall to the streams. Instead of the fixed control value proposed for the "Simple Control Logic", the

If Electrical Conductivity (EC) @ S1 > EC @ S4 then "Open GoV1 & Fill Detention: GoV2 Closed" (See **Fig. 1**)

If $EC_{S1} < EC_{S4}$ then "Close GoV1 & Open GoV2" (See **Fig. 1**)

&

Adjust GoV2 with EC Feedback from S4 and S5 to maintain $(EC_{S5} - EC_{S4})/EC_{S4} \times 100 \leq MAX$ *

MAX: Maximum relative EC percent increase allowed for the stream reach by DEP

*: Assuming that SCMS outfall is the major contributor to "EC/Chloride" and "Flow" of the stream reach monitored by S4 and S5 (i.e. distance between S4 and S5 must be relatively short).

"Complex Control Logic" will use the dynamic in-stream data from S4 and S5 (see **Fig. 1**). A tentative simplified version of the complex control logic is presented below. Development of the complex control logic is highly likely to be an iterative process requiring the analysis of monitoring data. DEP will be consulted during the process and its approval of the finalized logic will be sought.

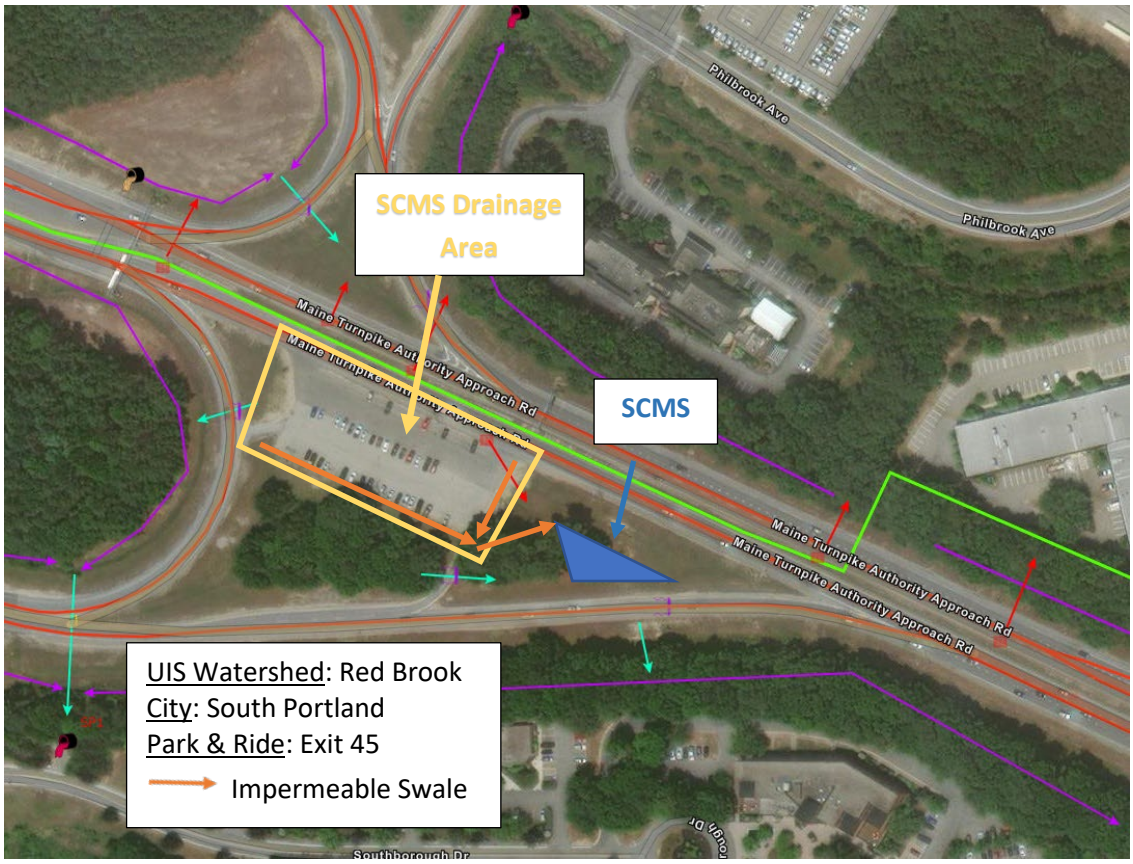


Figure 2. Plan view of a potential smart chloride mitigation system (SCMS) in an urban impaired stream (UIS) watershed. Arrows and lines other than the orange ones belong to the MaineDOT MS4 outfall map and indicate flow directions.

3.2 PILOT APPLICATION FOR THE LINEAR SOURCE AREAS

Linear source areas for SCMS mainly consist of highways treated with deicer during winter maintenance season. Existing depressions can be potentially used to treat the surface runoff from source areas using SCMS. Smart Chloride Mitigation System can also be installed at the outlet of a closed drainage system collecting the surface runoff from a sufficiently large source area. However, it is a challenge to find a closed drainage system meeting the criteria for SCMS, especially having appropriate space and grade at its outlet. It appears that a pilot SCMS application is practicable for the highway medians and interchange infields. The SCMS design must satisfy the clear zone and other applicable safety standards and guidelines.

A potential SCMS application in an interchange infield is shown in **Fig. 3**. In this example, it is assumed that one lane and shoulder of northbound I-295 is sloped towards the infield whereas the on- and off-ramps are sloped away from the infield. Therefore, the section sloped towards the infield is delineated

as the source area of SCMS. As previously stated for the nonlinear source area application, scope of SCMS work will be limited to the construction of stormwater conveyances, detention basin, and auxiliary structures within the infield. Existing catch basin will be modified to operate as a “smart” outlet control structure (OCS) equipped with an actuated gate or valve (see GoV2 in Fig. 1). The OCS will have an overflow/emergency spillway to prevent excessive ponding in the detention area. Outlet pipe of the existing catch basin will be minimally impacted by the SCMS unless it is in very poor condition and must be repaired or replaced. Major earthwork will be for the construction of an impermeable detention basin around the low point of the depression. Construction of impermeable swales that will collect the snowmelt/surface runoff from the source can be necessary (e.g. impermeable downspouts from the shoulder to SCMS). This is particularly important to minimize the infiltration of chloride-rich snowmelt into shallow groundwater as the it runs over the inslope. More chloride-rich stormwater infiltrates, less effective becomes SCMS.

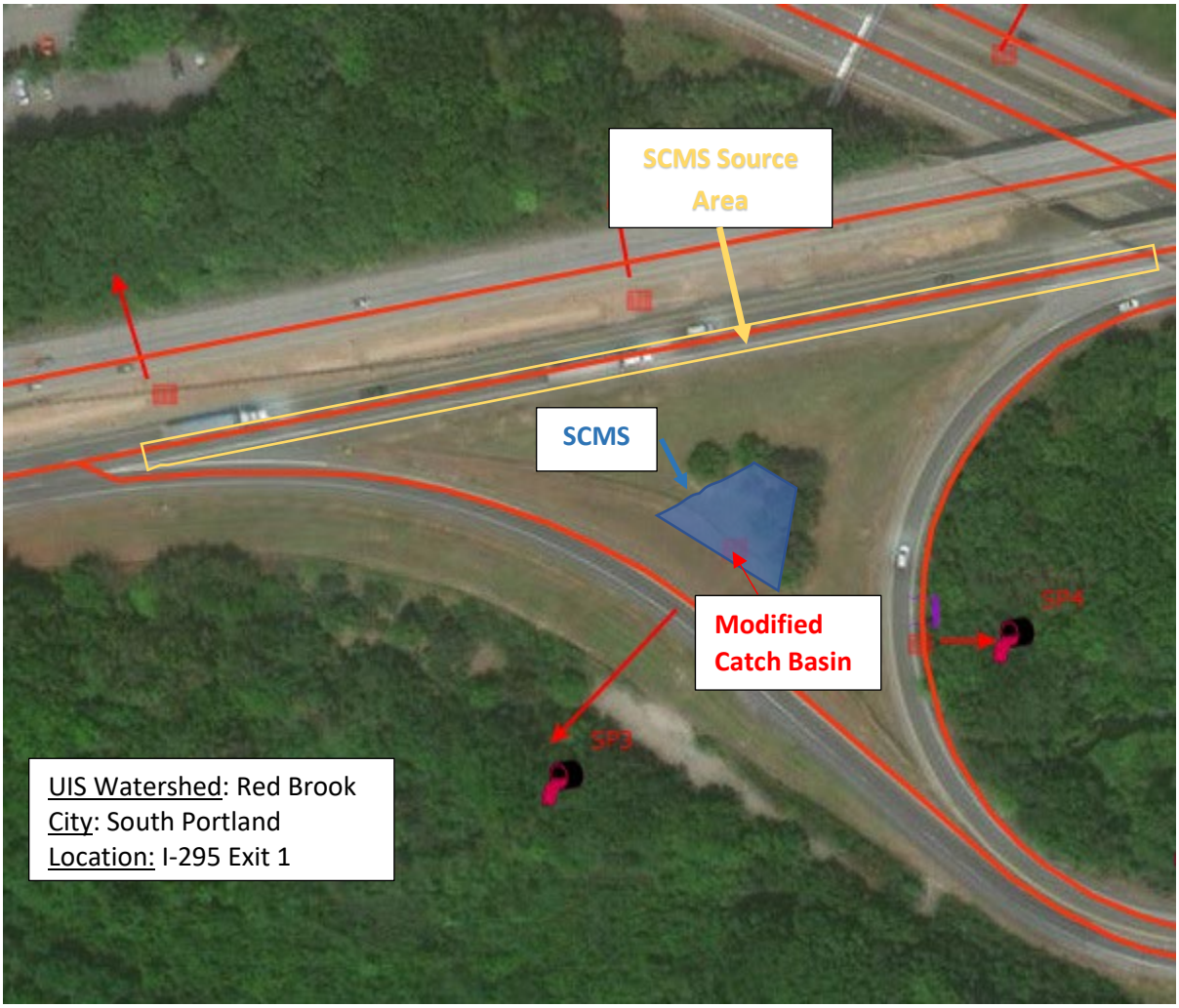


Figure 3. Plan view of a potential smart chloride mitigation system (SCMS) in an urban impaired system (UIS) watershed. Arrows and lines other than the orange lines belong to the MaineDOT MS4 outfall map and indicate flow directions.

4. REFERENCES

1. Herb, William; Janke, Ben; Stefan, Heinz. (2017). Study of De-icing Salt Accumulation and Transport Through a Watershed. Minnesota Department of Transportation. Retrieved from the University of Minnesota Digital Conservancy, https://hdl.handle.net/11299/195170.
2. Curtis Bohlen, Casco Bay Estuary Partnership. Personal Communication on the Long Creek Watershed Chloride Monitoring Data.

Attachment 3. Total Suspended Solids (TSS), Total Phosphorus (TP), and Total Nitrogen (TN) Concentrations of the Stormwater Best Management Practices (BMPs).

	Median TSS (mg/L) (95% Confidence Interval)		
BMP Category	**In**	**Out**	**TSS Median Concentration Reduction (%)**
HRBF	30.8	3.8	87.7%
Media Filter	44	7.2	83.6%
Bioretention	44	10	77.3%
Retention Pond	49	12	75.5%
Porous Pavement	77	22	71.4%
Detention Basin	65.1	22	66.2%
Wetland Basin	35.5	14	60.6%
HRMF	44	18	59.1%
OGS	36	15.5	56.9%
Grass Strip	48	23	52.1%
Grass Swale	26	13.7	47.3%
HDS	63.9	39	39.0%
All BMP categories above have been shown to reduce the TSS concentration significantly using three statistical methods.			
	Median TP (mg/L) (95% Confidence Interval)		
BMP Category	**In**	**Out**	**TP Median Concentration Reduction (%)**
Retention Pond	0.246	0.12	51.2%
HRBF	0.099	0.05	49.5%
Media Filter	0.165	0.09	45.5%
Porous Pavement	0.17	0.1	41.2%
HRMF	0.12	0.08	33.3%
Wetland Basin	0.17	0.122	28.2%
Detention Basin	0.25	0.186	25.6%
All BMP categories above have been shown to reduce the TP concentration significantly using three statistical methods.			
	Median TN (mg/L) (95% Confidence Interval)		
BMP Category	**In**	**Out**	**TN Median Concentration Reduction (%)**
HRMF *	1.88	1	46.8%
Retention Pond	1.63	1.2	26.4%
Bioretention	1.26	0.96	23.8%
Wetland Channel	1.76	1.45	17.6%
Media Filter *	1.06	0.89	16.0%
All BMP categories above have been shown to reduce the TN concentration significantly using three statistical methods.			
*: Two of the three methods indicated significant TN concentration reduction.			
HRBF: High-rate Biofiltration. Manufactured devices with high rate filtration media that support plants.			
HRMF: High-rate Media Filtration. Manufactured devices with high rate filtration media consisting of a variety of inert and sorptive media types and configurations (e.g. cartridge filters, upflow filters, membrane filters, vertical bed filters).			

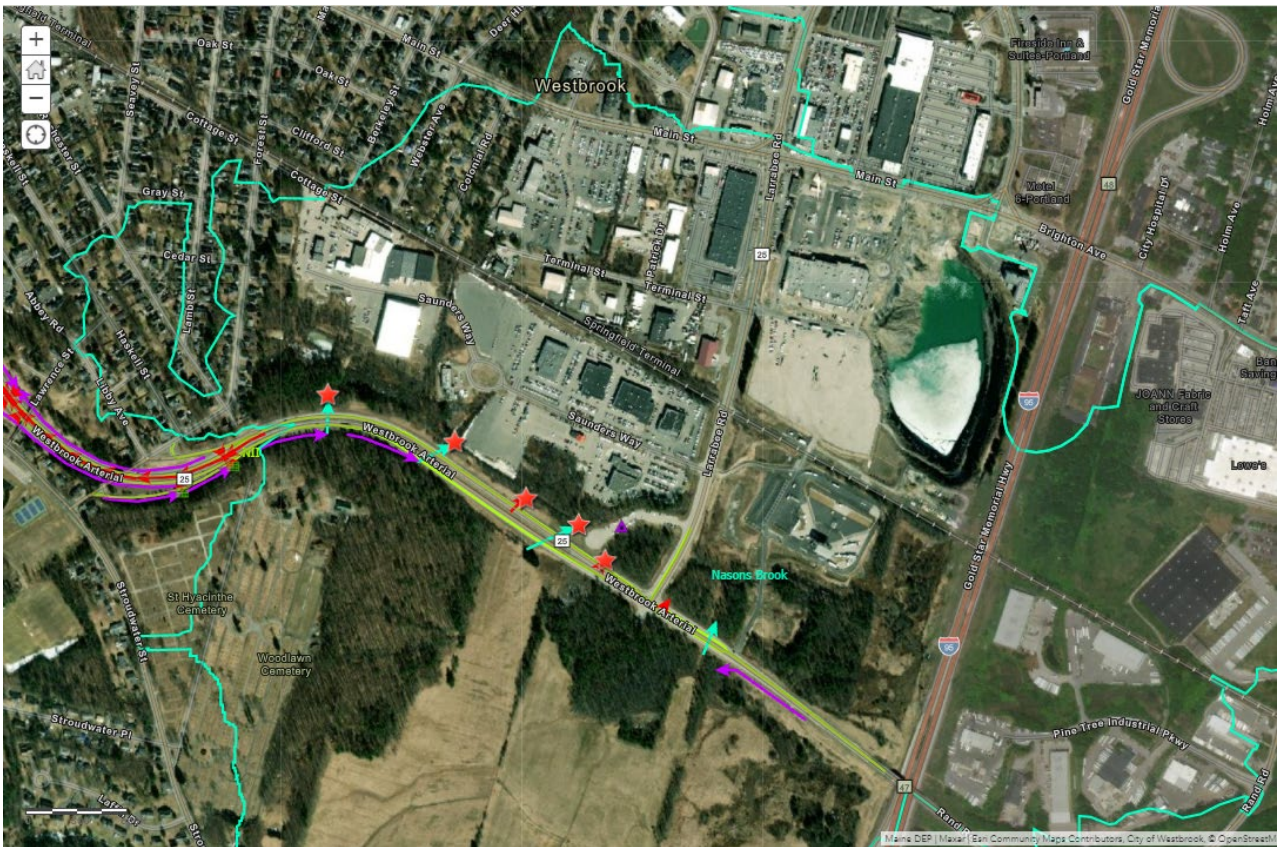
Reference: Water Research Foundation. 2020. International Stormwater BMP Database: 2020 Summary Statistics. Accessible from https://www.waterrf.org/system/files/resource/2020-11/DRPT-4968_0.pdf

Attachment 4. The Roads Plowed by MaineDOT and its Contractors in the Urban Impaired Stream (UIS) Watersheds.

UIS Watershed	Plow Crew #	Road Totals		
		Centerline Miles*	Lane Miles*	Impervious Area (ac)*
Arctic Brook	71404	1.7	3.5	8.4
Concord Gully	71114	1.2	2.4	5.9
Goosefare Brook	CNTRCT	6.2	12.3	28.4
Penjajawoc Stream	71404	5.8	11.6	28.2
	CNTRCT	0.2	0.3	0.7
Red Brook	71103	8.5	17.0	41.3
Sucker Brook	71404	12.5	24.9	60.5

*: Estimated figures which may be revised for accuracy.
Five-digit plow crew numbers stand for MaineDOT Region 1 and 4 plow crews.
CNTRCT: Contractor

Attachment 5. The Roads Plowed by MaineDOT and its Contractors in the Urban Impaired Stream (UIS) Watersheds.



Red stars signify MaineDOT TS4 outfalls along Westbrook Arterial discharging into the northerly stream reach.

The ArcGIS Online web map can be accessed from “Stormwater” link available at https://www.maine.gov/mdot/env/

DEP INFORMATION SHEET

Appealing a Department Licensing Decision

Dated: August 2021 **Contact: (207) 314-1458**

SUMMARY

This document provides information regarding a person's rights and obligations in filing an administrative or judicial appeal of a licensing decision made by the Department of Environmental Protection's (DEP) Commissioner.

Except as provided below, there are two methods available to an aggrieved person seeking to appeal a licensing decision made by the DEP Commissioner: (1) an administrative process before the Board of Environmental Protection (Board); or (2) a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

A person filing an appeal with the Board should review Organization and Powers, 38 M.R.S. §§ 341-D(4) and 346; the Maine Administrative Procedure Act, 5 M.R.S. § 11001; and the DEP's *Rule Concerning the Processing of Applications and Other Administrative Matters* (Chapter 2), 06-096 C.M.R. ch. 2.

DEADLINE TO SUBMIT AN APPEAL TO THE BOARD

Not more than 30 days following the filing of a license decision by the Commissioner with the Board, an aggrieved person may appeal to the Board for review of the Commissioner's decision. The filing of an appeal with the Board, in care of the Board Clerk, is complete when the Board receives the submission by the close of business on the due date (5:00 p.m. on the 30th calendar day from which the Commissioner's decision was filed with the Board, as determined by the received time stamp on the document or electronic mail). Appeals filed after 5:00 p.m. on the 30th calendar day from which the Commissioner's decision was filed with the Board will be dismissed as untimely, absent a showing of good cause.

HOW TO SUBMIT AN APPEAL TO THE BOARD

An appeal to the Board may be submitted via postal mail or electronic mail and must contain all signatures and required appeal contents. An electronic filing must contain the scanned original signature of the appellant(s). The appeal documents must be sent to the following address.

Chair, Board of Environmental Protection
c/o Board Clerk
17 State House Station
Augusta, ME 04333-0017
ruth.a.burke@maine.gov

The DEP may also request the submittal of the original signed paper appeal documents when the appeal is filed electronically. The risk of material not being received in a timely manner is on the sender, regardless of the method used.

At the time an appeal is filed with the Board, the appellant must send a copy of the appeal to: (1) the Commissioner of the DEP (Maine Department of Environmental Protection, 17 State House Station, Augusta, Maine 04333-0017); (2) the licensee; and if a hearing was held on the application, (3) any intervenors in that hearing proceeding. **Please contact the DEP at 207-287-7688 with questions or for contact information regarding a specific licensing decision.**

REQUIRED APPEAL CONTENTS

A complete appeal must contain the following information at the time the appeal is submitted.

