

Charlotte-Mecklenburg Storm Water Services

Proprietary and Innovative SCM Testing and Approval Policy

December 2015

MISSION:

The mission of the Pilot SCM Program is to provide Charlotte-Mecklenburg citizens with the most technically-advanced, proven, and cost-effective stormwater treatment options designed to protect water quality and meet the requirements of the Post-Construction Stormwater Ordinance, while also offering developers a range of innovative practices that, if shown successful, may be added to the BMP design manual.

PURPOSE:

Charlotte-Mecklenburg Storm Water Services; hereafter referred to as “CMSWS”, implements a proactive Pilot Stormwater Control Measure program, which includes the study and testing of stormwater control measures (SCMs). The purpose of this document is to specify the requirements for the testing, review and approval of proprietary and innovative SCMs necessary to support the potential inclusion of these SCMs in the Charlotte-Mecklenburg BMP design manual.

CMSWS REVIEW COMMITTEE:

All decisions, reviews, and SCM recommendations for the Pilot SCM program will be made by an internal committee of City and County staff within CMSWS. The committee will consist of the following staff positions:

- Post-Construction Stormwater Ordinance administrator-City
- Pilot SCM program administrator-City
- NPDES section supervisor-City
- WQ monitoring supervisor-County
- Post-Construction Stormwater Ordinance project coordinator-City
- Water quality data analyst/modeler-City and County
- Water quality planner-City
- Senior water resources engineer-City

The committee will be responsible for the following:

- reviewing all pertinent pilot SCM information and data
- approving pilot SCM test study projects

- ensuring that all pilot test study criteria and standards are met
- making determinations as to whether or not a pilot test study was positive
- making recommendations for pilot SCM approval in the BMP design manual

TESTING, REVIEW AND APPROVAL PROCESS:

CMSWS will implement the following process for the testing, review and approval of proprietary and innovative SCMs:

1. The review committee will review each pilot SCM test study project application to determine eligibility and acceptance into the program. Acceptance is contingent on the project meeting the minimum design specifications noted in subsequent sections of this document.
2. CMSWS staff will coordinate all aspects of the accepted pilot SCM project study and testing for the purpose of generating appropriate study data to support the review and approval process. This will involve the development, implementation and management of field study projects designed to produce data that meets the study criteria noted in subsequent sections of this document.
3. The review committee will review and qualify the study data to ensure that all criteria are met for each storm event monitored for the purpose of developing an appropriate data set for analysis and evaluation. Storm event data that does not meet the criteria will not be considered for inclusion in the data set.
4. CMSWS staff will analyze the data set to determine the median event mean concentration (EMC) values for Total Suspended Solids (TSS), as well as other selected parameters, for the project study SCM system influent and effluent. This will involve using non-parametric statistical methods that account for data below parameter detection limits. Specifically robust regression on order statistics will be used to calculate summary statistics, including the median EMCs used to calculate a percent concentration reduction or increase from the influent to the effluent for each parameter. The modified sign test will be used to test for significant differences between SCM system influent and effluent paired samples, where possible. Individual parameter data that does not show a statistically significant result when comparing the difference between the influent and effluent will be assigned a zero percent (0%) reduction or increase, as applicable, as non-significant results are considered to be not statistically different from zero. Results shown to be not statistically significant will not be used in making determinations of positive study results.
5. CMSWS staff will utilize the data analysis results to prepare a report of the pilot SCM study project which will include discussion on the project design, SCM type, watershed characteristics, monitoring procedure, data analysis and results. The report will include discussion on findings and conclusions and a recommendation on whether or not the proprietary and/or innovative SCM should be considered for further review for potential approval for inclusion in the Charlotte-Mecklenburg BMP design manual.