1. *Aggrieved status*. The appeal must explain how the appellant has standing to bring the appeal. This requires an explanation of how the appellant may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions, or conditions objected to or believed to be in error.* The appeal must identify the specific findings of fact, conclusions of law, license conditions, or other aspects of the written license decision or of the license review process that the appellant objects to or believes to be in error.
3. *The basis of the objections or challenge.* For the objections identified in Item #2, the appeal must state why the appellant believes that the license decision is incorrect and should be modified or reversed. If possible, the appeal should cite specific evidence in the record or specific licensing criteria that the appellant believes were not properly considered or fully addressed.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license to changes in specific license conditions.
5. *All the matters to be contested*. The Board will limit its consideration to those matters specifically raised in the written notice of appeal.
6. *Request for hearing.* If the appellant wishes the Board to hold a public hearing on the appeal, a request for hearing must be filed as part of the notice of appeal, and it must include an offer of proof regarding the testimony and other evidence that would be presented at the hearing. The offer of proof must consist of a statement of the substance of the evidence, its relevance to the issues on appeal, and whether any witnesses would testify. The Board will hear the arguments in favor of and in opposition to a hearing on the appeal and the presentations on the merits of an appeal at a regularly scheduled meeting. If the Board decides to hold a public hearing on an appeal, that hearing will then be scheduled for a later date.
7. *New or additional evidence to be offered.* If an appellant wants to provide evidence not previously provided to DEP staff during the DEP's review of the application, the request and the proposed supplemental evidence must be submitted with the appeal. The Board may allow new or additional evidence to be considered in an appeal only under limited circumstances. The proposed supplemental evidence must be relevant and material, and (a) the person seeking to add information to the record must show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process; or (b) the evidence itself must be newly discovered and therefore unable to have been presented earlier in the process. Requirements for supplemental evidence are set forth in Chapter 2 § 24.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, and is made accessible by the DEP. Upon request, the DEP will make application materials available to review and photocopy during normal working hours. There may be a charge for copies or copying services.

2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing the appeal.* DEP staff will provide this information upon request and answer general questions regarding the appeal process.

3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed, the license normally remains in effect pending the processing of the appeal. Unless a stay of the decision is requested and granted, a licensee may proceed with a project pending the outcome of an appeal, but the licensee runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will acknowledge receipt of an appeal, and it will provide the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials admitted by the Board as supplementary evidence, any materials admitted in response to the appeal, relevant excerpts from the DEP's administrative record for the application, and the DEP staff's recommendation, in the form of a proposed Board Order, will be provided to Board members. The appellant, the licensee, and parties of record are notified in advance of the date set for the Board's consideration of an appeal or request for a hearing. The appellant and the licensee will have an opportunity to address the Board at the Board meeting. The Board will decide whether to hold a hearing on appeal when one is requested before deciding the merits of the appeal. The Board's decision on appeal may be to affirm all or part, affirm with conditions, order a hearing to be held as expeditiously as possible, reverse all or part of the decision of the Commissioner, or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, the licensee, and parties of record of its decision on appeal.

II. JUDICIAL APPEALS

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court (see 38 M.R.S. § 346(1); 06-096 C.M.R. ch. 2; 5 M.R.S. § 11001; and M.R. Civ. P. 80C). A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. See 38 M.R.S. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board Clerk at 207-287-2811 or the Board Executive Analyst at 207-314-1458 bill.hinkel@maine.gov, or for judicial appeals contact the court clerk's office in which the appeal will be filed.

Note: This information sheet, in conjunction with a review of the statutory and regulatory provisions referred to herein, is provided to help a person to understand their rights and obligations in filing an administrative or judicial appeal. The DEP provides this information sheet for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.

APPENDIX E – IDDE Plan
(Attached)

ILLICIT DISCHARGE DETECTION AND ELIMINATION PROCEDURES

1.0 INTRODUCTION

The Maine Department of Transportation (MaineDOT) implements and maintains a Stormwater Management Plan (SWMP) to comply with the State of Maine Department of Environmental Protection (MDEP) Bureau of Water Quality's *General Permit for the Discharge of Stormwater from Maine Department of Transportation and Maine Turnpike Authority Municipal Separate Storm Sewer Systems* (TS4 GP) issued on August 18, 2021. This document has been prepared to meet the written illicit discharge detection and elimination (IDDE) Plan requirement under Minimum Control Measure 3 (MCM 3) of the TS4 GP.

The goal of MCM 3 is to detect and eliminate illicit discharges, and this written IDDE Plan is intended to serve as a protocol to help identify any discharge that is not uncontaminated groundwater, water from a natural resource, or an allowable non-stormwater discharge.

2.0 AUTHORITY

The MaineDOT, as established by 23 M.R.S. §1 and authorized by 23 MRS §52, is the owner of state and state-aid highway corridors and other state-owned property, which falls within the definition of transportation infrastructure, and has the authority to plan, construct, and regulate the use of transportation infrastructure in the State of Maine. Furthermore, MaineDOT operates and maintains a subset of these highway corridors that are not operated and maintained by municipalities as established under 23 M.R.S. §754. The MaineDOT has developed a process to implement all aspects of the IDDE program on those highway corridors operated and maintained by MaineDOT. **Section 9.0** describes the process followed by MaineDOT staff which includes contacting the landowner, municipality, and/or MDEP to enforce elimination of illicit discharges. If MaineDOT is unable to resolve an illicit discharge with a landowner, MaineDOT would refer the matter to MDEP for subsequent investigation and/or enforcement in accordance with MDEP's statutory authority under the Maine Pollutant Discharge Elimination System (MEPDES).

3.0 OBJECTIVE

This procedure establishes requirements for inventorying all stormwater outfalls operated by the MaineDOT Bureau of Maintenance and Operations (M&O), which discharge to the surface waters of the State of Maine and are located within a regulated small Municipal Separate Storm Sewer System (MS4) Urbanized Areas. This procedure also establishes requirements for detecting and responding to illicit discharges from the above identified stormwater outfalls.

M&O must ensure compliance with applicable regulatory requirements for detecting and subsequently reporting illicit discharges of all stormwater outfalls located within the regulated small MS4 communities operated by the MaineDOT. Employees conducting work within the limits of a MS4 community must be familiar with these procedures and take appropriate measures to ensure that these procedures and related practices are followed.

4.0 APPLICABILITY

This policy is applicable to MaineDOT regions having areas located partially or entirely within an MS4 community.

This procedure applies to the inventory of all stormwater outfalls located within regulated areas of the MS4 communities which discharge to the surface waters of the State of Maine. This procedure also applies to the detection and response efforts involving illicit discharges of pollutants to the waters of the State of Maine from a stormwater outfall located within an MS4 community.

5.0 TARGET AUDIENCE

This policy will be distributed to M&O supervisory personnel and other affected units of MaineDOT, including but not limited to:

Director, Bureau of Maintenance and Operations
MaineDOT Region Managers and Engineers
Superintendents, Transportation Operations Managers, Crew Supervisors
Region Environmental Coordinators
Director, Environmental Office (ENV)
Stormwater Engineer, Surface Water Quality Unit, ENV

6.0 DEFINITIONS AND ABBREVIATIONS

ENV: means the Maine Department of Transportation Environmental Office.

GIS: means geographic information system.

Illicit discharge: means any non-permitted discharge to a regulated small MS4 or the waters of the state that does not consist entirely of stormwater or allowable non-stormwater discharges as identified in Appendix A.

MDEP: means the Maine Department of Environmental Protection.

Municipal Separate Storm Sewer System (MS4): a conveyance or system of conveyances designed or used for collecting or conveying stormwater (other than a publicly owned treatment works (POTW), as defined at 40 CFR 122.2, or a combined sewer), including, but not limited to, roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, human-made channels or storm drains owned or operated by any municipality, sewer or sewage district, Maine Department of

Transportation (MaineDOT), Maine Turnpike Authority (MTA), State agency or Federal agency or other public entity that discharges directly to waters of the State other than groundwater.

MS4 Map: means the master online GIS map including the stormwater drainage assets (catch basins, pipes, ditches, outfalls) which are in the urbanized area and maintained by MaineDOT. The map also includes the flow directions, interconnection points with the MS4s maintained by other entities, and the receiving water bodies. The map is used for all IDDE activities.

Pollutant: means dredged spoil, solid waste, junk, incinerator residue, sewage, refuse, effluent, garbage, sewage sludge, munitions, chemicals, biological or radiological materials, oil, petroleum products or byproducts, heat, wrecked or discarded equipment, rock, sand, dirt and industrial, municipal, domestic, commercial or agricultural wastes of any kind.

Region Chain of Notification: Crew Supervisor, Transportation Operation Manager, Environmental Coordinator, Superintendent of Operations.

Regulated Small MS4: means any Small MS4 authorized by this General Permit or the general permits for the discharge of stormwater from State or Federally-owned Small MS4s or Small Municipal MS4s, including all those located partially or entirely within an Urbanized Area (UA). A list of these regulated small MS4 municipalities is included in Appendix B.

Small MS4: means any MS4 that is not already covered by the Phase I MS4 stormwater program including municipally owned or operated storm sewer systems, state or federally-owned systems, such as colleges, universities, prisons, MTA and MaineDOT road systems and facilities, and military bases and facilities.

Stormwater: means runoff from rain or melting ice and snow that flows across the surface as sheet flow, shallow concentrated flow, or in drainageways.

Urbanized Area (UA): means the areas of the State of Maine so defined by the inclusive sum of the 2000 decennial census and the latest decennial census (2010) by the U.S. Bureau of the Census.

7.0 REQUIREMENTS

7.1 Responsibility

a. Region Managers shall assure that all catch basins and outfalls operated by MaineDOT, within each regulated small MS4, are inventoried. For each outfall, the following information must be included: type, material, and size of conveyance (e.g. 24” concrete pipe).

b. The Surface Water Quality Unit Stormwater Engineer shall assure that the MS4 map and associated stormwater GIS database have the best available information and are regularly updated.

c. The Surface Water Quality Unit Stormwater Engineer or designee shall provide training on a biannual basis to maintenance personnel responsible for maintaining outfalls operated by the MaineDOT.

d. Region Managers shall assure that, in conjunction with routine maintenance or asset inventory activities, responsible maintenance personnel conduct field inspections by using the Illicit Discharge Detection and Elimination (IDDE) principles defined in the biannual training program and shall properly log (ref. **Appendix C**) and report any occurrences of illicit discharge identified during routine maintenance.

e. The Surface Water Quality Unit Stormwater Engineer shall either perform or contract out the dry weather outfall inspections and wet weather monitoring required by the TS4 GP.

7.2 Procedures

MaineDOT uses the following methods to identify and report illicit discharges:

1. Observations during routine maintenance
2. Dry weather outfall inspections; and
3. Wet weather monitoring.

7.2.1 Illicit Discharges Observed During Routine Maintenance

In the event that an illicit discharge is discovered during routine work activities, the direct supervisor shall be immediately notified, and the direct supervisor shall assure that the Region Chain of Notification identified in **Section 6.0** is initiated. The illicit discharge shall be logged in an IDDE Log form (see **Appendix C**) and a copy of the IDDE Log shall be provided to the Crew Supervisor. The Region Superintendent of Operations or designee will immediately contact the MaineDOT ENV Office Surface Water Quality Unit or Hazardous Waste Unit. **Section 8.0** details the steps that must be taken when an illicit discharge is reported.

7.2.2 Dry Weather Outfall Illicit Discharge Inspection Program

In accordance with Part IV(C)(3)(c) of the TS4 GP, MaineDOT has developed and implemented an annual prioritized dry weather outfall inspection plan with additional consideration given to urban impaired stream (UIS) watersheds. MaineDOT's MS4 map and associated stormwater GIS database are utilized to prioritize outfalls that will be inspected during periods of dry weather (defined in the TS4 GP as no measurable precipitation greater than ¼ of an inch, or snow melt within 72 hours prior to the outfall inspection). Outfalls discharging to a UIS are given priority.

Each catch basin, outlet, and outfall is uniquely identified to facilitate control of potential illicit discharges, and to ensure proper operation and maintenance of the structures. For each outfall, the following information is kept in MaineDOT's stormwater GIS database:

- Type of conveyance (pipe size and material, if applicable); and
- Name and location of the immediate surface waterbody or wetland to which the outfall eventually discharges.

In accordance with Part IV(C)(3)(c)(ii), MaineDOT will conduct visual dry weather inspections on 100% of its identified outfalls during the 5-year term (2022-2027) of the TS4 GP, except those outfalls meeting the condition in Part IV(C)(3)(c)(vi)(1) which are associated with roadway drainage in undeveloped areas with no dwellings and no sanitary sewers, which are exempt from visual dry weather inspection. Outfalls that meet this exemption will be identified in MaineDOT's stormwater GIS database and reviewed during annual MS4 map updates.

Dry weather inspections will be documented in GIS. If an outfall is inaccessible due to safety concerns, MaineDOT will conduct a substitute inspection at the closest accessible inspection location (e.g., catch basin, manhole, pipe, etc.) that drains to the inaccessible outfall. The inspection of a substitute location will be noted in GIS.

If an outfall is observed to be flowing during dry weather and is not exempt from dry weather investigation in Part IV(C)(3)(c)(vi) of the TS4 GP, MaineDOT will sample the discharge to evaluate whether it is an illicit discharge. If an illicit discharge is observed during dry weather inspections, it is reported to the MaineDOT ENV Surface Water Quality Unit and documented on the IDDE Log form (see **Appendix C**). **Section 8.0** details the steps that must be taken when an illicit discharge is identified.

Section 10.0 describes the procedures that MaineDOT will use to sample discharges from outfalls flowing during dry weather. MaineDOT may rely on screening conducted under previous permits to the extent it meets the requirements in Part IV(C)(3)(c)(iv) of the TS4 GP and no new construction or redevelopment has occurred in the outfall drainage area since the screening.

7.2.3 Wet Weather Illicit Discharge Assessments

In accordance with Part IV(C)(3)(d) of the TS4 GP and prior to June 30, 2027, MaineDOT will perform a wet weather assessment for the potential for illicit discharges during wet weather events. This assessment will consist of a desktop study utilizing available GIS data, including aerial imagery, field observations, as applicable, and the available data listed in Part IV(C)(3)(d)(i – vi) of the TS4 GP. The outcome of this desktop study will be a list of outfalls identified for wet

weather monitoring and testing, if applicable, by MaineDOT in the next permit cycle. Following the wet weather assessment, this IDDE Plan will be updated to include a brief description of the data and process used to perform the assessment, the list of outfalls identified for wet weather monitoring (based on the EPA New England bacterial source tracking protocol or other acceptable protocol), the rationale for including these outfalls, and the timing and frequency of wet weather monitoring to be completed during the next permit cycle. Should the MaineDOT complete the IDDE plan update prior to the expiration date of the TS4 GP and permittee specific DEP Order, the MaineDOT will implement the wet weather monitoring upon completion of the IDDE plan update.

8.0 ILLICIT DISCHARGE INVESTIGATION

The MaineDOT ENV Surface Water Quality Unit is responsible for investigating illicit discharges. The following techniques should be utilized to locate the source of the illicit discharge. **Section 9** details the steps that must be taken to verify and eliminate an illicit discharge once the source has been identified.

8.1 *Field Reconnaissance*

Visual observations at the location of the illicit discharge are essential for identifying the source of the discharge. MaineDOT will attempt to trace the source of an observed discharge upstream to the point of origin or the point where the discharge is no longer present to narrow down where the discharge enters MaineDOT's stormwater system. If the discharge's point of origin can be traced back to the source, then MaineDOT will document the source and follow the procedures outlined in **Section 9** to verify and eliminate the discharge. If the source of the discharge cannot be determined in the field, MaineDOT will narrow down the area where the discharge enters MaineDOT's stormwater system and continue the investigation by conducting a document review and/or sampling the discharge as described in **Section 10**.

8.2 *Document Review*

Review of MaineDOT's stormwater GIS database and MS4 map can be helpful when investigating an illicit discharge. In some cases, review of additional documents, such as construction and as-built plans, may be required. If the document review produces information beyond what was observed during field reconnaissance, then additional field reconnaissance may be necessary, and the stormwater GIS database may need to be updated to reflect the information found.

8.3 *Additional Investigation*

If warranted, MaineDOT may perform additional investigation to attempt to identify the source of an illicit discharge. This may include, but is not limited to, visual/video inspections of the storm sewer systems, smoke/dye testing of the storm sewer systems, and/or other methods based on the EPA New England bacterial source tracking protocol or other acceptable protocol. Additional investigation efforts should be employed until the source of the discharge is

identified. If additional investigative efforts fail to identify the source of the illicit discharge this should be documented in the annual TS4 GP compliance report following the investigation.

9.0 VERIFICATION AND ELIMINATION OF ILLICIT DISCHARGE

Once the source of the discharge has been identified, it must be verified to be an illicit discharge, uncontaminated groundwater, water from a natural resource, or an allowable non-stormwater discharge.

9.1 *Allowable Non-Stormwater Discharge*

In accordance with Part IV(C)(3)(e) of the TS4 GP, the non-stormwater discharges outlined in **Appendix A** are allowed as long as the MaineDOT does not identify any of these sources to be a significant contributor of pollutants. If the discharge is determined to be an allowable non-stormwater discharge, such as uncontaminated groundwater, then this should be documented in MaineDOT's SWMP and the annual TS4 GP compliance report following the determination.

9.2 *Illicit Discharge*

If the discharge is not uncontaminated groundwater, water from a natural resource, or an allowable non-stormwater discharge, then it is an illicit discharge and must be eliminated as expeditiously as possible.

Once the source has been identified and the discharge is determined to be illicit, MaineDOT will contact the responsible party as soon as practicable and require immediate cessation of improper disposal practices in accordance with the MaineDOT's legal authorities. If the illicit discharge is caused by a private landowner, MaineDOT's ENV Surface Water Quality Unit will attempt to contact the landowner in person or by telephone, if possible. Additionally, the local MS4 Coordinator and the MDEP will be contacted by telephone and/or email to notify them of the illicit discharge. MaineDOT will work with the landowner, MS4 Coordinator, and/or MDEP to resolve the situation as soon as possible and eliminate the illicit discharge.

Where elimination of an illicit discharge within 60 calendar days of its identification and verification as an illicit discharge is not possible, the MaineDOT will establish an expeditious schedule for its elimination and report the dates of identification and schedules for removal in the MaineDOT MS4 annual report. The MaineDOT will immediately commence and continue actions identified in the schedule as necessary for elimination. The MaineDOT will diligently pursue actions identified in the schedule to be consistent with the intent of the TS4 GP. In the interim, the MaineDOT will take all reasonable and prudent measures to minimize the discharge of pollutants to and from its MS4, including follow-up screening and inspection to confirm permanent elimination of the discharge.

10.0 QUALITY ASSURANCE PROJECT PLAN (QAPP)

The objective of sampling is to collect data that can be used to determine if a discharge is illicit or an allowable non-stormwater discharge. The purpose of the Quality Assurance Project Plan (QAPP) is to provide sampling personnel information that will assist them in collecting samples and analyzing the samples using field equipment/test kit(s) and/or laboratories in a manner that ensures sufficient accuracy and precision for the purpose of compliance with the TS4 GP.

Sampling and analysis for the following parameters will be performed when flow is observed during dry weather or a potential illicit discharge is being investigated:

- E. coli, enterococci, total fecal coliform or human bacteroides;
- Ammonia, total residual chlorine, temperature, and conductivity; and
- Optical enhancers or surfactants.

Appendix D contains MaineDOT's Stormwater Monitoring QAPP that has been developed to comply with the TS4 GP.

MaineDOT will use the thresholds listed in Table 3 of the Stormwater Monitoring QAPP (**Appendix D**) and the following general guidance to make determinations whether an outfall requires additional investigation for illicit discharges:

Outfalls that have visual evidence of an illicit discharge and exceed at least one of the thresholds in Table 3 of the Stormwater Monitoring QAPP will be investigated further using techniques described in **Section 8.0**.

Outfalls that do not have any visual evidence of an illicit discharge but exceed more than one of the thresholds in Table 3 of the Stormwater Monitoring QAPP will be investigated further using techniques described in **Section 8.0**.

11.0 DOCUMENTATION

The IDDE Logs and all related additional records and correspondences shall be maintained by MaineDOT's ENV Surface Water Quality Unit for 5 years.

12.0 EVALUATION

The Region Manager or designee will meet with a MaineDOT ENV Surface Water Quality Unit or Hazardous Materials Unit representative on an annual basis to review all aspects of this policy to ensure compliance with the TS4 GP.

13.0 REFERENCE

- MDEP, General Permit for the Discharge of Stormwater from Maine Department of Transportation and Maine Turnpike Authority, Municipal Separate Storm Sewer Systems, August 18, 2021
- 38 M.R.S.A. § 413
- MaineDOT Bureau of M&O, Spill Response and Reporting Procedures
- CWP and Robert Pitt 2004. Illicit Discharge Detection and Elimination Manual – A Guidance Manual for Plan Development and Technical Assessments. October 2004.
- USEPA New England Bacterial Source Tracking Protocol 2012.

14.0 APPROVAL

This procedure will take effect as of March 6, 2009.
Updated: January 21, 2015
Version 2.0: September 28, 2021

Brian Burne, Highway Maintenance Engineer

APPENDIX A

Allowable Non-Stormwater Discharges

- landscape irrigation
- diverted stream flows
- rising ground waters
- uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20))
- uncontaminated pumped ground water
- uncontaminated flows from foundation drains
- air conditioning and compressor condensate
- irrigation water
- flows from uncontaminated springs
- uncontaminated water from crawl space pumps
- uncontaminated flows from footing drains
- lawn watering runoff
- flows from riparian habitats and wetlands
- residual street wash water (where spills/leaks of toxic or hazardous materials have not occurred, unless all spilled material has been removed and detergents are not used)
- hydrant flushing and firefighting activity runoff
- water line flushing and discharges from potable water sources

APPENDIX B

Regulated Small MS4 Municipalities

Auburn	Milford
Bangor	Old Orchard Beach
Berwick	Old Town
Biddeford	Orono
Brewer	Portland
Cape Elizabeth	Sabattus
Cumberland	Saco
Eliot	Scarborough
Falmouth	South Berwick
Freeport	South Portland
Gorham	Veazie
Hampden	Westbrook
Kittery	Windham
Lewiston	Yarmouth
Lisbon	York

APPENDIX C
Illicit Discharge Detection Elimination Log Form

Illicit Discharge Report Form

Location Information

Date: _____ **Inspector:** _____
Time: _____

Type of Outfall: Catch Basin Culvert Ditch

Location **Route Log Mile:** _____ **Left or Right:** _____ **Town:** _____

Weather: Clear Rain/Snow **Approximate Temp:** _____ **Wind Present:** Yes No
Precipitation in the past 3 days: No Yes _____ inches

Flow in Structure: None Trickle Steady
Ponded Water Present: Yes No

Photos Taken: Yes No **Photo ID:** _____

Inspection Information *Select all that are applicable*

Odor:	**(X)**	**Floatables:**	**(X)**
Petroleum Oil or Gas:		**Petroleum Oil or Gas:**	
Sewage:		**Sewage:**	
Other (Describe):		**Suds:**	
		Excessive Algae Bloom:	
		Other (Describe):	
Abnormal Vegetation	**(X)**		
Excess or Plush Growth:		**Deposits, Staining (not rust), or Algae Growth in Structure:**	
Stressed or Dead:			

Color (if flow is present): _____

Additional Information

Sediment Condition: Open 1/4 Full 1/2 Full 3/4 Full Plugged

Trash/Litter Present: Yes No **Yard Waste Observed:** Yes No

General Comments:

Follow Up

Forward this form to the Region Environmental Coordinator for further action :

APPENDIX D
Stormwater Monitoring Quality Assurance Project Plan (QAPP)
(Attached)

MAINE DEPARTMENT OF TRANSPORTATION

GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER FROM MAINE DEPARTMENT OF TRANSPORTATION AND MAINE TURNPIKE AUTHORITY MUNICIPAL SEPARATE STORM SEWER SYSTEMS

STORMWATER MONITORING QUALITY ASSURANCE PROJECT PLAN (QAPP)

prepared for

MAINE DEPARTMENT OF TRANSPORTATION (MaineDOT)

Prepared by

GZA GeoEnvironmental, Inc.
707 Sable Oaks Drive
Suite 150
South Portland, Maine 04106

Prepared: September 2021

MaineDOT - Stormwater Monitoring Quality Assurance Project Plan (QAPP)

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MaineDOT - Stormwater Monitoring Quality Assurance Project Plan (QAPP)

1. INTRODUCTION

The Maine Department of Transportation (MaineDOT) implements and maintains a Stormwater Management Plan (SWMP) to comply with the State of Maine Department of Environmental Protection (Maine DEP) Bureau of Water Quality's *General Permit for the Discharge of Stormwater from Maine Department of Transportation and Maine Turnpike Authority Municipal Separate Storm Sewer Systems* (TS4 GP) issued on August 18, 2021. This document is an appendix to MaineDOT's Illicit Discharge Detection and Elimination (IDDE) Plan and has been prepared to meet one of the requirements under Minimum Control Measure 3 (MCM 3) of the TS4 GP.

The objective of stormwater monitoring is to collect data that can be used to determine if a discharge is illicit or an allowable non-stormwater discharge. The purpose of the Quality Assurance Project Plan (QAPP) is to provide sampling personnel information that will assist them in collecting and analyzing the samples using field equipment/test kit(s) and/or laboratories in a manner that ensures sufficient accuracy and precision for the purpose of compliance with the TS4 GP.

2. SAMPLING PREPARATION

Sampling and analysis for the following parameters will be performed when flow is observed during dry weather or a potential illicit discharge is being investigated:

- E. coli, enterococci, total fecal coliform or human bacteroides;
- Ammonia, total residual chlorine, temperature, and conductivity; and
- Optical enhancers or surfactants.

If an outfall is observed to be flowing during dry weather and is not exempt from dry weather investigation in Part IV(C)(3)(c)(vi) of the TS4 GP, MaineDOT will sample the discharge. Additionally, if a potential illicit discharge is observed during routine maintenance activities, it may be sampled to help determine its origin.

Personnel should be prepared to collect samples during any outfall inspection, because dry weather flow is sometimes intermittent, and if personnel need to return to the site later in the same day, or several days later, the flow may no longer be present. **Table 1** contains a list of equipment that should be prepared and available in order to conduct dry weather monitoring.

When using a third-party laboratory for any off-site analysis, sample bottles should be obtained before the sampling event. Coordination with the laboratory is also recommended to ensure that sample hold times and preservation requirements are being met. If samples are being collected on a Friday, some laboratories need prior notice to meet short hold times. Analytical methods, hold times, and other pertinent information is described in **Section 4** (Sampling Analyses and Reporting Limits) of this QAPP.

Table 1 provides a list of equipment that should be gathered and available for use in the event stormwater monitoring will be conducted.

Table 1 – Field Equipment for Stormwater Monitoring

Safety Vest (Class 3)
Equipment to remove and access catch basin covers if needed (pull, hammer, crowbar)
Sampling pole and or sampling pump and tubing
Clean plastic beakers or bottles for water sample collection
Nitrile gloves
Plastic bags (1 gallon size)
Distilled water for rinsing
Paper or clean reusable towels
Cooler with ice
Sample bottles and labels for any laboratory samples or off-site analysis
Field equipment/test kits (see Table 2)
Field Data Sheets (See Attachment 1)
Chain of Custody (See Attachment 3)
Permanent marker and water-proof pens
Camera or phone
Paper or small white board with pen to mark outfall ID, date, and time in photo

3. SAMPLING PROCEDURES

Samples will be collected from a flowing source only and where the pipe outlet has at least one or two inches of free-flowing drop before any standing water or pool below it. Stagnant water should not be sampled.

This outfall, though in poor condition because it is cantilevered, provides a good opportunity for a clean catch of its discharge.

This outfall is partially submerged and a clean catch of its discharge is not possible. If tidal influences are strong, wait until low tide to sample. Additional options include: sampling upstream structures or using sand bags around the outfall to prevent contamination from backflow.

For each outfall sampled, a Field Data Sheet (See **Attachment 1**) will be used to document the date, time, and location of sample(s) collected, weather conditions, general observations related to the samples or tests being performed, and results of any parameters analyzed using field equipment or test kits. Note that the Field Data Sheet contains spaces to document sample observations including odor, color, turbidity, presence of algae, etc. These observations can be documented on this form or the dry weather inspection form when performing a dry weather inspection.

Sample bottles that will be sent for laboratory analysis will be labelled with the date, time, sample location, and the name of the sampler.

After sampling events, any reusable sample collection containers will be cleaned with an appropriate decontamination solution (such as Alconox and water). Decontamination cleaning will be completed in a location where wash water can be discharged to a licensed wastewater treatment plant, sanitary sewer, or septic system.

4. SAMPLING ANALYSES AND REPORTING LIMITS

The TS4 GP does not require samples to be analyzed using Clean Water Act (CWA) Methods published in 40 Code of Federal Regulations Part 136. The use of field equipment/ test kit(s) and laboratories are both allowed. The TS4 GP does not require samples to be analyzed by a laboratory that is certified by the Maine DEP. However, this QAPP specifies that when a commercial laboratory is used for a CWA method, it will be certified by the Maine DEP[1] for the CWA method specified. Use of a certified laboratory is specified in this QAPP because the data generated by a certified lab is anticipated to be useable for both investigative and regulatory purposes. This QAPP does not specify CWA methods or Maine DEP certification for use of field equipment/test kit(s).

Table 2 provides summary information for the sampling parameters, analysis methods, and sample preservation and holding times that may be used during dry weather outfall monitoring. Analysis methods specified in **Table 2** include CWA methods, field equipment, and test kits, where applicable. **Table 2** also provides information on when a given CWA method, field equipment, or test kit might be preferable if there are multiple options for a given parameter.

Prior to sampling, MaineDOT's Stormwater Engineer will determine which analysis method (CWA method, field equipment, or test kit) will be used.

User manual(s) and safety data sheets (SDS) for field equipment and/or test kit(s) that will be utilized for dry weather monitoring are included as **Attachment 3** to this QAPP. Lab analysis methods, field equipment, and test kits utilized for monitoring must be sufficiently sensitive to meet the TS4 GP required reporting limits listed in **Section 5**.

[1] A list of commercial certified laboratories is available on the Maine DEP website at: https://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml.

Table 2 – Sampling Parameters, Analysis Methods, and Sample Preservation and Holding Times

Parameter for all Potential Illicit Discharges	CWA Method, Field Equipment, or Test Kit	Preservation	Holding time	Bottle needed	Notes on Use
Temperature	Temperature/ Conductivity probe	None	Immediate (w/in 15 minutes) in Field	Field jar or beaker	Use to distinguish between groundwater and surface water.
Conductivity	Temperature/ Conductivity probe	None	Immediate (w/in 15 minutes) in Field	Field jar or beaker	Use to distinguish between salt water and fresh water. Can also be used to distinguish between uncontaminated waters and waters with high dissolved solids.
Parameter for Potential Bacteria Illicit Discharges	**CWA Method, Field Equipment, or Test Kit**	**Preservation**	**Holding time**	**Bottle needed**	**Notes on Use**
Bacteria - E. coli	SM 9223 B (IDEXX Colilert Quanti-Tray) EPA 1603 (membrane filtration, MF) Or SM 9221 B (Most probable number, MPN)	Ice	To lab within 6 hours Analyze within 2 hours of receipt	120 ml or 250 ml plastic sterile bottle with lid from lab	Use for discharges to freshwater (with ammonia and either optical enhancers or surfactants)
Bacteria - enterococcus	SM 9230 B, C or D, (MPN including IDEXX Enterolert, or MF) EPA 1600 (MF)	Ice	To lab within 6 hours Analyze within 2 hours of receipt	120 ml or 250 ml plastic sterile bottle with lid from lab	Use for discharges to salt water (with ammonia and either optical enhancers or surfactants)
Bacteria – Fecal Coliform	SM 9222 D (MF CFU/100ml) Or SM 9221 C, E (Multitube MPN/100ml)	Ice	To lab within 6 hours Analyze within 2 hours of receipt	120 ml or 250 ml plastic sterile bottle with lid from lab	Use for discharges to salt or freshwater (with ammonia and either optical enhancers or surfactants)
Bacteria – Human Bacteroides	Labs: EMSL (NJ), Microbial Insights (TN) or Source Molecular (FL) Or Dr. Steve Jones, UNH	Ice	To lab within 24 hours Analyze within 48 hours	1000 ml plastic bottle with sodium thiosulfate from lab (with insulated shipping box)	Use for discharges to salt or freshwater (with ammonia and either optical enhancers or surfactants). Not a CWA method, so Maine Laboratory certification not required.

Parameter for Potential Bacteria Illicit Discharges (continued)	CWA Method, Field Equipment, or Test Kit	Preservation	Holding time	Bottle needed	Notes on Use
Surfactants	SM5540C	Ice	To lab within 24 hours Analyze within 48 hours	500 ml plastic bottle from lab	Works on most soaps (laundry detergent, personal care products, dish soap)
Optical brighteners	VWR handheld UV lamp: UV-A: 360-365 nm, model number 89131-488	None	Analyze within 7 days	Unbleached cotton pad wetted with sample placed in sealed baggie	Works only on water with high to moderate laundry detergent. Provides only presence/absence.
Optical brighteners	Maine Healthy Beaches Fluorometer ($15,000 unit)	None	Keep in a dark container, provide to MHB in 1-2 days, analyze within 7 days	Whirl bag or 100 ml plastic bottle.	Provides semi-quantitative numeric fluorescence of sample. Need to provide sample to MHB in bottle or whirl bag (in a box or cooler). One week hold time. Provide advanced notice to coordinate delivery to office. Organic matter or tannins, or color will interfere.
Ammonia	Hach Ammonia Test Strips	None	Immediate (w/in 15 minutes) in field	Field jar or beaker	
Ammonia	Laboratory Method EPA 350.1/350.2	H_2SO_4 (pH <2) + Ice	28 days	250 ml plastic bottle from lab	
Parameter for Potential Chlorine based Illicit Discharges	**CWA Method, Field Equipment, or Test Kit**	**Preservation**	**Holding time**	**Bottle needed**	**Notes on Use**
Chlorine	Field kit – Hach Colorimeter II low range	None	Immediate (w/in 15 minutes) in Field	Field jar or beaker	Instructional video available at: https://www.youtube.com/watch?v=WTTUD0Hq1Vw
Chlorine	Industrial test Systems Ultra-Low Total Chlorine Test Strips	None	Immediate (w/in 15 minutes) in Field	Field jar or beaker	As of 6/2020, USEPA had not used this set of test strips, but the strips can detect to an appropriate lower limit for chlorine.

Parameter for Potential Detergent based Illicit Discharges	**CWA Method, Field Equipment, or Test Kit**	**Preservation**	**Holding time**	**Bottle needed**	**Notes on Use**
See Surfactants					
Other Optional Parameters	**CWA Method, Field Equipment, or Test Kit**	**Preservation**	**Holding time**	**Bottle needed**	**Notes on Use**
Dissolved Oxygen	Hach DO Test kit Model OX-2P	None	Immediate (w/in 15 minutes) in Field	Field jar or beaker	Waters of the State have Dissolved Oxygen standards. This test can show whether outfall contributions are affecting Dissolved Oxygen content of receiving waters.
Total Phosphorus	EPA 365.3	Sulfuric Acid (pH <2) + Ice (4°C)	28 days	250 ml glass bottle from lab.	Provides data regarding nutrient contributions to receiving waters which can originate from paved surfaces, fertilizers and eroding soils.
Personal Care Products	EPA 1694	Sulfuric Acid (pH <2) + Ice (4°C)	7 day to extraction 40 days after extraction	1000 ml amber jar	EPA Lab Chelmsford can run if capacity. Contact Todd Borci. Otherwise need to use a commercial laboratory. EPA recommends analyzing only for following subset: Caffeine, 1,7-DMX (metabolite of caffeine), Acetominophen, Carbamazepine (anti-depressant), Primidone (anti-epilepsy drug), Atenolol (high Blood pressure med), Cotinine (metabolite of nicotine), urobilin (by product of hemoglobin breakdowns), Azithromycin (antibiotic)
Total Suspended Solids	EPA 160.2 or SM2549D	Ice	7 days	1000 ml plastic bottle from lab	
Biochemical Oxygen Demand	EPA 405.1 or SM5210B	Ice	To lab within 24 hours, analyze within 48 hours		Provides general water quality information.

Other Optional Parameters (continued)	CWA Method, Field Equipment, or Test Kit	Preservation	Holding time	Bottle needed	Notes on Use
Total Petroleum Hydrocarbons DRO and GRO	SW 8015C	Ice	7 Days to extraction 40 days after extraction	500 ml amber glass jar and 3 40 ml VOA containers from lab with sulfuric acid	DRO is Diesel Range Organics (C10 to C28) GRO is Gasoline Range Organics (C5 to C10)
Nitrate + Nitrite	SM 4500 or EPA 300	Sulfuric Acid (pH <2) + Ice (4^{o}C)	28 days	125 ml plastic bottle from lab	Provides data regarding nutrient contributions to receiving waters which can originate from paved surfaces, fertilizers, eroding soils or wastewaters.
Total Kjeldahl Nitrogen	SM 4500 or EPA 300	Sulfuric Acid (pH <2) + Ice (4^{o}C)	28 days	1000 ml amber glass bottle from lab	Provides data regarding nutrient contributions to receiving waters which can originate from paved surfaces, fertilizers, eroding soils or wastewaters.

5. QUALITY CONTROL

The following are the reporting limits required by the TS4 GP:

Ammonia: 0.5 mg/L
Surfactants: 0.25 mg/L
Total Residual Chlorine: 0.05 mg/L
E. coli bacteria: 4 cfu/100 ml
Enterococcus: 10 cfu/100 ml

To ensure the data collected meets the required reporting limits, the MaineDOT will use either a Maine Certified Laboratory or one of the field equipment/test kit methods listed in **Table 2** to assess dry weather flow.

Each of the test kits listed in **Table 2** has a use range that is appropriate for the work being conducted, and which meets the TS4 GP required reporting limits.

Test kit reagents that have expired will not be used. Test kit and temperature/conductivity probes that have useful life limits will be replaced when they have reached the end of their useful lives.

Maine Certified Laboratories have standard reporting limits for the parameters that conform to the TS4 GP required reporting limits.

For most instances, dedicated equipment and containers will be used to collect samples, so that equipment and rinsate blanks are not required to be collected and analyzed. However, if equipment or collection containers are being used multiple times in the field for different sample locations, they will be cleaned in between samples, wash water will be collected in the field and disposed of when returning to office or lab spaces, and equipment or rinsate blanks will be collected and assessed. The USEPA Volunteer Monitor's Guide to Quality Assurance Project Plans has additional information on how to complete these tasks (EPA Document 841-B-96-003).

6. FIELD DATA SHEETS AND CHAIN OF CUSTODY

As described in **Section 3** (Sampling Procedures), Field Data Sheets will be used to document sample collection. Field Data sheets will be used to document the type of field equipment or test kit(s) used and results of any in-situ analysis. A Field Data Sheet is provided as **Attachment 1** of this QAPP.

Whenever samples will be sent to a laboratory for analysis, a Chain of Custody will be used to document sample collection dates, times, analytical methods requested, and custody of the sample from the time it was collected, until the time it was analyzed. An example Chain of Custody is provided as **Attachment 2** of this QAPP.

7. DATA REPORTS

Field data collection sheets shall constitute data reports for analyses using field equipment or test kits.

Whenever samples are sent to a laboratory for analysis, data reports are provided by the laboratory and document the sample location, date and time of collection, results of the analysis, the reporting limit, the person who conducted the analysis, the analytical method used.

8. DATA REVIEW AND FOLLOW UP

Once all data has been received, it will be reviewed by MaineDOT's Stormwater Engineer. Data shall also be stored electronically or in paper format for at least 3 years following the expiration date of the TS4 GP, as required.

If the sampling is performed by MaineDOT's Stormwater Engineer, they may opt to have another staff person or an outside consultant review the data. Data should be reviewed within two weeks of receipt and additional investigations should be implemented to identify the source of any potential illicit discharge if any of the thresholds in **Table 3** are exceeded.