6. The review committee will evaluate the study data and report to determine if the study criteria have been satisfactorily met and make a determination as to whether or not the results indicate a positive study. In order for a study to be considered positive, all study criteria must have been met. Also, statistically significant results for median EMC SCM system influent and effluent TSS values must fall within the respective target ranges specified in subsequent sections of this document.
7. On a case by case basis and as necessary, the review committee will consider accepting for review and approval study information and data from SCM testing conducted outside of the City of Charlotte or City ETJ area. The study and testing must be conducted only by other third party independent investigators. The SCM testing, information and data submitted must meet all requirements contained in this document to be considered for study approval and acceptance. Data and study information from test studies conducted directly by SCM product companies and/or product vendors will not be accepted or considered for review and approval. It is strongly recommended that persons wishing to submit study information and test data for review coordinate with the review committee up front before beginning the study.
8. Upon the collection of sufficient information and test study data showing that at least two (2) positive studies from two (2) different study sites have been conducted and approved, the review committee will conduct a final review of all information and data and make a determination as to whether or not the SCM is approved within the pilot SCM program utilizing the criteria noted in subsequent sections of this document.
9. Upon the approval of the SCM as discussed in paragraph eight, the review committee will make a recommendation to both the City and County water quality program managers within CMSWS to consider including the SCM in the Charlotte-Mecklenburg BMP design manual. CMSWS water quality manager approval will be considered “conditional” pending review and final approval for inclusion of the SCM in the Charlotte-Mecklenburg BMP design manual by the North Carolina Department of Environmental Quality – Division of Energy, Mining and Land Resources (NCDEQ-DEMLR). The conditional approval will allow the use of the SCM as an approved practice in the Charlotte-Mecklenburg BMP design manual; however, use of the SCM will be suspended from further use should NCDEQ-DEMLR disapprove the change to the Charlotte-Mecklenburg BMP design manual following its review.

DESIGN REQUIREMENTS:

The pilot SCM test study project must meet all specifications and design requirements of the City of Charlotte Post-Construction Stormwater Ordinance and the Charlotte-Mecklenburg BMP design manual, as applicable. In addition, the following design specifications are required:

1. The proprietary and/or innovative SCM must be designed and sized to achieve a minimum of 85% average annual removal for total suspended solids (TSS).

2. The proprietary and/or innovative SCM must be designed and sized to treat the entire runoff volume generated from the first one inch of rainfall from the watershed area draining to the SCM [the water quality volume (WQv)]. The SCM must be designed and sized to completely treat the entire WQv within 52 hours. This is typically accomplished by capturing and holding the WQv in a detention structure upstream of the SCM.
3. The proprietary and/or innovative SCM must be designed to allow for proper access and monitoring of stormwater runoff as it flows into and out of the detention system and SCM, per CMSWS specifications.
4. The proprietary and/or innovative SCM must be designed to allow for proper gravity free-flow of stormwater runoff as it flows into, through and out of the detention system and SCM, meaning that no back water conditions can exist at any time at the detention system inflow and SCM outflow test study monitoring locations.
5. The proprietary and/or innovative SCM must be designed to include a separate 110/120 volt, 20 ampere AC power supply via ground fault (GFCI) protected receptacles at each monitoring station within the storm drainage system and project design.

STUDY CRITERIA:

The following study criteria must be met for each pilot SCM study conducted:

1. Storm events monitored must be qualifying events. A storm event will be deemed a qualifying event if the event meets the following conditions:
 - A storm event that begins after a time period of at least 72 hours in which no rainfall event has occurred measuring greater than 0.10 inches.
 - For a storm event which may contain time periods of no rainfall, the period of no rainfall can be no longer than 10 consecutive hours.
 - A storm event that measures at least 0.10 inches of rainfall, but not greater than 2.5 inches of rainfall.
 - A storm event in which full storm hydrograph flow-weighted composite samples were successfully collected at both the SCM system influent and effluent monitoring stations, with individual flow-paced sample aliquots making up the composite sample collected over at least 70% of the area of the flow hydrograph.
2. A study must include at least 15 qualifying events, but not more than 36 qualifying events.
3. The time period between the first and last qualifying event conducted must be at least 12 months, but not more than 36 months.

4. A minimum of three (3) qualifying events must be conducted in each of the four meteorological seasons. Meteorological seasons are defined as winter (Dec – Feb); spring (Mar – May); summer (Jun – Aug); fall (Sep – Nov).
5. No more than two (2) qualifying events may be conducted in any one calendar month in any given year.
6. A quality assurance project plan (QAPP) and SCM monitoring plan must be in place for each study.
7. CMSWS reserves the right to terminate a pilot study early at any time for any reason. CMSWS may also terminate a pilot study early if it appears that after eight (8) qualifying events have been conducted, the study results will likely not show a positive result.