Table 3 Thresholds for Additional Investigation

Parameter	Threshold Level for Additional Investigation	Notes/Discussion
E. coli	236 cfu/100 ml – discharges into freshwater rivers or streams	The standard for all classifications of flowing fresh surface water in Maine (AA, A, B and C) requires that that no more than 10% of the samples may exceed this concentration in any 90-day period. A freshwater river or stream is at risk of impairment if it is receiving significant discharges from human sources above this concentration.
E. coli	194 cfu/100 ml – discharges into freshwater ponds	The standard for Great Ponds and lakes less than 10 acres requires that no more than 10% of the samples may exceed this concentration in any 90-day period. A water of this type is at risk of impairment if it is receiving significant discharges from human sources above this concentration.
Enterococci	54 CFU/100 ml – discharges into saline/ estuarine Class SA or SB	The standard for these waters requires no more than 10% of the samples may exceed this concentration in any 90-day period. A water is at risk of impairment if it is receiving significant discharges from human sources above this concentration. (Note Maine Healthy Beaches threshold is 104 MPN/100 ml)
Enterococci	94 CFU/100 ml – discharges into saline/ estuarine Class SC	The standard for these waters requires that no more than 10% of the samples may exceed this concentration in any 90-day period. A water is at risk of impairment if it is receiving significant discharges from human sources above this concentration. (Note Maine Healthy Beaches threshold is 104 MPN/100 ml)
Fecal Coliform	61 cfu/100 ml (2 times 31 cfu/100 ml for MF) to 100 cfu/100ml	The low end of this threshold is two times the 90th percentile standards that DMR applies for approved (open) shellfish harvesting areas and is very conservative (90% of the samples collected from the area must be above these concentrations for the harvesting area to remain open and completely unrestricted for shellfish harvesting. See Addendum 2 for additional info from DMR)

Parameter	Threshold Level for Additional Investigation	Notes/Discussion
Human Bacteroides	Any concentration may be indicative of human sewage, but MHB considers 4,200 col/100ml HB to be equivalent to the level of contamination that exceeds the EPA acceptable risk of gastrointestinal illness to swimmers. (Rothenburger and Jones, 2018 and Boehm, Soller and Shanks 2015)	Any concentration indicating the presence of human source sewage should be investigated.
Ammonia	≥ 0.50 mg/L	This is the effective reporting limit of the ammonia test strips and was taken from USEPA Draft 2012 Bacteria Source Tracking Protocol.
Chlorine	≥ 0.05 mg/L	Limit of test kit and was taken from USEPA Draft 2012 Bacteria Source Tracking Protocol.
Surfactants	≥ 0.25 mg/L	Taken from USEPA Draft 2012 Bacteria Source Tracking Protocol.
Optical Brighteners	≥ 100 ug/L) (≥ 0.10 mg/L)	This is used by Maine Healthy Beaches as an actionable threshold. If using a handheld fluorometer, conduct further investigation if presence of optical brighteners is detected

As described in the IDDE Plan, if the above thresholds are not exceeded, the MaineDOT may make the determination that the flow is from uncontaminated groundwater, water from a natural resource, or an allowable non-stormwater discharge.

9. REFERENCES

Rothenheber and Jones 2018. *Enterococci Concentrations in a Coastal Ecosystem are a function of fecal source input*. Published in Applied Environmental Microbiology, July 13, 2018.

Boehm, Soller and Shanks 2015. *Human-Associated Fecal Quantitative Polymerase Chain reaction Measurements and Simulated Risk of Gastrointestinal Illness in Recreational Waters Contaminated with Raw Sewage*. Published in Environmental Science and Technology Letters 2015, 2, 270-275.

ATTACHMENT 1 – FIELD DATA SHEET

Field Data Collection Sheet for Dry Weather Outfall Monitoring

Date: _____ Time: _____

Sampler's Name: _____

Location / Outfall: _____

Weather: _____

Sample Type: (Circle) Dry Weather Flow Potential Illicit Discharge Other

Sample Notes: _____

Field Parameters to Monitor

Parameter	Result (units)	Equipment Used	Threshold triggering additional investigation (see QAPP)
Temperature (all flows)	C/F		No threshold. FYI: Temp. is dependent on season. Groundwater is typically 40-55 F. Surface water can be hotter or colder.
Conductivity (all flows)	µs		No threshold. FYI: Groundwater is typ. Less than 1000 µs. Freshwater can be as high as 2000 µs. Saltwater can be as high as 55,000 µs.
Ammonia (potential bacteria sources)	mg/L	Hach Test Strips	≥ 0.50 mg/L
Chlorine (potential chlorine sources)	mg/l	Ultra-Low Total Chlorine Test Strips	≥ 0.05 mg/L

Observations (unless already documented as part of outfall inspection: odor, color, turbidity, algae, etc):_____

Laboratory Analyses (see QAPP for thresholds)

Parameter		Method / Lab Code	Comments
Choose One	E. coli	SM 9223 B, EPA 1603, or SM 9221 B (To lab within 6 hours, analyze within 2 hours of receipt)	For freshwaters
	Enterococci	SM 9230 or EPA 1600 (To lab within 6 hours, analyze within 2	For marine/estuarine waters
	Fecal Coliform	SM 9222 D or SM 9221 D, E (To lab within 6 hours, analyze within 2 hours of receipt)	For fresh or marine/estuarine waters
	Human Bacteriodes	qPCR (To lab within 24 hours, analyze within 48 hours)	For fresh or marine/estuarine waters
Ammonia		EPA 350.1/350.2 (H2SO4 + Ice preserved, 28 day hold time)	For fresh or marine/estuarine waters
Surfactants		SM5540C (To lab within 24 hours, analyze within 48 hours)	For fresh or marine/estuarine waters

Comments/Field Notes

ATTACHMENT 2 – GENERIC COC

Laboratory Sample Chain of Custody

Client:	Contact:	Phone #:	Email
Address:	City:	State:	Zip Code:
Purchase Order #:	Proj. Name/No.:		Quote #:
Bill (if different than above):	Address:		
Sampler (Print/Sign):			Copies To:

LAB USE ONLY Work Order #:

Remarks:

Shipping Info: FEDEX UPS CLIENT

Airbill No:

Temp C Temp Blank Intact Not Intact

*	Sample Description	Date/Time Collected	Matrix water/soil /other	No. of Containers	Analysis and Container Type Preservatives									
					Filt. Y / N	Filt. Y / N	Filt. Y / N	Filt. Y / N	Filt. Y / N	Filt. Y / N	Filt. Y / N	Filt. Y / N	Filt. Y / N	Filt. Y / N

COMMENTS:

Relinquished By:	Date/Time	Received By:	Relinquished By:	Date/Time	Received By:
Relinquished By:	Date/Time	Received By:	Relinquished By:	Date/Time	Received By:

ATTACHMENT 3 – FIELD EQUIPMENT USER MANUALS

INSTRUCTION MANUAL
MULTI-PARAMETER TESTR 35 SERIES
pH / Conductivity / TDS / Salinity / Temperature

EUTECH INSTRUMENTS OAKTON

Part of Thermo Fisher Scientific 68X441601 Rev. 1 March 2010

Thank you for selecting our Multi-Parameter Testr. This manual serves the following (3) models:

- **PCTestr 35** (Eutech PCTEST35-01X441504 / Oakton 35425-00)
  pH / Conductivity / Temperature

- **PTTestr 35** (Eutech PCTEST35-01X441505 / Oakton 35425-05)
  pH / Total Dissolved Solids / Temperature

- **PCSTestr 35** (Eutech PCSTEST35-01X441506 / Oakton 35425-10)
  pH / Conductivity / Total Dissolved Solids / Salinity / Temperature

Getting Started:

Your instrument has been factory calibrated and usually works well out of the box. However, after extended periods of non-use, it's best to remove the sensor cap and soak the sensor (pictured here) in warm tap water or pH buffer for 10 minutes or so. A brief rinse with deionized (DI) water is OK, but avoid soaking or storing in deionized water as this will shorten the pH electrode life. Prior to taking measurements, periodic calibration with certified standards is recommended for best accuracy.

Your Testr begins in the measuring mode that was previously used. Just prior to measurement or when switching modes, you will see the setting associated with each parameter i.e.) pH (buffer group selected), Conductivity (Auto), TDS (factor), Salinity (unit of measure).

Setup:

Your Testr allows customization of various settings. **To access the setup mode:**

1. With the Testr off, keep the MODE/ENT pressed down while you press and release ON/OFF. SEt UP (Setup) will appear, then as you release MODE/ENT, PAr-A (Parameter) will appear.
2. Press HOLD or CAL to choose PAr-A (Parameter Setup) or SYSt (System Setup) menu.
3. Press MODE/ENT to enter the selected setup menu.

IMPORTANT **It is necessary to save your Parameter and System changes in order for them to take effect.**

1. When you are finished making your desired changes, press both HOLD and CAL at the same time and keep them pressed until you see "SA" (Save) on the display.
2. With the primary display "SA" and secondary display "YES", press MODE/ENT to save the changes. The instrument will resume measurement mode with new setting(s).

SA
YES

Note: If auto-shut off is used, changes will be automatically saved 8.5 minutes after the last change was made.

Parameter Setup: Select PAr-A to make changes relating to the parameters – pH, Conductivity TDS, Salinity. Note: only the PCS Testr will have all of these options. See below for menus available from each parameter. To Navigate the menus:

- Press MODE/ENT to select or confirm the displayed option.
- Press HOLD or CAL to scroll thru options or change values.

pH Options:

- **USA** or **NIST** Buffer Group for calibration buffer option.
  - **5-pt** calibration (all points) or **3-pt** calibration (middle three points only).

Salinity (SALt) Option (PCS Testr only)

- Choose **PPt** (parts per thousand) or **Per** (percentage %) as unit of measure.

Total Dissolved Solids (tDS) Option (PT and PCS Tester only)

- **FACt** factor the instrument uses to convert from conductivity to TDS value. Adjustable from **0.40 to 1.00** (default factor is 0.71).

Conductivity Options (PC and PCS Tester only)

- **A.Cal** (Automatic Calibration) Choose **YES** or **NO** (manual).

TIP: The PC Testr 35 and PCS Testr 35 are capable of automatic or manual conductivity calibration. In automatic calibration mode, the meter will automatically choose one of (3) conductivity calibration standards depending on the ranges listed below. If you will only use 84 µS, 1413 µS, or 12.88 mS calibration standards, automatic calibration is a time saving option. If you intend to calibrate with one or more standards that are **not** listed below, choose "NO" which will disable auto calibration and allow you to enter your desired value manually.

Conductivity Range	Automatic Calibration Value	Available with
0.0 – 200.0 µS	84 µS	PCS only
201 – 2000 µS	1413 µS	PC or PCS
2.01 – 20.00 mS	12.88 mS	PC or PCS

- **SPC** (Single-Point Calibration) Choose **YES** or **NO** (multi-point calibration).

TIP: The PC Testr 35 and PCS Testr 35 are capable of single or multi-point conductivity calibration. Use Single-Point Calibration to apply a single calibration value across all ranges. Use Multi-Point Calibration for individual calibration in each range. This will restrict an individual calibration so that it is applied to one range only. When using multi-point calibration, perform a calibration in each range that you expect to use for best results.

System Setup:

Select SYSt to make changes relating to the system. See below for available menus. Note: other than changing Temperature units, it is advised to keep the factory default settings for best results. To Navigate the System menus:

- Press MODE/ENT to select or confirm the displayed option.
- Press HOLD or CAL to scroll thru menu options or change values.

- **Unit rSt** (Instrument reset)
  - **PH** (pH) or **EC** (electrical conductivity / TDS / Salinity)
  - **CAL** (calibration reset) or **FCt** (Reset to factory default settings)
- **Set A.Off** (Automatic shut off after 8.5 minutes) Choose **YES** or **NO**.
- **Set t.C** (Temperature Coefficient) **0.0-10.0%** (2.1% is default)
- **Set AtC** (Auto Temperature Compensation) Choose **YES** or **NO** (25°C is used).
- **Set °C °F** (select temperature units) Choose **°C**elsius or **°F**ahrenheit.

Temperature Calibration:

The factory temperature calibration should last for the life of the original sensor since it doesn't normally drift. Temperature calibration is always recommended upon sensor replacement. It may also be desirable to adjust the temperature to match a certified accurate thermometer or another Testr. The temperature value is common to all parameters so only one calibration is needed. To perform temperature calibration:

1. Press ON/OFF to turn on meter. Place the reference thermometer and your Testr into the same sample. Allow enough time for both to stabilize.
2. Press MODE/ENT as needed to select the pH measuring mode. Press CAL to begin pH calibration mode.
3. Press HOLD for 5 seconds to begin temperature calibration mode. The current temperature will be displayed on top while the factory default temperature is below.
4. Press HOLD or CAL to manually adjust to the desired temperature—up to ± 5° C or ± 9° F of the factory default value.
5. Press MODE/ENT to confirm and return to the pH measuring mode.

pH Calibration:

For best results, calibrate with certified accurate pH calibration standards (buffers). You may calibrate up to five points with the USA (1.68, 4.01, 7.00, 10.01, 12.45) or the NIST (1.68, 4.01, 6.86, 9.18, 12.45) buffer group.

1. Press ON/OFF to turn meter on and MODE/ENT to select pH mode as needed.
2. Rinse the sensor with clean water. Immerse the sensor into your pH buffer and press CAL. The primary display will show the un-calibrated pH value, while the secondary display should search for and lock on the closest automatic calibration value.
3. Allow the primary display to stabilize, then press MODE/ENT to confirm the calibration value. The primary value will blink briefly before the secondary value automatically scrolls thru the remaining pH buffers available for calibration.
4. Repeat steps 2 & 3 with additional buffers or press CAL to return to measurement mode.

Conductivity Calibration (Automatic):

For best results, calibrate with certified accurate conductivity calibration standards. Selection of multi-point calibration will allow up to three of the following values, while Single-point calibration will allow only one; choose 84 µS, 1413 µS, or 12.88 mS.

Conductivity Range	Automatic Calibration Value	Available with
0.0 – 200.0 µS	84 µS	PCS only
201 – 2000 µS	1413 µS	PC or PCS
2.01 – 20.00 mS	12.88 mS	PC or PCS

1. Press ON/OFF to turn meter on and MODE/ENT to select conductivity mode as needed.
2. Rinse the sensor with clean water. Immerse the sensor into your standard and press CAL. The primary display will show the un-calibrated value, while the secondary display display should search for and lock on the closest automatic calibration value.
3. Allow the primary display to stabilize, then press MODE/ENT to confirm the calibration value. The primary value will blink briefly before returning to measurement mode.
4. Repeat steps 2 & 3 with additional calibrations standards if desired.

Conductivity, TDS, & Salinity Calibration (Manual):

For best results, calibrate with certified accurate calibration standards. 1 point per range.

Conductivity (3-pt)	TDS (3-pt)	Salinity (1-pt)
0.0 – 200.0 µS*	0.0 – 99.9 ppm*	1.00 – 10 ppt
201 – 2000 µS	100 – 999 ppm	
2.01 – 20.00 mS	1.00 – 10 ppt	

*Range only available with PCS Testr 35

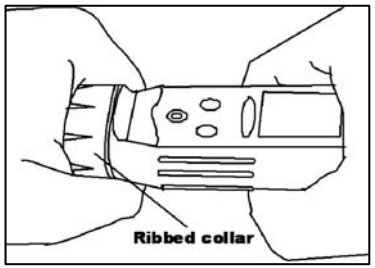
1. Press ON/OFF to turn meter on and MODE/ENT to select conductivity, TDS, or salinity mode.
2. Rinse the sensor with clean water. Immerse the sensor into your standard and press CAL. The primary display will show the un-calibrated value, while the secondary display will display the factory default calibration.
3. Press HOLD or CAL to manually adjust the primary display to your calibration standard.
4. Press MODE/ENT to confirm the new adjusted value. The primary value will blink briefly before returning to measurement mode.
5. Repeat steps 2 & 3 with additional calibration standards if desired.

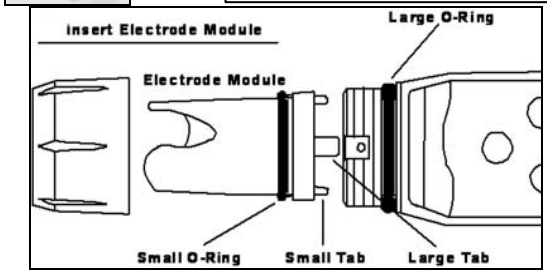
Hold Function:

For prolonged observation of a reading, press HOLD during measurement mode to freeze the display. The "HOLD" indicator will display when the reading is held. To release the held value and resume live measurement, press HOLD.

Sensor Replacement:

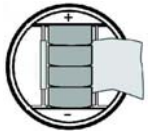
Your instrument includes a replaceable sensor (Eutech PCSENSOR - 01X097108 / Oakton 35425-50). If the tip gets damaged or as the sensor wears over time, the entire sensor can easily be replaced. To remove the old sensor, simply twist off the ribbed collar and pull the sensor straight out.





To install the new sensor, line up the tabs and 8 pins of the sensor to the instrument body. Twist ribbed collar back on to keep waterproof rating and secure sensor. The O-rings should create a watertight seal and provide some resistance when twisting.

Battery Replacement:



Your Testr includes (4) 1.5V alkaline batteries. LR44 or A76 battery types are suitable and commonly available. Replace all (4) batteries together. Waiting too long to replace the batteries can lead to inaccurate readings and is the most common cause of problems. Twist and unscrew to remove the battery cover at the top of the Testr. Pull on the white ribbon to remove the batteries. Note the correct polarity of the instrument before installing. The flat side of the battery is +. Place new batteries on top of the white ribbon so they can be easily removed next time. Hand tighten the battery cover to keep waterproof rating.

Storage:

The sensor does not require special storage. Rinse with clean water after use and cover the sensor with the included cap. Keep at room temperature away from extreme temperatures. The sensor can easily be re-hydrated by soaking if stored dry.

Message	Indicates
	>75% battery life remaining
	50-75% battery life remaining
	25-50% battery life remaining
	No bars & blinking = replace batteries
Err	Calibration error, usually attempting to calibrate to a value which is out of range or under range.
Unstable pH reading / Slow response	Broken or dirty sensor. Clean, rehydrate, and replace if necessary. Could also be due to low battery condition or sample with temperature that has not stabilized.
"Ur" (Under range) or "Or" (Over range)	Measured value is out of range. Most often caused by dry electrode that needs to be re-hydrated / soaked. Sensor may not be completely submersed or is not connected to Testr body properly.
Meter not responsive	If "Hold" on display, press Hold key to resume live measurement.
Secondary display continually scrolls	The automatic calibration standard is not within expected calibration range. Use fresh standard or an alternate calibration standard.

Warranty:

The waterproof Testrs are warranted to be free from manufacturing defects for 1 year and the electrode module is warranted for 6 months, unless otherwise stated. If repair, adjustment or replacement is necessary and has not been the result of abuse or misuse within the time period specified, please return the tester – freight prepaid – and correction will be made without charge. Out of warranty products will be repaired on a charge basis.

Return of Items:

Authorization must be obtained from your distributor before returning items for any reason. When applying for authorization, please include information regarding the reason the item(s) are to be returned. Note: We reserve the right to make improvements in design, construction and appearance of products without notice. Prices are subject to change without notice.

For more information on our products, please contact us or visit our websites:

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Multiparameter 35-Series Testrs™

Our most versatile Testrs combine up to five measurements in one pocket-sized meter

Determine pH, conductivity, TDS, salinity, and temperature – Great for water, wastewater, laboratory, or plant use

Accuracy up to ±0.01 for pH; ±1% full-scale for EC/TDS/salt – Ideal for a wide variety of applications

Long-lasting pH sensor with PVDF reference junction – Large volume of polymer gel reference gives long, clog-free sensor lifespan

Stainless steel pin-style conductivity sensors – Durable and compatible with a wide range of samples

Adjustable TDS factor, temperature coefficient, and salinity factor – Provide accurate readings under changing conditions

Push-button calibration – Calibrate more precisely than trimpot adjustment; no screwdrivers necessary

Automatic temperature compensation (ATC) – Gives you accurate readings even with fluctuating temperatures

Waterproof, dustproof housing – Meets IP67 rating, plus it floats!

Hold function – Freezes reading until you can record it

Auto shutoff – Extends the life of batteries

Sensor includes both pH and conductivity/TDS/salt probes.

35425-00 **35425-05** **35425-10**

Ordering Information

Catalog number	Description
WD-35425-00	PCTestr 35 (pH/conductivity)
WD-35425-05	PTTestr 35 (pH/TDS)
WD-35425-10	PCSTestr 35 (pH/conductivity/ TDS/salt)

Accessories

WD-35425-50 Replacement pH/conductivity/TDS/ salinity sensor module for all 35-series Testrs

Applications

Water quality: Hydroponics/agriculture, research labs, industrial process checks, pools, and spas, drinking water, wastewater, aquaculture.

Specifications

ISO 9001:2000 CERTIFIED SUPPLIER CE 1 year warranty meter only

Model		PCTestr 35	PTTestr 35	PCSTestr 35
Range	pH	0.0 to 14.0 pH	0.0 to 14.0 pH	0.00 to 14.00 pH
	Conductivity	0 to 2000 µS; 2.00 to 20.00 mS	—	0 to 200 µS, 201 to 2000 µS; 2.01 to 20.00 mS
	TDS	—	0 to 1000 ppm; 1.00 to 10.00 ppt	0.0 to 99.9 ppm, 100 to 999 ppm; 1.00 to 10.00 ppt
	Salinity	—	—	0 to 10.00 ppt
	Temperature	0 to 50°C (32 to 122°F)	0 to 50°C (32 to 122°F)	0 to 50°C (32 to 122°F)
Resolution	pH	0.1 pH	0.1 pH	0.01 pH
	Conductivity	10 µS; 0.1 mS	—	0.1 µS, 1 µS; 0.01 mS
	TDS	—	1 ppm; 0.01 ppt	0.1 ppm, 1 ppm; 0.01 ppt
	Salinity	—	—	0.1 ppm, 1 ppm; 0.01 ppt; 0.01%
	Temperature	0.1°	0.1°	0.1°
Accuracy	pH	±0.1 pH	±0.1 pH	±0.01 pH
	Conductivity	±1% full-scale	—	±1% full-scale
	TDS	—	±1% full-scale	±1% full-scale
	Salinity	—	—	±1% full-scale
	Temperature	±0.5°C (±0.9°F)	±0.5°C (±0.9°F)	±0.5°C (±0.9°F)
Calibration	pH	3 points	3 points	5 points
	Conductivity	2 points	—	3 points
	TDS	—	2 points	3 points
	Salinity	—	—	1 point
	Temperature	1 point	1 point	1 point

Temperature compensation: automatic (ATC), from 0 to 50°C (32 to 122°F) or manual

Operating temperature: 0 to 50°C (32 to 122°F)

Power: four 1.5 V alkaline batteries (included), approximately 250 hours continuous use; Eveready® A76 or LR44 equivalent replacement

Dimensions
Unit only: 6½" x 1½" dia (16.5 x 3.8 cm)
Boxed: 7¼" x 2½" x 2" (18.4 x 6.4 x 5.0 cm)

Weight
Unit only: 3.25 oz (90 g); **Boxed:** 6 oz (170 g)

Ammonia (Nitrogen) Test Strips, 0-6.0 mg/L

Product #:	**2755325**
USD Price:	$26.39
Available	

Suitable for both lab and field testing, Hach Test Strips are easy to use and easy to read. Ammonia (Nitrogen) is a product of microbiological decay of plant and animal protein. Its presence in raw surface waters usually indicates domestic or agricultural pollution. Above certain levels, it is toxic to fish. Contains 25 tests.

Easy to use, disposable, and inexpensive

A great way to obtain quick, quantitative answers in the field or in the lab

Specifications

Footnote:	*mg/L unless otherwise noted, ppb = µg/L, ppm = mg/L.; gpg = grains per gallon; 1 gpg = 17.1 mg/L or 17.1 ppm.
Model:	Test Strips
Number of tests:	25
Parameter:	Ammonia, Nitrogen, low range - As NH_3-N, For freshwater
Platform :	Test Strip
Range:	0 - 6 ppm
Ship Wt. (lbs):	0.25
Smallest Increment Steps:	Steps: 0, 0.25, 0.5, 1.0, 3.0, 6.0 ppm
Units:	25 tests

Hach Test Strips

Obtain quick, quantitative answers in the field or lab

Test strips are one of the easiest methods of testing water. Simply dip the strip in water, following the instructions and compare the color of the strip to determine the result. Use test strips when a general range is sufficient. Test strips should not be used when an exact measurement is required.

With Hach Water Quality Test Strips, technicians in the field can test many samples in only a few minutes, and make immediate evaluations on-site. No measuring, set-up, clean-up, or chemical handling are necessary. Hach test strips are also used in laboratories all over the world for pre-test screening-to detect the presence of materials that might interfere with lab testing.

- Easy to use
- Disposable
- Inexpensive

How to Use Test Strips

Test strips are one of the simplest types of tests to use. Simply dip the strip into the water according to directions on the bottle or package. The test strip will change color. Then compare the color of the test strip to the chart provided in the package to determine the test result.

For common questions about test strips, see our **FAQ page**.

What is the accuracy of Hach Test Strips?

Hach Test Strips are semi-quantitative and are accurate to +/- one half of a color block. Quantab strips are accurate to +/- 10 percent. Specific accuracies vary by parameter and are denoted on the product ordering page as well as on the package itself. If you are looking for a more precise method of testing, for instance if you are reporting to the EPA, please view our **other test kits.**

Most Popular Test Strips

5 in 1 Water Quality Test Strips

Free & Total Chlorine Test Strips, 0-10 mg/L

pH Test Strips, 4-9 pH units

Total Hardness Test Strips, 0-425 mg/L, 250 tests, Individually Wrapped

SenSafe®

Contains 30 Test Strips
Part Number: 480007

Ultra-Low Total Chlorine

Visual Dip & Read Test Strips

Tests Total Chlorine from 0 – 0.20 ppm and from 0 – 0.05 ppm.
Test strips are individually wrapped in foil packets.
US Patent #6541269

SCAN FOR INFO

ITS

Help us build a sustainable future. Please Recycle

IMPORTANT: Store in cool, dry place (below 80°F/27°C) and away from direct sunlight.

METHOD A TEST PROCEDURE:

1. Remove 1 test strip from foil packet and dip the test strip into a fresh **100mL (about 4oz)** water sample for **20 seconds** with a constant, gentle back and forth motion.
2. Remove the strip and shake once, briskly, to remove excess water.
3. **Wait 20 seconds.**
4. Match to the Method A color chart included. Complete color matching within **20 seconds.** Gently dry off excess water from color chart after matching.

Suggestion: For best accuracy, scan the QR code on front and consult the temperature compensation chart.

METHOD B TEST PROCEDURE:

1. Remove 1 test strip from foil packet and dip the test strip into a 100mL water sample for **40 seconds** with a constant, gentle back and forth motion.
2. Remove the strip and shake once, briskly, to remove excess water.
3. Match to the Method B color chart included. Complete color matching within **20 seconds.** Gently dry off excess water from color chart after matching.

Interferences: Other oxidizers. Metals will develop brown tint.

Total Chlorine

For best results, run test immediately after collecting a fresh water sample. Total Chlorine is the measurement of both Free Chlorine and Combined Chlorine as a sanitizer & oxidizer. This information is used in many applications to determine the total amount of chlorine in a body of water. Chlorine can be used as a disinfectant in the medical industry to clean medical

-0162

7

Ultra-Low Total Chlorine
Part Number: 480007-EZCC

METHOD A:

ppm (mg/L)	0	<0.01	0.01	0.02	0.05	0.10	0.15	0.20

METHOD B:

ppm (mg/L)	0	<0.005	0.005	0.01	0.015	0.02	0.025	0.05

EASY-READ™

ITS

MADE IN THE USA
US Pat. # 5620658

APPENDIX F – MCM6 Written Procedures
(Attached)

MAINE DEPARTMENT OF TRANSPORTATION

GENERAL PERMIT FOR THE DISCHARGE OF STORMWATER FROM MAINE DEPARTMENT OF TRANSPORTATION AND MAINE TURNPIKE AUTHORITY MUNICIPAL SEPARATE STORM SEWER SYSTEMS

MINIMUM CONTROL MEASURE 6 WRITTEN PROCEDURES

prepared for

MAINE DEPARTMENT OF TRANSPORTATION (MaineDOT)

Prepared by

GZA GeoEnvironmental, Inc.
707 Sable Oaks Drive
Suite 150
South Portland, Maine 04106

Prepared: September 2021

MaineDOT - Minimum Control Measure 6 Written Procedures

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MaineDOT - Minimum Control Measure 6 Written Procedures

1. INTRODUCTION

The Maine Department of Transportation (MaineDOT) implements and maintains a Stormwater Management Plan (SWMP) dated September 2021 to comply with the State of Maine Department of Environmental Protection (DEP) Bureau of Land and Water Quality's *General Permit for the Discharge of Stormwater from Maine Department of Transportation and Maine Turnpike Authority Municipal Separate Storm Sewer Systems* (TS4 GP). This document has been prepared as a supplement to MaineDOT's SWMP to demonstrate MaineDOT's compliance with fulfilling Minimum Control Measure 6 (MCM 6) of the TS4 GP.

The goal of MCM 6 is pollution prevention and good housekeeping in community/ facility operations. **Table 1** identifies the TS4 GP MCM 6 BMPs and their documentation requirements.

Table 1: MCM 6 BMPs

BMP	Description	TS4 Documentation
BMP 6.1	Inventory of operations and implement written operations and maintenance procedures	See Section 3
BMP 6.2	Train employees on pollution prevention as well as erosion and sediment control annually	TS4 Annual Report MCM 1 Training Documentation
BMP 6.3	Sweep paved areas within the Urbanized Area at least once per year as soon as possible after snowmelt.	TS4 Annual Report MCM 6 Street Sweeping Documentation
BMP 6.4	Complete catch basin inspections and cleanout within the Urbanized Area at least once every other year.	TS4 Annual Report Catch Basin Inspection and Clean Out Documentation
BMP 6.5	Inspect infrastructure (including stormwater conveyance structures and outfalls) and prioritize repairs and upgrades (*).	Inspection Reports
BMP 6.6	Implement Stormwater Pollution Prevention Plans (SWPPPs) for vehicle maintenance facilities operated by the permittee within the Urbanized Area.	SWPPPs
***:** Inspection of the post-construction stormwater treatment BMPs is covered under BMP 5.2 (see SWMP MCM 5).		

2. APPROACH

The following sub-sections describe MaineDOT's approach for implementing the pollution prevention and good housekeeping BMPs identified in MCM 6.

2.1 BMP 6.1: INVENTORY OF OPERATIONS AND IMPLEMENT WRITTEN OPERATIONS AND MAINTENANCE PROCEDURES

The MaineDOT has developed an inventory of operations and associated potential pollutant sources which is summarized in **Section 3** along with the written Operations and Maintenance (O&M) procedures that are implemented in policies and Standard Operating Procedures (SOPs) to reduce stormwater pollution.

Table 2 identifies the nonstructural controls to reduce stormwater pollution from operations with potential stormwater pollutants.

Table 2: Operations, Potential Pollutants, and Policy/SOP Names

Operation(s)	Potential Pollutant Source	Policy/SOP Name	Document Location
Drainage and Ditch Cleaning	Sediment	Level of Service Guidance – Cleaning Drainage Structure	On file in Surface Water Quality Unit office (*).
		Level of Service Guidance – Maintaining Ditches	On file in Surface Water Quality Unit office (*).
Equipment & Vehicle Maintenance	Oil & Grease Residues, Sediment, and Salt	Stormwater Pollution Prevention Plan (SWPPP)	On file in Surface Water Quality Unit office (*) and at each applicable Maintenance Facility.
		EP203 Oil and Equipment Maintenance Waste Procedure	On file in Surface Water Quality Unit office (*) and at each Maintenance Facility.
Hazardous Chemical Storage	Hazardous Material Spills	EP205 Hazardous Chemicals Handling and Storage Procedure	On file in Surface Water Quality Unit office (*) and at each Maintenance Facility.
Hazardous Waste	Hazardous Waste	EP204 Hazardous Waste Management Procedure	On file in Surface Water Quality Unit office (*) and at each Maintenance Facility.
Materials Management	Solid Waste and Reusable Materials	MaineDOT Greenbook	On file in Surface Water Quality Unit office (**) and at each Maintenance Facility.
Solid Waste Collection	Solid Waste	Level of Service Guidance – Removing Litter and Debris	On file in Surface Water Quality Unit office (*).
		Level of Service Guidance – Maintaining Rest Areas and Picnic Areas	On file in Surface Water Quality Unit office (*).
Spills	Petroleum or Hazardous Materials	EP213 Spill Response and Reporting Procedure	On file in Surface Water Quality Unit office (*) and at each Maintenance Facility.
Street Sweeping	Street Dust Within the	Level of Service	On file in Surface Water Quality Unit office (*).

	Travel Lanes	Guidance - Sweeping	
Universal Waste Collection	Universal Waste	EP210 Universal Waste Management Procedure	On file in Surface Water Quality Unit office (*) and at each Maintenance Facility.
Vegetation Management	Landscaping Chemicals (e.g., Pesticides, Herbicides, etc.)	Level of Service Policy – Vegetation Management	On file in Surface Water Quality Unit office (*).
		EP212 Pesticide Management	On file in Environmental Services Coordinator office (*).
Winter Road Maintenance	Deicer Products	Level-of-Service Goals – Snow & Ice Control	On file in Surface Water Quality Unit office (*).
		Maine Environmental BMP Manual for Snow and Ice Control	On file in Surface Water Quality Unit office (***).
***: Electronic copies of the current policy documents** are also **on the MaineDOT Maintenance & Operations Intranet webpage (http://mdotweb.state.me.us/mo/policy/index.php).** **: Electronic copy of the "Green Book Training Policy Memo" is also on MaineDOT Maintenance & Operations Intranet webpage (**http://mdotweb.state.me.us/mo/policy/index.php**). ***: Electronic copy of the Manual is also on the internet webpage of "Maine Local Roads Center" open to general public (**https://www.maine.gov/mdot/mlrc/technical/winterplowsand/**).			

2.2 BMP 6.2: ANNUAL EMPLOYEE TRAINING

The MaineDOT conducts annual training for its staff (in accordance with the SWMP implementation guidelines for MCM 1) that includes awareness and pollution prevention SOPs for the source areas listed above.

2.3 BMP 6.3: ANNUAL STREET SWEEPING PROGRAM

The MaineDOT conducts annual street-sweeping to remove grit and fines associated with winter road maintenance activities each spring after snowmelt. Materials recovered during the annual sweeping operations are managed in accordance with the requirements of Maine's Solid Waste Management Rules: Chapter 418 Beneficial Use of Solid Wastes.

2.4 BMP 6.4: CATCH BASIN CLEANING AND INSPECTION IN THE URBANIZED AREA

The MaineDOT conducts catch basin cleanout and inspection within the Urbanized Area at least once every other year. Materials recovered during the catch basin cleanout are managed in accordance with the requirements of Maine's Solid Waste Management Rules: Chapter 418 Beneficial Use of Solid Wastes.

2.5 BMP 6.5: STORMWATER INFRASTRUCTURE INSPECTION

Inspections of the MaineDOT infrastructure, excluding the post-construction stormwater treatment BMPs (see BMP 5.2 under SWMP MCM 5), are conducted regularly by MaineDOT's Maintenance and Operations

crews. These inspections include observation of MaineDOT-owned infrastructure, including conveyance structures and outfalls. A list of repairs and upgrades are then addressed by MaineDOT Highway Maintenance. Repairs are prioritized by severity of the condition and criticality of the infrastructure.

2.6 BMP 6.6: STORMWATER POLLUTION PREVENTION PLANS FOR VEHICLE MAINTENANCE FACILITIES WITHIN THE URBANIZED AREA.

The MaineDOT currently operates two vehicle maintenance facilities within the Urbanized Area, one in Bangor and one in Scarborough. The SWPPPs for these facilities will be updated to meet the requirements of the TS4 GP no later than June 30, 2022.

3. FACILITIES, OPERATIONS, AND POTENTIAL POLLUTANTS

The following sub-sections describe MaineDOT facilities located within the Urbanized Area, the associated operations, and an inventory of potential pollutant sources.

3.1 MAINTENANCE/STORAGE LOTS

The MaineDOT operates eight maintenance/storage lots (**Table 3**) located within the Urbanized Area.

Table 3: Maintenance/Storage Lots

Facility Name	Location
Dunstan Lot (Storage)	576 US Route 1, Scarborough, ME. 04070
Gorham Maintenance Lot	315 Libby Avenue, Gorham, ME. 04038
Auburn Maintenance Lot	250 Poland Spring Road, Danville, ME. 04223
Bangor Maintenance Lot and Regional Office	219 Hogan Road, Bangor, ME. 04401
Yarmouth Maintenance Lot	478 Portland Road, Yarmouth, ME. 04096
South Berwick Maintenance Lot	Route 236, South Berwick, ME. 03908
Scarborough Maintenance Lot and Regional Office	51 Pleasant Hill Road, Scarborough, ME. 04074
Empty Lot (No Activity)	Route 100, Falmouth, ME. 04105

Various potential pollutant sources are associated with each maintenance/storage lot depending on the operations performed and materials stored at a respective lot. Typical operations include equipment maintenance, equipment storage, loading/unloading of bulk products (e.g., liquid deicer, sand, and salt), and fuel delivery. SWPPPs have previously been developed for the two maintenance lots where equipment/vehicle maintenance is performed (Bangor and Scarborough). The SWPPPs for these facilities will be updated to meet the requirements of the TS4 GP no later than June 30, 2022. The SWPPPs will then be reviewed and modified as appropriate to address changes at a respective facility.

The MaineDOT conducts annual Greenbook training for maintenance personnel that includes stormwater pollution prevention, erosion and sediment control practices, hazardous/ universal waste management, and emergency response procedures.

3.2 VISITOR CENTER

The MaineDOT operates one visitor center located within the Urbanized Area (**Table 4**).

Table 4: Visitor Center

Facility Name	Location
Visitors Information Center	Interstate 95, Kittery, ME. 03904

The visitor center includes restrooms and a parking area. Potential pollutants at the visitor center include petroleum products from motor vehicle accidents and leaks, deicer products from winter maintenance operations, and litter/solid waste.

3.3 PARK AND RIDE LOTS

The MaineDOT owns 13 park and ride lots (**Table 5**) located within the Urbanized Area, and those which are operated by another entity are indicated with an asterisk (*).

Table 5: Park and Ride Lots

Facility Name	Location
Lisbon Falls, State Route 196 (Lisbon Street) P&R	State Route 9\196 (Lisbon Street), near State Route 125
Freeport, North P&R*	US Route 1, off I-295 Exit 20 (Desert Road)
Yarmouth, Visitor Center P&R	US Route 1 (Visitor Information Center) off I-295 Exit 17
Sabattus, High Street P&R	High Street and State Route 126 (Sabattus Road)
Saco, Industrial Park Road P&R	Industrial Park Road at Exit 1 of I-195, near I-95 Exit 36
Portland, Marginal Way P&R	Marginal Way at I-295 Exit 7, (Franklin Street)
Westbrook, Larrabee Road P&R*	Larrabee Road off State Rte 25 (Westbrook Arterial)
Bangor, Odlin Road P&R	Odlin Road (US Route 2) off I-95 Exit 182
Yarmouth, South P&R	US Route 1 off I-295, Exit 15
Auburn, US Rte 202 (Washington Street) P&R*	US Route 202 (Washington Street) off I-95 Maine Tpk Exit 75
Portland, Portland Transportation Center P&R*	Portland Transportation Center, North parking lot, off I-295 exit 5
Freeport, South P&R	US Route1, just north of Casco Bay Regional YMCA
South Portland, Exit 45 P&R	I-95 Exit 45, on Turnpike Approach near toll plaza

* Indicates Park & Ride Lot is operated by another entity

The park and ride lots are intended for commuter use only, for 24 hours or less. Recreational vehicles and commercial trucks are not allowed in these lots. Potential pollutants at the park and ride lots include petroleum products from motor vehicle accidents and leaks, litter, and deicer products from winter maintenance operations.

3.4 REGIONAL OFFICES

The MaineDOT operates regional offices in Bangor and Scarborough that are co-located with maintenance lots (see **Table 3**). The potential pollutant sources at the regional offices include petroleum products from motor vehicle accidents and leaks, deicer products from winter maintenance operations, and solid waste.

3.5 ROADS AND BRIDGES

The MaineDOT operates several thousand miles of roads and bridges that are maintained throughout the State. The primary sources of pollutants along the roads and bridges are related to motor vehicle usage and maintenance of the roadways and rights of way, and litter. Such pollutant sources include litter, vegetation management, and winter maintenance. Occasionally motor vehicle accidents (between vehicles as well as between vehicles and animals) may result in additional pollutant sources.

APPENDIX G – Urban Impaired Stream BMP Compliance Strategy
(Attached)

APPENDIX G. Urban Impaired Stream BMP Compliance Strategy

This document explains MaineDOT's strategy to comply with the additional best management practice (BMP) requirement of the new transportation municipal separate storm sewer system (TS4) permit for the urban impaired stream (UIS) watersheds.

1. TS4 Permit Requirement

Part IV.E.3 of the TS4 permit requires MaineDOT to propose and fully implement at least three structural or non-structural BMPs or equivalent measures in the UIS watersheds where the Department operates a point source:

"If the waterbody to which a point source covered by this GP discharges is an Urban Impaired Stream (UIS) (Appendix B of this permit) the permittee must propose and fully implement at least three structural or non-structural BMPs or other equivalent measures to be considered for inclusion in the permittee specific DEP Order, unless the Department has determined the MS4 discharge is not causing or contributing to the impairment. The BMPs must address a specific impairment from the MS4 discharge within the UA and be clear, specific and measurable. Structural or nonstructural BMPs may selected from a) MCMs 1-6, b) an existing Department approved Watershed Management Plan, or c) BMPs in Appendix D, BMPs for Discharges to Urban Impaired Streams, of this GP or more specifically developed by the permittee. For receiving waters impaired in whole or in part by nutrient loading, including UISs covered by the Impervious Cover TMDL, permittees may propose measures designed to reduce loads into the MS4 system. The permittee specific DEP Order will set forth those measures the permittee must take, and may include, in whole or in part, the measures proposed by the permittee."