DETERMINATION OF POSITIVE STUDY:

A pilot SCM study shall be deemed a positive study if the study meets the following:

1. The study has satisfactorily met all the conditions of the pilot SCM program, including the study criteria stated in the previous section.
2. The study results produced an appropriate data set showing, at a minimum, a statistically significant result ($P\text{-value} < 0.05$) for the reduction of TSS when comparing the difference between the median EMC values of the SCM system influent to the effluent.
3. The median EMC influent and effluent TSS values for the SCM system must fall within the respective target ranges specified below:
 - The median EMC TSS influent value must be at least 15 ppm or greater, but not more than 150 ppm.
 - For median EMC TSS influent values ranging from 50 ppm to 150 ppm, the median EMC TSS effluent value must be 25 ppm or less.
 - For median EMC TSS influent values ranging from 40 ppm to 49.999 ppm, the median EMC TSS effluent value must be 20 ppm or less.
 - For median EMC TSS influent values ranging from 30 ppm to 39.999 ppm, the median EMC TSS effluent value must be 15 ppm or less.
 - For median EMC TSS influent values ranging from 20 ppm to 29.999 ppm, the median EMC TSS effluent value must be 10 ppm or less.
 - For median EMC TSS influent values ranging from 15 ppm to 19.999 ppm, the median EMC TSS effluent value must be 7.5 ppm or less.

DETERMINATION OF APPROVABILITY WITHIN THE PILOT SCM PROGRAM:

A proprietary and/or innovative SCM studied within the pilot SCM program shall be deemed suitable for approvability if the following criteria have been met:

1. At least two (2) positive studies at two (2) different study sites have been conducted, reviewed and approved within the CMSWS pilot SCM program, with at least one (1) of the studies having been conducted by CMSWS staff on a pilot SCM at a test study site located in the City of Charlotte or City ETJ area.
2. For studies conducted by others and approved for use that were conducted outside of the City of Charlotte or City ETJ area, the study must have been conducted on a SCM located in the southern piedmont physiographic region in either North Carolina, South Carolina, Virginia, Georgia, or Alabama; and in areas of this region with similar climate, soils, and topography as that of the Charlotte-Mecklenburg, NC geographic area. In addition, the study must have been conducted by a third party independent investigator.
3. In the event that a pilot SCM study conducted by CMSWS within the City of Charlotte or City ETJ area does not show a positive study result, CMSWS reserves the right not to conduct a second study on that particular pilot SCM within the program.

For questions or additional information, contact:

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DEFINITIONS:

For purposes of the CMSWS Pilot SCM program, the following terms are defined as:

Effluent monitoring station – the monitoring station located at the point downstream of the SCM outlet, the point where treated stormwater runoff would first enter the downstream stormwater pipe system or receiving water.

Influent monitoring station – the monitoring station located at the point upstream of the detention structure and/or SCM in the SCM system, the point where untreated stormwater runoff would first enter the SCM system from the upstream watershed.

Normal base flow stage – the level of water flow through the SCM system that is not contributed to or influenced by stormwater runoff. Normal base flow stage is typically achieved within 72 hours following a rainfall event.

SCM system – includes the SCM, any upstream detention structure(s), and the influent and effluent monitoring stations.

Storm event – the time period between the point in time at which rainfall begins within the SCM upstream watershed and the point in time that stormwater runoff flow ceases, or returns to normal base flow stage at the effluent monitoring station of the SCM system.

Storm event hydrograph – the time period between the point in time at which stormwater runoff flow begins at the influent monitoring station of the SCM system and the point in time that stormwater runoff flow ceases at the effluent monitoring station of the SCM system. For systems with flow-through base flow conditions, the storm event hydrograph will be the time period between the point in time at which flow stage begins to consistently rise above normal base flow stage at the influent monitoring station of the SCM system and the point in time that flow stage returns to normal base flow stage at the effluent monitoring station of the SCM system.