2. The Urban Impaired Streams and Priority Stressors

MaineDOT operates (maintains) TS4 outfalls in eight UIS watersheds (**Table 1**). MaineDOT must propose and fully implement BMPs in these watersheds to comply with the new TS4 permit. Land use/land cover, MaineDOT impervious cover and outfall metrics for each UIS watershed is given in **Attachment 1**.

DEP Division of Environmental Assessment (DEA) has provided MaineDOT the pririty stressors based on the best available data (**Table 1**).

Chloride is the most common stressor prioritized by DEP DEA across the UIS watersheds.

Table 1. Summary of the UIS Watershed Priority Stressors

UIS Watershed	Town	Environmental Stressors Prioritized by DEP*	WBMP Available?
Arctic Brook	Bangor	DO, Chloride, Habitat/Flow	Yes
Concord Gully	Freeport	Chloride, Habitat/Flow	Yes
Frost Gully Brook	Freeport	Flow/Habitat Instability	-
Goosefare Brook	Saco	Chloride, Nutrients, Habitat	Yes
Nasons Brook	Westbrook, Portland	Habitat, Chloride**	-
Penjajawoc Stream	Bangor	DO, Chloride	Yes
Red Brook	Scarborough, South Portland	Habitat/Flow, Habitat/Crossings, Chloride	Yes
Sucker Brook	Bangor, Hampden	Chloride, DO/Nutrient Enrichment	-

*: As provided by DEP Division of Environmental Assessment (2021).
**: MaineDOT has no plow crew in Nasons Brook watershed and does not contribute to the chloride input to the watershed.
DO: Dissolved Oxygen
IC: Impervious Cover
TMDL: Total Maximum Daily Load
WBMP: Watershed-based Management Plan

3. Stormwater BMPs for the Urban Impaired Stream Watersheds

Operational priorities of and resources available to MaineDOT may change over the course of the permit cycle. Therefore, MaineDOT proposes a flexible approach rather than a highly prescriptive one to address the BMP requirement given in Part IV.E.3 of the TS4 permit. The proposed flexible approach considers the uncertainty associated with the number, scope, and schedule of the MaineDOT construction projects which will be completed in each urban impaired stream (UIS) watershed during the permit cycle. The proposed approach also aims to ensure that MaineDOT contributes to the full implementation of clear, specific, and measurable best management practices (BMPs) by the end of the permit cycle.

MaineDOT has created a list of BMP alternatives targeting the priority stressors in the UIS watersheds (**Table 2**). MaineDOT proposes to fulfill its BMP requirement in each UIS watershed through implementation of three of these BMP alternatives before the end of the permit cycle (i.e. 7/1/2027).

MaineDOT will evaluate its BMP implementation progress for each UIS watershed by the end of PY3. If the evaluation results indicate that MaineDOT will not be able to meet the permit requirement (i.e. minimum three BMPs) in certain UIS watershed(s) by the end of the permit cycle, MaineDOT will propose to (a) implement new BMPs which are not listed in **Table 2,** and/or (b) fund eligible BMPs to be implemented by other entities by the end of the permit cycle. The proposal will be submitted to DEP as a permit modification request.

Table 2. Stormwater Best Management Practices for the Urban Impaired Stream Watersheds.

A. Structural Best Management Practices			
#	BMP	Project Type	Target UIS Stressor(s)
A.1.a	New Treatment Measure	O	All Except Chloride
A.1.b	New Small Footprint Measure	O	Nutrients, Dissolved Oxygen
A.2	Smart Chloride Mitigation System	N	Chloride
A.3	Stream Crossing Upgrade	O	Habitat
B. Non-structural Best Management Practices			
B.1	Street Sweeping	N	Nutrients, Dissolved Oxygen
B.2	Winter Salt Application	N	Chloride
B.3	Stream Channel Restoration	N	Habitat

Abbreviations:
Project Type: Opportunistic (O) stands for the BMPs linked to the projects in the current or future MaineDOT work plans. New (N) stands for the BMPs developed to address the TS4 permit requirements.

Table 3 summarizes the BMPs that MaineDOT intends to implement for each UIS watershed. It must be noted that the potential BMPs given for a UIS watershed are designed to address the specific priority stressors. Emboldened potential BMPs are those most likely to be implemented in the watershed.

Table 3. Summary of the UIS Watershed BMP Implementation.

UIS Watershed	Environmental Stressors Prioritized by DEP*	Potential BMPs for the Watershed (from Table 2)
Arctic Brook	DO, Chloride, Habitat/Flow	A.1**, **A.2**, A.3, B.1, **B.2**, B.3
Concord Gully Brook	Chloride, Habitat/Flow	**A.1**, **A.2**, **B.2**, B.3
Frost Gully Brook	Flow/Habitat Instability	A.1, A.3, B.3
Goosefare Brook	Chloride, Nutrients, Habitat	**A.1**, **A.2**, A.3, B.1, **B.2**, B.3
Nasons Brook	Habitat, Chloride***	A.1, **A.2**, A.3, B.3
Penjajawoc Stream	DO, Chloride	**A.1**, **A.2**, B.1, **B.2**
Red Brook	Habitat/Flow, Habitat/Crossings, Chloride	A.1, **A.2**, **A.3**, **B.2,** B.3
Sucker Brook	Chloride, DO/Nutrient Enrichment	A.1**, **A.2**, B.1, **B.2**

*: As provided by DEP Division of Environmental Assessment (2021).
**: Small footprint treatment measure can be implemented.
***: MaineDOT has no plow crew serving Nasons Brook watershed and does not contribute to the winter salt/chloride input to the watershed. So, B.2 is not included in the "Potential BMPs for the Watershed (from Table 2)" column for Nasons Brook watershed.
DO: Dissolved Oxygen

Explanations for the BMPs given in **bold**:
A.1: MaineDOT projects in the current work plan which will include a new post-construction treatment measure (see **Table 4**).

A.2: Smart chloride mitigation system (SCMS) will be implemented in one of the seven chloride-impaired UIS watersheds. However, DEP indicated that MaineDOT could receive one BMP credit for each of the watersheds with a chloride impairment considering the *"know-how"* generated by the first SCMS can be used for the development of new BMPs in the chloride impaired UIS watersheds (MaineDOT-DEP meeting dated 9/13/2021).

B.2: "Winter Salt Application Report", which will be submitted with the annual TS4 report, will include the winter salt application rates for the pavement maintained by MaineDOT in the chloride impaired UIS watersheds.

A. Structural Best Management Practices

A.1 New Treatment Measure

MaineDOT proposes the following to count towards the fulfillment of the UIS BMP requirement:

a. New treatment measures constructed to comply with minimum control measure 5 (MCM5) or with the UIS BMP requirement:

"New treatment measure" refers to a new structural measure constructed in an UIS watershed within the permit cycle to mitigate the impact of the stormwater discharges from a developed area that is under the control of MaineDOT. These measures typically provide water quality and channel protection volume to mitigate the downstream impact of the stormwater. MaineDOT plans on constructing new treatment measures for the projects which are in its current work plan (2021-2022-2023) and given in **Table 4**. MaineDOT may also choose to partner with another entity to construct a new treatment measure.

Table 4. MaineDOT Projects Including New Treatment Measures (Work Plan: 2021 thru 2023).

UIS Watershed	WIN#	Project Description	Construction	
			Begin Date (Forecast)	End Date (Forecast)
Goosefare Brook	023274.00	Park & Ride Expansion	04/10/2023	08/18/2023
Penjajawoc Stream	018595.10	Diverging Diamond Interchange (Hogan Rd-I95)	06/09/2024	10/21/2026
Concord Gully Brook	023627.00	I-295 Exit 20 Bridge	11/17/2021	11/07/2024

b. New small footprint measures opportunistically constructed with the maintenance projects:

"New small footprint measure" refers to a new structural measure including high rate filter media with demonstrated "Total Suspended Solids (TSS)" and "Total Phosphorus (TP)" removal performance. A recent study on the "International Stormwater BMP Database" has shown that the high rate filter media supporting plants (high rate biofiltration) significantly reduce the TSS and TP concentrations using three statistical methods (see **Attachment 3**). MaineDOT can consider the high rate biofiltration measures for the UIS watersheds with sediment related priority stressors (i.e. dissolved oxygen, nutrients) (see **Table 3**). The high rate biofiltration measures can be implemented in Arctic Brook and Sucker Brook watersheds for these watersheds do not have any projects with new treatment measure in the current MaineDOT work plan. MaineDOT will consult with and obtain the approval of DEP prior to the construction of the small footprint measures.

A.2 Smart Chloride Mitigation System

MaineDOT has developed a novel smart chloride mitigation system (SCMS) concept which will be implemented in one of the seven UIS watersheds where chloride has been identified as a priority stressor (**Table 3**). The SCMS will utilize continuous monitoring adaptive control (CMAC) consisting of sensors, actuated valves or gates to detain chloride-rich stormwater from impervious surfaces treated with winter salt and gradually release it to minimize its adverse impact on the freshwater stream habitat. In other words, the SCMS will be designed to flush the winter salt from the stream watershed with minimum salinity impact on the habitat. Details of the SCMS are provided in **Attachment 2**.

MaineDOT proposes to fully implement one pilot SCMS in an area which is under the full control of the Department by the end of the permit cycle. The park & ride lots have emerged as likely candidates for the pilot SCMS in the cursory review of the winter salt treated impervious areas in MaineDOT right-of-way. The ultimate location will be determined based on the results of a multi-criteria site evaluation and selection process. If no feasible site can be identified in the seven UIS watersheds where MaineDOT maintains outfalls, MaineDOT may select a site in another UIS watershed in consultation with DEP.

MaineDOT proposes the following implementation schedule for SCMS BMP:

- Permit Year (PY) 2: Site evaluation and selection, SCMS design
- PY3: SCMS construction
- PY 4 and 5: SCMS operation and maintenance, development of new SCMS configurations, and public education and outreach.

MaineDOT had a meeting with DEP on the SCMS on 9/13/21: DEP indicated that MaineDOT could receive one BMP credit for each of the UIS watersheds (see **Table 3**) with chloride impairment considering the *"know-how"* generated by the first SCMS can be used for the development of new BMPs in the chloride impaired UIS watersheds. Therefore, MaineDOT proposes to receive one BMP credit for each chloride impaired UIS watershed for the full implementation of the SCMS.

A.3 Stream Crossing Upgrade

MaineDOT has developed and successfully implemented a range of design approaches to remove fish and aquatic organism passage barriers when upgrading its stream crossings. These include hydraulic and geomorphic-based designs, and may follow MaineDOT's Habitat Connectivity Design (HCD) guidance in areas covered by the Maine Atlantic Salmon Programmatic Consultation (MAP). MaineDOT proposes that its stream crossing upgrade projects which removes fish and aquatic organism barriers count toward the fulfillment of the BMP requirement for the habitat impaired UISs (**Table 3**). MaineDOT currently has two stream crossing upgrade projects in its current work plan (**Table 5**). Both are retrofits of existing large culverts intended to provide fish passage for brook trout and therefore will likely require a hydraulic design approach. This may include weir/baffles to the inside of the culvert and building either a concrete pool-weir fishway or geomorphic-based roughened channel at the outlet. Similar projects in the future work plans (e.g. 2022-2023-2024) will be considered towards the fulfillment of the BMP requirement. Potential upstream and downstream geomorphological effects of the stream crossing upgrade projects will be assessed to ensure that the projects will not negatively impact the stream habitat.

Table 5. MaineDOT Stream Crossing Upgrade Projects in the UIS Watersheds (Work Plan 2021-2022-2023).

UIS Watershed	WIN#	Project Description	Construction	
			Begin Date (Forecast)	End Date (Forecast)
Red Brook	023601.00	Culvert Rehabilitation to I-295 Northbound/Red Brook Bridge	10/18/2022	01/24/2023
	020535.00	Aquatic Organism Passage Restoration	10/18/2022	10/21/2026

B. Non-structural Best Management Practices

B.1 Street Sweeping

MaineDOT "Maintenance & Operations" sweeps state and state-aid highways typically once a year in accordance with its level-of-service guidance document. Sweeping is a source control BMP that removes coarser sediment and sediment-bound nutrients from impervious surfaces before they are washed off by surface runoff. Road intersections with high traffic counts and long queues have higher concentrations of fine sediment and exhaust particulate and are considered pollutant "hot spots." To effectively remove the fine particulate requires the use of regenerative vacuum sweepers.

In addition to scheduled sweeping, the Department proposes to provide regenerative vacuum sweeping of road intersections and sections hot spots, to be pre-approved by DEP, when antecedent dry periods exceed two weeks.

B.2 Winter Salt Application

MaineDOT proposes to track and report its winter salt application for the UIS watersheds for which chloride has been identified as a priority stressor (**Tables 2 & 3**). The winter salt application rates coupled with the Accumulated Winter Season Severity Index (AWSSI) (https://mrcc.purdue.edu/research/awssi/indexAwssi.jsp) will be reported for the UIS watersheds with the annual report. To increase the temporal resolution of the salt application rates, MaineDOT will track the amount of the salt applied by its own crews and its contractors for each storm in the UIS watersheds (**Attachment 4**). The application rates will be both reported on a seasonal "per lane mile" and "per impervious area" basis. High-resolution GIS data will be used to calculate the impervious area served by each crew and contractor. MaineDOT will include its average statewide salt application rates and the average statewide salt application rates of neighboring state DOTs to put the MaineDOT's UIS watershed salt application rates into context. Salt application data of the other state DOTs will be obtained from the Clear Roads "Annual Survey of State Winter Maintenance Data" (https://clearroads.org/winter-maintenance-survey/). The annual UIS watershed salt application data to be reported by MaineDOT can be used to determine the baseline salt/chloride input to a UIS watershed and potential salt/chloride hot spots if coupled with the data from the other winter salt applicators (e.g. towns, contractors).

MaineDOT is currently in the process of reviewing the latest generation of spreader controls that are on the market. Currently, MaineDOT's fleet of 400 plow trucks is about two-thirds outfitted with a generation of spreader controls known as *Cirus SpreadSmart,* and about one-third are outfitted with a much older generation of spreader controls from the 90's known as *Compu-Spread CS-230AC* units. Being an older generation of spreader control, the *CS-230AC* units are much more complicated to calibrate and have a spread-rate variability of approximately 10%. Newer spreader controls, like the *Cirus* units, provide a much more automated calibration process and reduce the variability of the spread rate to approximately 2%. Over the course of the permit cycle, MaineDOT intends to swap over the last remaining *CS-230AC* units to a current-generation spreader control that will improve the accuracy of the salt application data. MaineDOT will provide the number of spreader control upgrades for the plow crews serving the UIS watersheds in the annual reports.

In this permit cycle, MaineDOT will implement *Automatic Vehicle Location (AVL)* technology to increase the spatial resolution of the salt application data in one of the UIS watersheds where it has a relatively high winter maintenance footprint (**Attachment 4**): Red Brook or Sucker Brook. MaineDOT will equip the plow trucks of its Scarborough or Bangor crew (#71404 or #71103) by the end of PY2. MaineDOT will submit its salt application data with finer spatial resolution for Red Brook or Sucker Brook watershed starting with PY3 annual report.

MaineDOT will evaluate the baseline winter salt application data by the end of PY5 to assess the need for additional winter maintenance BMPs to be implemented in the UIS watersheds in the following permit cycle.

B.4 Stream Channel Restoration

MaineDOT proposes to restore the UIS reaches within its right-of-way. The stream restoration projects will be considered for the UIS under the stress of habitat degradation (**Tables 2 & 3**). MaineDOT can opportunistically develop a restoration project to be coupled with another project in its work plan. The restoration project development will follow the "General Stream Restoration Techniques" given under Attachment D of the 2022 Transportation MS4 permit. Upon identification of an UIS reach for restoration, MaineDOT will promptly contact DEP to obtain its approval and develop the restoration project in consultation with DEP.

Attachment 1. Land Use/Land Cover, MaineDOT TS4 Metrics of the Urban Impaired Stream Watersheds

Urban Impaired Stream	Watershed Area (sq. mi)	NLCD 2016 Developed Area	NCLD 2016 Impervious Area	Percent of the Watershed's Total Impervious Area (NLCD 2016)				MaineDOT Impervious Area (ac)	MaineDOT TS4 Outfalls
				Primary Roads	Secondary Roads	Tertiary Roads	Non-Road		
Arctic Brook	1.16	71%	29%	5%	7%	37%	52%	9.8	11
Concord Gully	0.88	56%	25%	4%	13%	19%	64%	9.1	2
Frost Gully Brook	2.54	29%	6%	10%	24%	26%	40%	11.7	7
Goosefare Brook	5.62	52%	18%	4%	12%	25%	60%	28.6	15
Nasons Brook	1.13	60%	32%	2%	11%	9%	78%	12.5	5
Penjajawoc Stream	8.61	29%	13%	5%	6%	24%	65%	37.6	14
Red Brook	2.96	32%	12%	15%	21%	8%	56%	50.4	17
Sucker Brook	2.75	72%	32%	10%	7%	13%	71%	52.1	26

NLCD 2016: National Land Cover Database Year 2016 Data. The land cover and imperviousness data were minimally processed by MaineDOT to obtain the percentages given in the table. https://www.mrlc.gov/data

Primary Roads: Interstates and other major roads.
Secondary Roads: Non-interstate highways.
Tertiary Roads: Any two-lane road.
Non-Road: Impervious area other than roads.

Attachment 2. A "Smart" Stormwater System to Mitigate the Chloride Impact on the Urban Impaired Streams

EXECUTIVE SUMMARY

Chloride has been identified as a stressor impairing stream water quality in Maine. Salt application due to winter maintenance of the impervious surfaces (roads, parking lots, sidewalks) is the leading chloride source in the stream watersheds. Chloride is a challenging stormwater contaminant since

- Chloride cannot be removed by any of the existing stormwater treatment measures due to its high solubility,
- As opposed to most stormwater contaminants, stormwater infiltration into soil is not a removal mechanism for chloride. On the contrary, groundwater contaminated by chloride persistently elevates chloride concentrations in streams through baseflow,
- Chloride source control is a challenging endeavor due to the public safety, level of service concerns against reduced winter salt application.

Research on the export of winter salt (chloride) has shown that the highest chloride mass export from the source areas (e.g. roadways) occurs during winter and spring snowmelt/rain events: small surface runoff volume and very high chloride concentrations. Seasonal diversion and detention of high-chloride stormwater to mitigate the chloride impact on the stream habitat has been proposed and evaluated by the researchers and practitioners.

Main goal of the project is to mitigate the chloride impact on the stream habitats by implementing:

- A "smart" stormwater system that detain and release chloride-rich stormwater

"Smart" stormwater systems consist of sensors, actuated valves, and specialized software giving them "Continuous Monitoring Adaptive Control" capabilities. As opposed to conventional stormwater control measures, smart systems can continuously measure parameters of interest, analyze the monitoring data, and make autonomous decisions which ultimately deliver better performance or even achieve goals that their conventional counterparts cannot.

The proposed smart system mainly consists of a non-infiltrating detention basin equipped with flow gauges and specific conductance (easy-to-measure, proxy parameter for chloride) sensors. A "logic" customized for chloride mitigation will be developed for the system. Potential DOT application sites are park & rides, highway medians, and interchange infields.

Detailed discussion of the proposed smart system's schematics and the pilot application alternatives can be found in Section 2 and 3, respectively.

1. BACKGROUND AND OBJECTIVE

Chloride has been identified as a stressor impairing stream water quality in Maine. The Department of Environmental Protection (DEP) Chloride is a stressor in seven of the eight urban impaired streams (UIS) where MaineDOT operates "Municipal Separate Storm Sewer Systems (MS4)". Additional best management practices are required to address the chloride and other stressors in the UIS watersheds by the new transportation general MS4 permit which will go into effect on July 1, 2022.

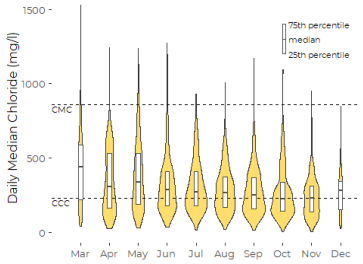
Salt application due to winter maintenance of the impervious surfaces (roads, parking lots, sidewalks) is the leading chloride source in the stream watersheds. Chloride is a challenging stormwater contaminant since

Chloride Trends in an Urban Impaired Stream in Maine: Long Creek

Long Creek is a unique urban impaired stream which has its own general permit issued by EPA under its residual designation authority. Long Creek Watershed Management District (LCWMD) is the entity specifically established to operate the general permit. Since 2010, LCWMD has been monitoring Long Creek main stem and its tributaries for various water quality parameters including specific conductance and chloride. Continuous specific conductance monitoring has generated a large data set reflecting temporal trend of specific conductance/chloride concentration in Long Creek main stem and its tributaries.

Following graph shows the daily median chloride concentrations estimated using automatic/continuous specific conductance measurements performed at various stations in the watershed. The blob width shows the number of observations for a given daily median chloride concentration: less observations/measurements are available for March and December as compared other months. Based on the figure, we can say:

- Daily median chloride concentration is generally high late winter/early spring and gradually decreases until fall indicating that road salt is partially flushed out of the watershed between the consecutive winter maintenance seasons,
- More than 50% of the daily median chloride concentrations exceed the chronic water quality criterion set for chloride (i.e. 230 mg L^{-1}) (see "CCC" line in the figure) indicating a persistent yearlong chloride stress on the stream biota,
- It is not uncommon that the daily mean chloride concentrations exceed the acute water quality criterion every month (i.e. 860 mg L^{-1}) (see "CMC" line in the figure),
- Even under the worst conditions (see "March" in the figure), approximately 25% of the daily median chloride concentrations are under the chronic water quality criterion (CCC) which indicates that a window of opportunity exists every month for releasing chloride-rich stormwater from a smart system (see the details for the proposed smart system below).



Aggregated Daily Mean Chloride Concentrations in Long Creek streams (Courtesy of Dr. Curtis Bohlen)

A Comprehensive Chloride Monitoring Case Study: Lake McCarrons Watershed (Minnesota)

A recent monitoring study on the roadway runoff provides very useful information on the chloride dynamics (Herb et al. 2017). Figures below are for the two monitoring sites in Lake McCarrons Watershed (MN) monitored for three field seasons (2015-2017):

- *County Road B:* 28-ac drainage area consisting of 0.5-mile county road and residential streets (curb-and-gutter roadway),
- *Highway 36 Ditch:* 12-ac drainage area consisting of ditches/swales adjacent to Highway 36 and its eastbound off-ramp.

Major findings are:

- There is a stark contrast between chloride retention behavior of the two study watersheds. Retention reported below is the "*percentage of applied road salt/chloride that is not observed in the surface runoff*":

Study Site	2015-2016 Field Season	2016-2017 Field Season
Curb-and-gutter Roadway (County Road B)	Road Salt Applied: 3,595 lbs (128 lbs/ac) Chloride Observed in Surface Runoff: 1,212 lbs (43 lbs/ac) Chloride Retention: **66%**	Road Salt Applied: 4,726 lbs (169 lbs/ac) Chloride Observed in Surface Runoff: 2,968 lbs (106 lbs/ac) Chloride Retention: **37%**
Highway Ditch (Highway 36)	Road Salt Applied: 6,233 lbs (519 lbs/ac) Chloride Observed in Surface Runoff: 375 lbs (31 lbs/ac) Chloride Retention: **94%**	Road Salt Applied: 9,012 lbs (751 lbs/ac) Chloride Observed in Surface Runoff: 556 lbs (46 lbs/ac) Chloride Retention: **94%**
Values reported in parentheses are chloride mass normalized by the area of the study watershed (Not impervious area or impervious roadway area)		

The highway ditch site consistently has a higher chloride retention than the curb-and-gutter roadway indicating that a significant amount (i.e. 94%) of road salt infiltrates into the ditch soil and does not appear in the concentrated ditch flow,

- Chloride retained in the ditch soil (shallow groundwater) can be exported in fall season (see "November Mean Chloride Load" in the bottom-right figure). Note that the November chloride peak was not due to new winter salt application. On the other hand, major chloride export occurs in winter season in the curb-and-gutter roadway (see "Mean Chloride Load" in the bottom-left figure),

Noteworthy Conclusions of the Researchers Pertinent to the Smart Chloride Mitigation Concept:

Section 6.3 of the report (Herb et al. 2017) includes statements supporting the smart chloride mitigation concept, although the authors did not specifically mention the application of a smart stormwater system, discussed herein. For instance, the authors state:

- *"The chloride management strategies examined in this study focused primarily on snowmelt capture, with the idea that capturing small amounts of snowmelt runoff with high chloride concentrations may be a relatively efficient method to mitigate chloride spreading from de-icers in the environment…."*
- *"….Chloride removal by diversion of saline runoff will be most effective (in terms of mass of chloride removed per volume of water) if implemented at the scale of a roadway, before runoff enters the drainage network (e.g., at County Road B)…..For example, a diversion of 0.1 inches of the most saline runoff at the County Road B site would remove 80% of surface runoff chloride from the site….."*

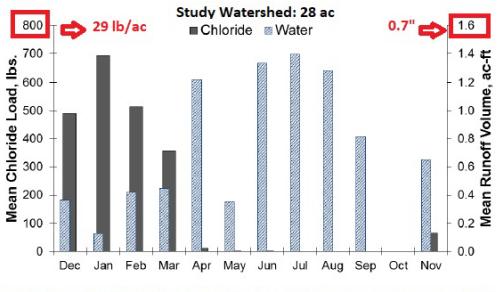


Figure 3-9. Mean monthly loading of chloride (lbs.; left axis) and water (ac-ft; right axis) observed at ***County Road B*** over two years of continuous monitoring Aug 1, 2015 – Jul 31, 2017. The lack of October runoff data is due to temporary removal of the weir for site maintenance.

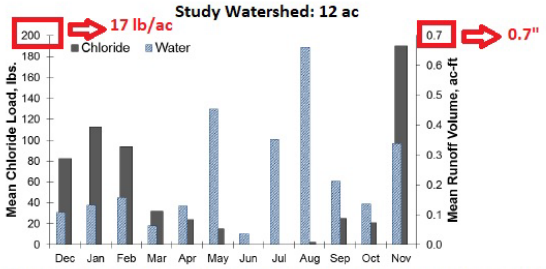


Figure 3-11. Mean monthly loading of chloride (lbs.; left axis) and water (ac-ft; right axis) observed at ***Highway 36 Ditch*** over two years of continuous monitoring Aug 1, 2015 – Jul 31, 2017.

- Chloride cannot be removed by any of the existing stormwater treatment measures due to its high solubility,

- As opposed to most stormwater contaminants, stormwater infiltration into soil is not a removal mechanism for chloride: chloride is neither retained by soil particles nor decomposes in the soil column. On the contrary, stormwater chloride contaminates groundwater after its infiltration. Elevated year-round chloride concentrations observed in the streams are due to the high-chloride groundwater baseflow in addition to the surface runoff (See text box below for the chloride trends in an urban impaired stream in Maine). Any stormwater measure aiming chloride mitigation must consider "chloride transport into groundwater via infiltration" as the surface runoff moves towards a stream or another surface water. This transport mechanism increases the chloride residence time in a watershed and results in chronic water quality problems for the chloride applied in a winter maintenance season is not "flushed out" of the watershed before the onset of the following winter maintenance season,

- Chloride source control is a challenging endeavor due to the public safety, level of service concerns against reduced winter salt application.

Therefore, there is a clear need for innovative end-of-pipe stormwater measures to mitigate the stress exerted on the stream water quality and habitats by elevated chloride levels.

Main goal of the project is to mitigate the chloride impact on the stream habitats by implementing:

- A "smart" stormwater system that detain and release chloride-rich stormwater

"Smart" stormwater systems consist of sensors, actuated valves, and specialized software giving them "Continuous Monitoring Adaptive Control (CMAC)" capabilities. As opposed to conventional stormwater control measures, smart systems can continuously measure parameters of interest, analyze the monitoring data, and make autonomous decisions which ultimately deliver better performance or even achieve goals that their conventional counterparts cannot (**Fig. 1**).

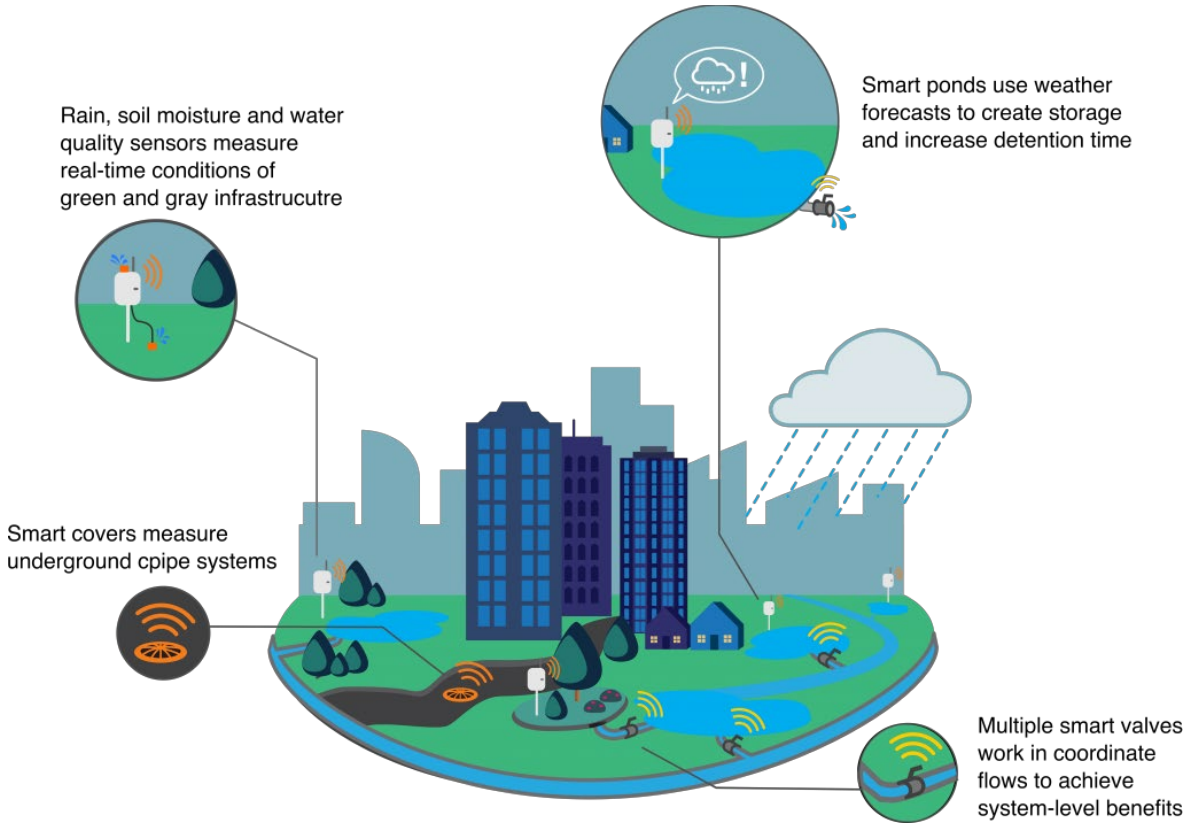


Figure 1. Potential applications of smart stormwater management (Reference: http://open-storm.org/workshop-cps2020/).

CMAC is an innovative stormwater management approach and an active area of research. As relative cost of CMAC components decrease, full-scale CMAC projects will be more common across the nation. Select (incomplete) list of the CMAC projects and their objectives are given below.

Project	Objective(s)
City of Ann Harbor (MI) Stormwater System*	• Flood mitigation • Water quality improvement • Cost reduction
Maryland Department of Transportation (MDOT) & Walmart "Public Private Partnership" (PPP)**	• Flood mitigation • Water quality improvement • Cost reduction • Water quality credit
Real-time Control Schemes for Bioretention Cells***	• Performance Enhancement
Conner Creek Watershed (Knox County, TN)***	• Investigation of site- and system-level barriers against smart stormwater management

City of Albany (NY), Bronx (NY), Hoboken (NJ), Kansas City (MO), Philadelphia (PA)**	• Combined Sewer Overflow (CSO) Mitigation
*: (http://open-storm.org/case-studies/) **: Opti Case Studies (https://optirtc.com/case-studies) ***: Jon Hathaway's Personal Research Webpage (Assoc. Prof @ UTK: http://hathaway.utk.edu/Research.html)	

Although smart stormwater systems have been used for flood and CSO mitigation, improving water quality treatment, they have yet to be used for mitigating the chloride resulting from winter deicing activities. Specifically, the "logic" required for the smart chloride system is currently unavailable and needs to be developed.

2. MAINEDOT STORMWATER BMP FRAMEWORK FOR CHLORIDE MITIGATION

New or retrofit post-construction stormwater best management practices (BMPs) that use CMAC to detain chloride-rich stormwater and mitigate its adverse impact on the downstream freshwaters. Potential application scenarios/configurations are shown below.

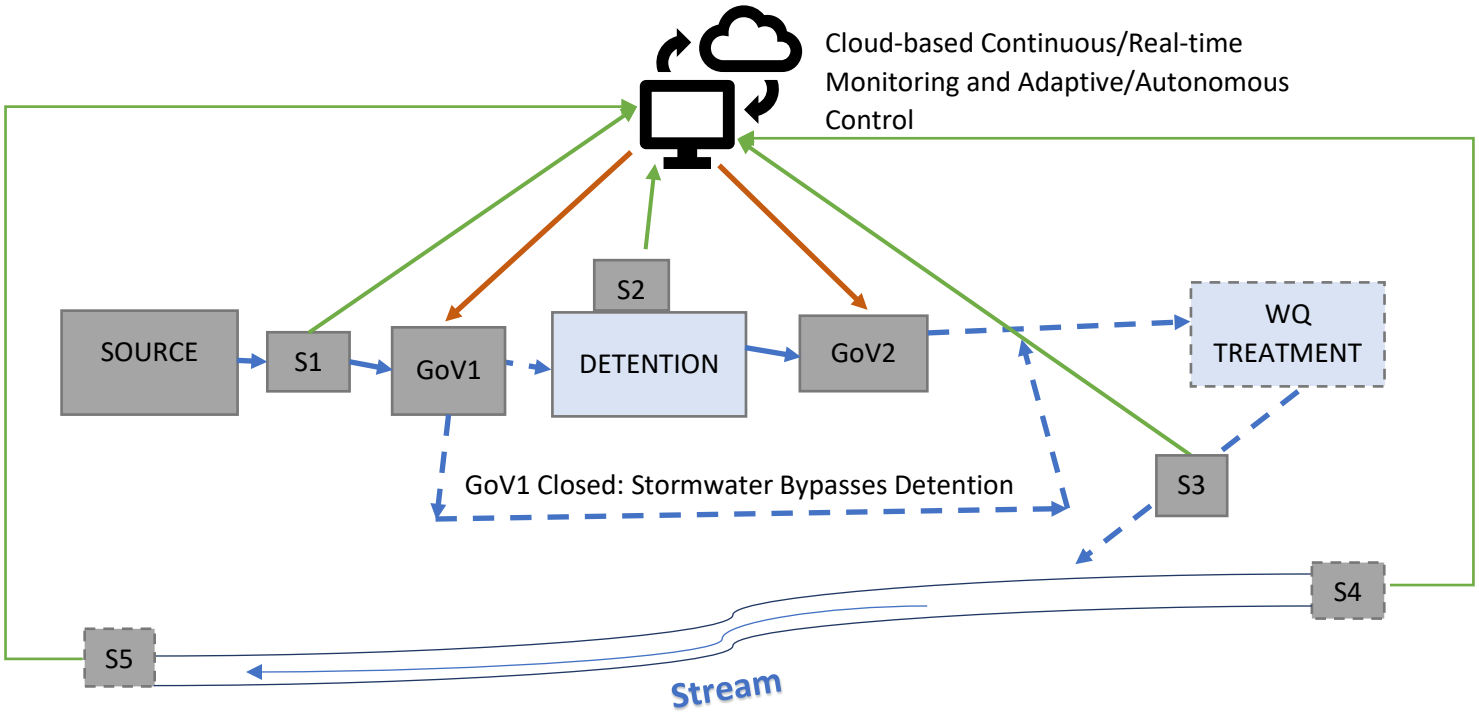


Figure 1. Smart Chloride Mitigation System Schematics.

Table 1. Smart Chloride Mitigation System Component Details.

DIAGRAM ITEM	DESCRIPTION	CRITERIA, LIMITATIONS ETC.
SOURCE	Deicer Treated Impervious Surfaces (i.e. Roads, Parking Areas, Sidewalks)	• Distance between the source and detention BMP or measure must be relatively small, • Source area must be sufficiently large to justify the cost of the smart system, • Sufficient detention volume must be available for storing chloride-rich stormwater: the smart system can be unfeasible for high "source area: detention area" • Source areas with closed stormwater drainage are preferred.
S1	Electrical Conductivity Sensor and Flow Gauge	• Stormwater sampling and analysis for chloride can be necessary to correlate "electrical conductivity" to "chloride concentration". • Based on the electrical conductivity input signal from S1, the logic will either open or close GoV1.
S2	Electrical Conductivity and Level Sensor (e.g. Pressure Transducer)	• If the level sensor indicates that the maximum water level is reached in the DETENTION measure, the logic will close GoV1. • Chloride mass in the DETENTION measure will be continuously monitored: chloride stratification (i.e. chloride concentration increasing with depth) in the DETENTION measure can be a limitation. • The logic will decide how much of the influent from the SOURCE will be blended with the stormwater based on S1 and S2 input signals. Hence, the smart system will deliver stormwater with "acceptable" electrical conductivity/chloride concentration downstream.
S3	Electrical Conductivity and Flow Gauge	• S3 will continuously monitor the flow and electrical conductivity/chloride concentration of the smart system effluent. • S1 and S3 data will demonstrate the chloride mitigation effectiveness of the smart system.
		• The logic can use S4 input signal to control GoV2 and release the detained stormwater if

S4	Electrical Conductivity and Flow Gauge on Stream Upstream the Smart System (OPTIONAL)	the stream conditions are amenable (i.e. high stream flow and/or low electrical conductivity). • This option can be unfeasible if the smart system and the receiving stream are relatively far from each other. • Stream channel accessibility (e.g. right-of-way) and environmental permitting requirements may limit S4 application.
S5	Electrical Conductivity and Flow Gauge on Stream Downstream the Smart System (OPTIONAL)	• S5 will be used to monitor the impact of the smart system outfall on the stream. S5 signals will not be necessarily used as an input for the logic. • Surface runoff, outfalls other than the smart system's outfall, and baseflow may also impact the flow rate and the electrical conductivity (i.e. challenge to isolate the impact of the smart system outfall).
GoV1	Actuated Gate or Valve	• The smart system will allow remote control of GoV1 (i.e. manual on/off) • GoV1 will be fully open or fully closed at a given time. GoV1 doesn't need to have the capability of being partially open.
GoV2	Actuated Gate or Valve	• The smart system will allow remote control of GoV2 (i.e. manual on/off). • GoV2 will have the capability of being open and adjusting the DETENTION outflow rate.
DETENTION	Detention Measure	• A stormwater measure (e.g. existing depression, extended dry detention basin, wetpond) with sufficient storage volume for high electrical conductivity/chloride inflows from the source. • Depending on the site soil characteristics, the detention measure may require a liner to minimize infiltration into the soil.
WQ TREATMENT	Structural Water Quality Treatment BMP (or Measure)	• Conventional stormwater treatment measure to retain and treat the "water quality volume" • The measure can be designed to infiltrate where applicable and appropriate.

3. PILOT APPLICATION ALTERNATIVES FOR SMART CHLORIDE MITIGATION

Following factors have been considered for the development of the pilot application alternatives for smart chloride mitigation:

- The pilot application must be in an urban impaired stream (UIS) watershed where MaineDOT will be required to implement additional stormwater BMPs in accordance with the new transportation general MS4 permit (henceforth, TS4 permit),
- MaineDOT has full access to and control over the project area,
- The pilot application must not conflict with other MaineDOT projects in the work plan,
- Source (deicer applied impervious) area of the pilot application must be sufficiently large to justify the cost of the smart system,
- The pilot application must not be very complex to minimize maintenance and operation problems,
- The pilot application must be flexible to expand the monitored and/or controlled water quality parameters beyond electrical conductivity/chloride,
- Hardware (e.g. sensors, valves) of the pilot application must operate under extreme weather conditions (particularly freezing temperatures) with minimal maintenance,
- Minimum grade must be available for positive drainage of the detained stormwater,
- The pilot application must provide the data to develop low-cost/simpler systems which can be applied more widely.

3.1 PILOT APPLICATION FOR THE NON-LINEAR SOURCE AREAS

Potential application areas are MaineDOT maintenance and park & ride lots within the UIS watersheds (**Table 2**). Maine Department of Environmental Protection has identified chloride as a major stressor for all the UIS watersheds given in **Table 2**. There is only one MaineDOT maintenance lot in the UIS watersheds:

- Bangor Maintenance Facility in the watershed of Penjajawoc Stream.

Table 2. MaineDOT Owned Park and Ride (P&R) Lots in the Urban Impaired Stream Watersheds.

UIS Watershed	Town	P&R Name	Maintenance Responsibility	Winter Maintenance
Concord Gully	Freeport	North	Town of Freeport	Town of Freeport
Sucker Brook	Bangor	Odlin Rd	MaineDOT	MaineDOT
Nasons Brook	Westbrook	Larrabee Rd	City of Westbrook	City of Westbrook
Red Brook	South Portland	Exit 45	MaineDOT	MaineDOT
Goosefare Brook	Saco	Industrial Park Rd	MaineDOT	Contracted
No P&R lots in Frost Gully Brook, Arctic Brook, and Penjajawoc Stream UIS watersheds.				

A potential application of smart chloride mitigation system (SCMS) for a nonlinear source area is shown in **Fig. 2**. Scope of the SCMS work will be limited to the construction of stormwater conveyances, detention basin, and auxiliary structures (e.g. solar panel, control panel box) to the maximum extent practicable. Regrading of the road inslopes and backslopes will be avoided to the maximum extent practicable. Existing

impervious area (e.g. driveways, parking areas) will not be disturbed to allow the continuity of the services. New stormwater conveyances will consist of swales strategically located to capture the chloride-rich snowmelt both from the snow piles and from the impervious surfaces. The swales will be impermeable to eliminate the infiltration of chloride-rich stormwater into the shallow groundwater and maximize the amount of chloride captured by SCMS. In other words, the impermeable swales will be designed to capture most of the chloride applied on the impervious surface during winter season and direct it to SCMS. The chloride-rich stormwater detained by SCMS will be gradually released during higher flow storm events which will presumably generate low-chloride stormwater. Furthermore, it is expected that the open stormwater conveyance (e.g. swales, ditches) soil will be saturated during the higher flow events and the stormwater travel time to the stream through the open conveyance will be relatively short. Under these conditions, minimal amount of the chloride released from SCMS will infiltrate into shallow groundwater as it is conveyed downstream and most of the released chloride will be discharged into the stream. Therefore, chloride from SCMS source area will not contaminate the groundwater and contribute to the base flow chloride load which results in elevated yearlong chloride concentrations in the streams.

Depending on the distance between SCMS outlet and UIS, a simple or complex control logic will be used:

- **Simple Control Logic:** This logic is more appropriate for the applications that do not have a direct outfall to the streams. A fixed electrical conductivity (EC) value (i.e. maximum allowable EC (MAX)) will be set for the autonomous control. The fixed value will be chosen in consultation and with the approval of the Maine Department of Environmental Protection (DEP). An on-site monitoring study may need to be performed prior to the SCMS installation to correlate the EC to chloride concentration.

If Electrical Conductivity (EC) @ S1 > MAX then "Open GoV1 & Fill Detention: GoV2 Closed" (See **Fig. 1**)

If EC @ S1 ≤ MAX then "Close GoV1 & Open GoV2" (See **Fig. 1**)

&

Adjust GoV2 with EC Feedback from S3 to keep EC @ S3 ≤ MAX

- **Complex Control Logic:** This logic is more appropriate for the applications that has a direct outfall to the streams. Instead of the fixed control value proposed for the "Simple Control Logic", the

If Electrical Conductivity (EC) @ S1 > EC @ S4 then "Open GoV1 & Fill Detention: GoV2 Closed" (See **Fig. 1**)

If $EC_{S1} < EC_{S4}$ then "Close GoV1 & Open GoV2" (See **Fig. 1**)

&

Adjust GoV2 with EC Feedback from S4 and S5 to maintain $(EC_{S5} - EC_{S4})/EC_{S4} \times 100 \leq MAX$ *

MAX: Maximum relative EC percent increase allowed for the stream reach by DEP

*: Assuming that SCMS outfall is the major contributor to "EC/Chloride" and "Flow" of the stream reach monitored by S4 and S5 (i.e. distance between S4 and S5 must be relatively short).

"Complex Control Logic" will use the dynamic in-stream data from S4 and S5 (see **Fig. 1**). A tentative simplified version of the complex control logic is presented below. Development of the complex control logic is highly likely to be an iterative process requiring the analysis of monitoring data. DEP will be consulted during the process and its approval of the finalized logic will be sought.

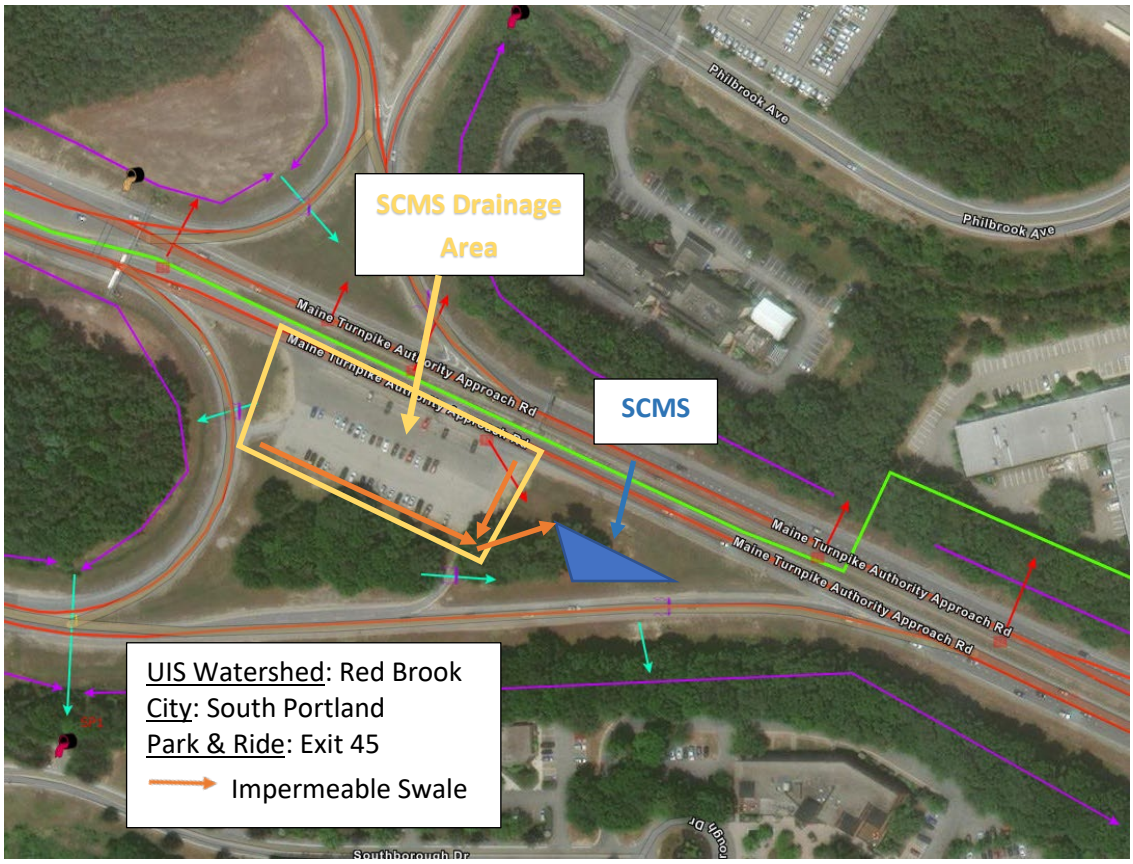


Figure 2. Plan view of a potential smart chloride mitigation system (SCMS) in an urban impaired stream (UIS) watershed. Arrows and lines other than the orange ones belong to the MaineDOT MS4 outfall map and indicate flow directions.

3.2 PILOT APPLICATION FOR THE LINEAR SOURCE AREAS

Linear source areas for SCMS mainly consist of highways treated with deicer during winter maintenance season. Existing depressions can be potentially used to treat the surface runoff from source areas using SCMS. Smart Chloride Mitigation System can also be installed at the outlet of a closed drainage system collecting the surface runoff from a sufficiently large source area. However, it is a challenge to find a closed drainage system meeting the criteria for SCMS, especially having appropriate space and grade at its outlet. It appears that a pilot SCMS application is practicable for the highway medians and interchange infields. The SCMS design must satisfy the clear zone and other applicable safety standards and guidelines.

A potential SCMS application in an interchange infield is shown in **Fig. 3**. In this example, it is assumed that one lane and shoulder of northbound I-295 is sloped towards the infield whereas the on- and off-ramps are sloped away from the infield. Therefore, the section sloped towards the infield is delineated

as the source area of SCMS. As previously stated for the nonlinear source area application, scope of SCMS work will be limited to the construction of stormwater conveyances, detention basin, and auxiliary structures within the infield. Existing catch basin will be modified to operate as a “smart” outlet control structure (OCS) equipped with an actuated gate or valve (see GoV2 in Fig. 1). The OCS will have an overflow/emergency spillway to prevent excessive ponding in the detention area. Outlet pipe of the existing catch basin will be minimally impacted by the SCMS unless it is in very poor condition and must be repaired or replaced. Major earthwork will be for the construction of an impermeable detention basin around the low point of the depression. Construction of impermeable swales that will collect the snowmelt/surface runoff from the source can be necessary (e.g. impermeable downspouts from the shoulder to SCMS). This is particularly important to minimize the infiltration of chloride-rich snowmelt into shallow groundwater as the it runs over the inslope. More chloride-rich stormwater infiltrates, less effective becomes SCMS.

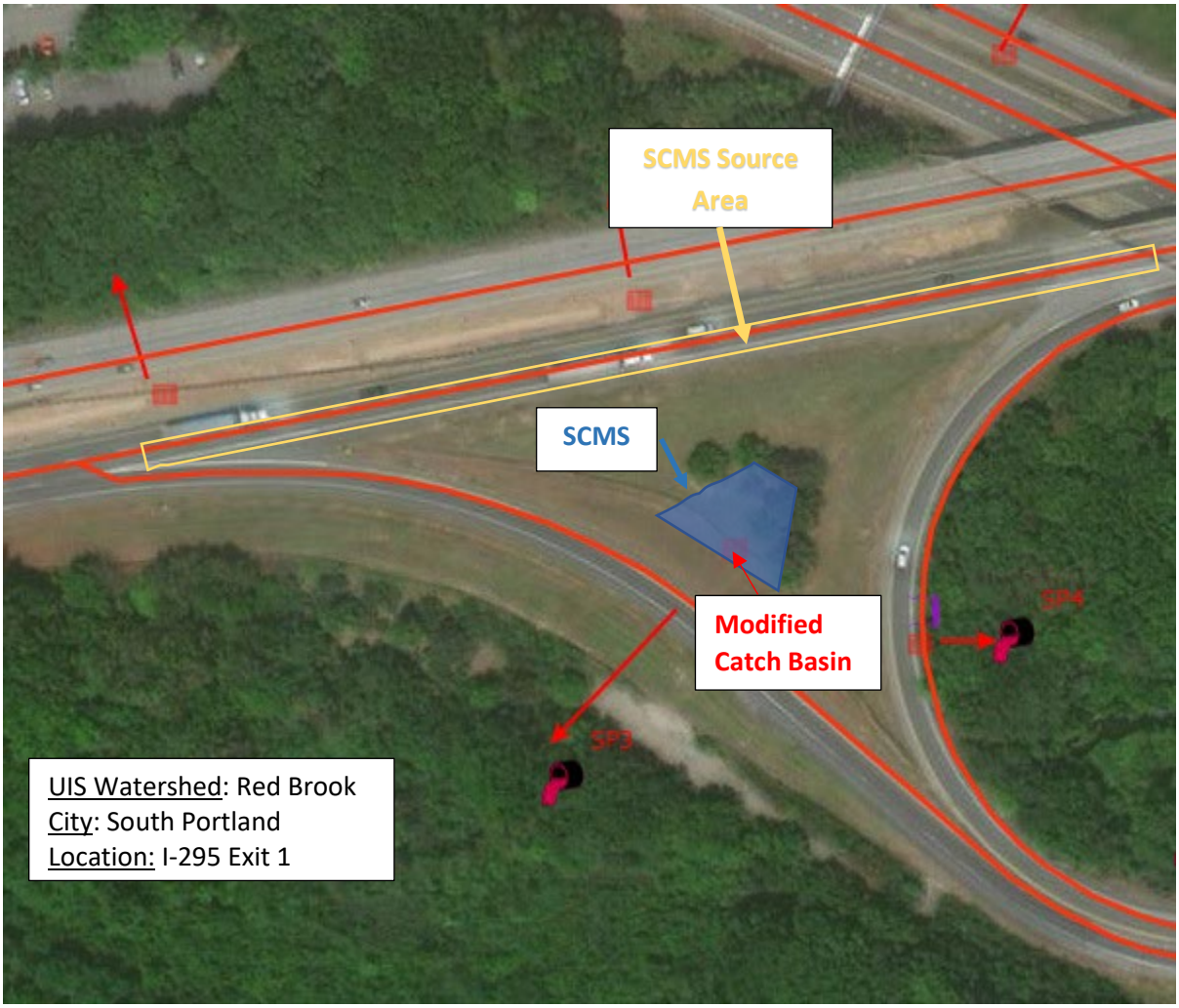


Figure 3. Plan view of a potential smart chloride mitigation system (SCMS) in an urban impaired system (UIS) watershed. Arrows and lines other than the orange lines belong to the MaineDOT MS4 outfall map and indicate flow directions.

4. REFERENCES

1. Herb, William; Janke, Ben; Stefan, Heinz. (2017). Study of De-icing Salt Accumulation and Transport Through a Watershed. Minnesota Department of Transportation. Retrieved from the University of Minnesota Digital Conservancy, https://hdl.handle.net/11299/195170.
2. Curtis Bohlen, Casco Bay Estuary Partnership. Personal Communication on the Long Creek Watershed Chloride Monitoring Data.

Attachment 3. Total Suspended Solids (TSS), Total Phosphorus (TP), and Total Nitrogen (TN) Concentrations of the Stormwater Best Management Practices (BMPs).

	Median TSS (mg/L) (95% Confidence Interval)		
BMP Category	**In**	**Out**	**TSS Median Concentration Reduction (%)**
HRBF	30.8	3.8	87.7%
Media Filter	44	7.2	83.6%
Bioretention	44	10	77.3%
Retention Pond	49	12	75.5%
Porous Pavement	77	22	71.4%
Detention Basin	65.1	22	66.2%
Wetland Basin	35.5	14	60.6%
HRMF	44	18	59.1%
OGS	36	15.5	56.9%
Grass Strip	48	23	52.1%
Grass Swale	26	13.7	47.3%
HDS	63.9	39	39.0%
All BMP categories above have been shown to reduce the TSS concentration significantly using three statistical methods.			
	Median TP (mg/L) (95% Confidence Interval)		
BMP Category	**In**	**Out**	**TP Median Concentration Reduction (%)**
Retention Pond	0.246	0.12	51.2%
HRBF	0.099	0.05	49.5%
Media Filter	0.165	0.09	45.5%
Porous Pavement	0.17	0.1	41.2%
HRMF	0.12	0.08	33.3%
Wetland Basin	0.17	0.122	28.2%
Detention Basin	0.25	0.186	25.6%
All BMP categories above have been shown to reduce the TP concentration significantly using three statistical methods.			
	Median TN (mg/L) (95% Confidence Interval)		
BMP Category	**In**	**Out**	**TN Median Concentration Reduction (%)**
HRMF *	1.88	1	46.8%
Retention Pond	1.63	1.2	26.4%
Bioretention	1.26	0.96	23.8%
Wetland Channel	1.76	1.45	17.6%
Media Filter *	1.06	0.89	16.0%
All BMP categories above have been shown to reduce the TN concentration significantly using three statistical methods.			
*: Two of the three methods indicated significant TN concentration reduction.			
HRBF: High-rate Biofiltration. Manufactured devices with high rate filtration media that support plants.			
HRMF: High-rate Media Filtration. Manufactured devices with high rate filtration media consisting of a variety of inert and sorptive media types and configurations (e.g. cartridge filters, upflow filters, membrane filters, vertical bed filters).			

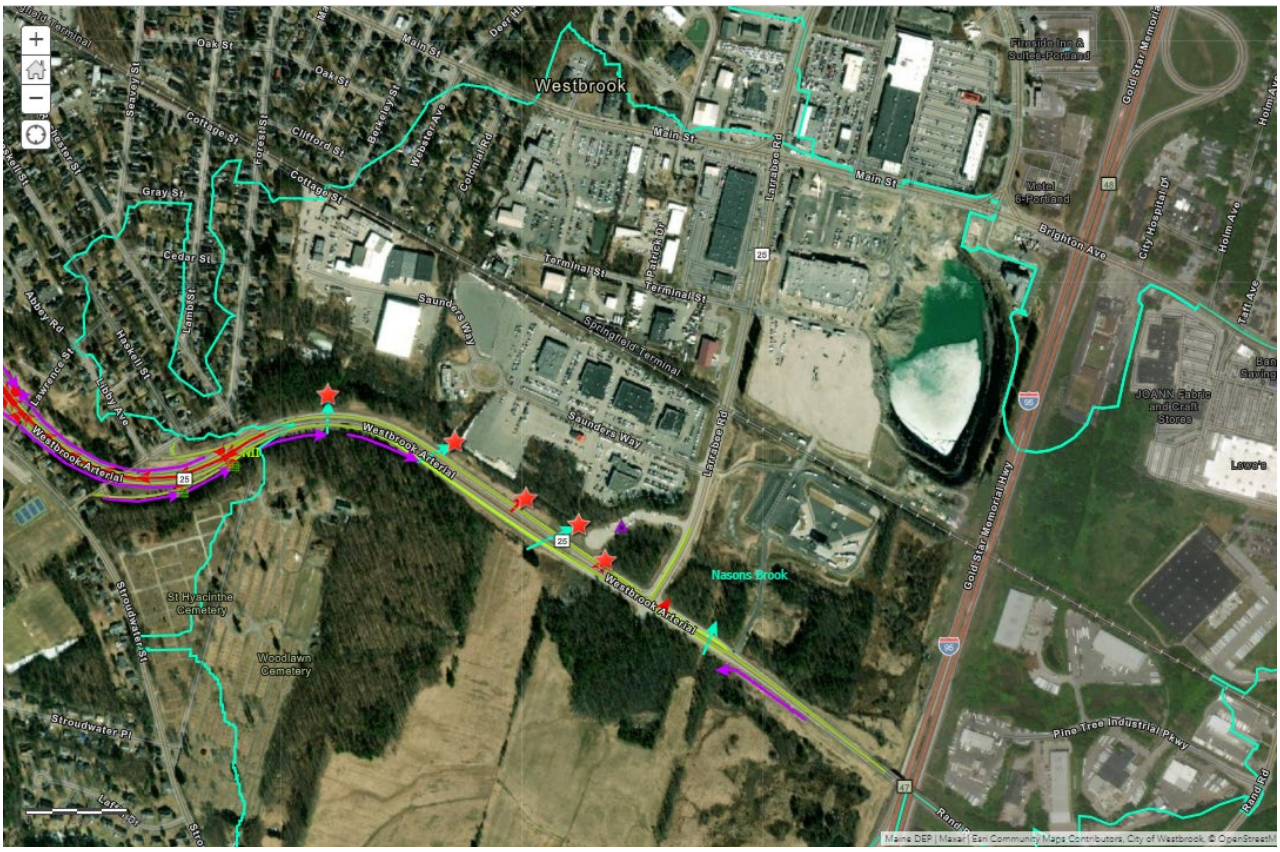
Reference: Water Research Foundation. 2020. International Stormwater BMP Database: 2020 Summary Statistics. Accessible from https://www.waterrf.org/system/files/resource/2020-11/DRPT-4968_0.pdf

Attachment 4. The Roads Plowed by MaineDOT and its Contractors in the Urban Impaired Stream (UIS) Watersheds.

UIS Watershed	Plow Crew #	Road Totals		
		Centerline Miles*	Lane Miles*	Impervious Area (ac)*
Arctic Brook	71404	1.7	3.5	8.4
Concord Gully	71114	1.2	2.4	5.9
Goosefare Brook	CNTRCT	6.2	12.3	28.4
Penjajawoc Stream	71404	5.8	11.6	28.2
	CNTRCT	0.2	0.3	0.7
Red Brook	71103	8.5	17.0	41.3
Sucker Brook	71404	12.5	24.9	60.5

*: Estimated figures which may be revised for accuracy.
Five-digit plow crew numbers stand for MaineDOT Region 1 and 4 plow crews.
CNTRCT: Contractor

Attachment 5. The Roads Plowed by MaineDOT and its Contractors in the Urban Impaired Stream (UIS) Watersheds.



Red stars signify MaineDOT TS4 outfalls along Westbrook Arterial discharging into the northerly stream reach.

The ArcGIS Online web map can be accessed from “Stormwater” link available at https://www.maine.gov/mdot/env/