Inspection, Enforcement and Maintenance of Post Construction BMPs: A Public Utility's Perspective

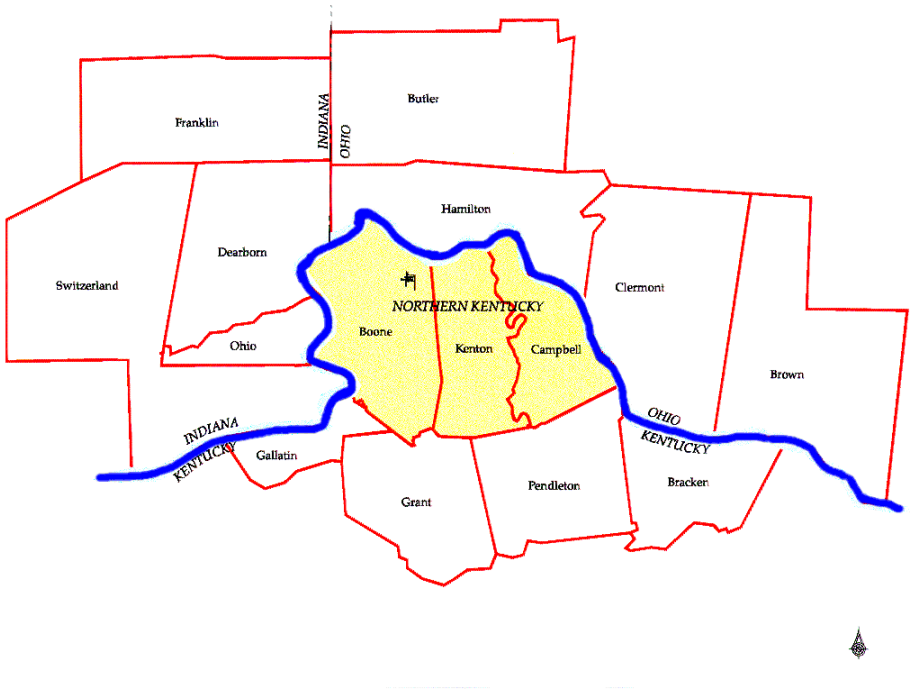
2018 INAFSM Annual Conference

November 7, 2018

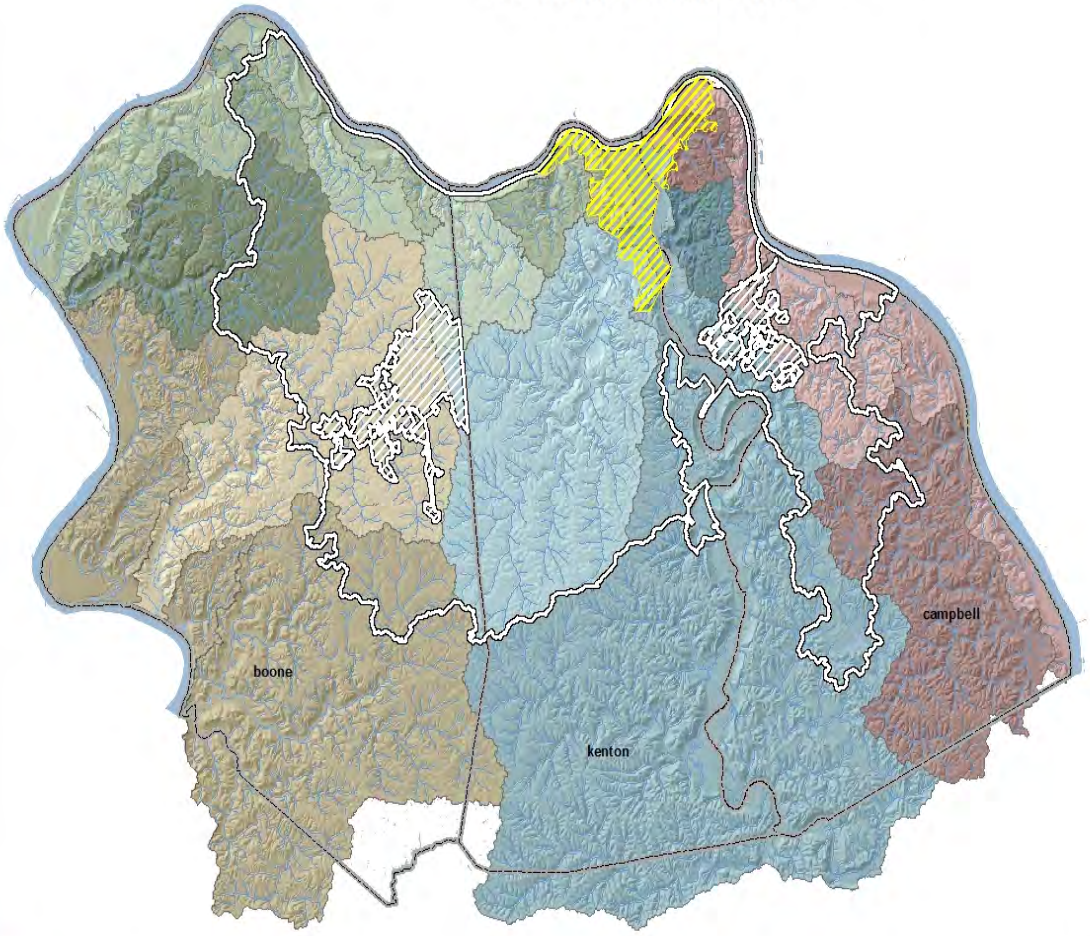
Presenter: Craig Frye

Serving Northern Kentucky

- SD1 is a utility that serves those who live and work in the Boone, Campbell and Kenton County radius
- SD1 works to protect public health and the environment through wastewater and storm water management
  - Provide wastewater service to 33 cities
  - Provide storm water service to 29 cities, and unincorporated parts of 3 counties



Northern Kentucky Regional Storm Water Program
Storm Water Service Area



Legend

Boundary
- SD1 SW Service Area
- Outside SD1 SW Service Area
- CSO Area
- County Boundary
- Waterbodies

Watersheds

North Basin
- Dry Creek
- Elijahs Creek
- Ohio River North
- Pleasant Run Creek
- Sand Run
- Woolper Creek

Central Basin
- Banklick Creek
- Licking River
- Threemile Creek

West Basin
- Big Bone Creek
- Gunpowder Creek
- Ohio River West

East Basin
- Fourmile Creek
- Ohio River East
- Twelvemile Creek
- Taylor Creek

Sanitation District No.1
1045 Eaton Drive
Fort Wright, KY 41017

0 1 2 4 6 8 10 Miles

Kentucky MS4 Phase II General Permit

Post-construction BMP Maintenance Requirements

The permittee shall:

- Enter into a long-term maintenance agreement with BMP property owner for both New Development and Redevelopment
- Establish and implement procedures for inspection of installed BMPs
- Notify the BMP owner of deficiencies discovered during the inspection
- Conduct follow-up inspections to ensure required repairs are complete
- Enforce correction and if needed perform the necessary work and recover cost from property owner

SD1 Storm Water Management Program

Rules and Regulations

October 1, 2011

Separate Sewer System

- New Development Projects
  - First 0.8” must pass through water quality BMP
- Re-development Projects
  - First 0.4” must pass through water quality BMP

SD1 Storm Water Management Program

Rules and Regulations

October 1, 2011

Combined Sewer System

- New Development Projects
  - > 1000’ land disturbed with impervious addition of > 2500 ft2
  - First 0.8” must pass through water quality BMP
- Re-development Projects
  - > 1000’ land disturbed with impervious addition of > 2500 ft2
  - 15% annual volume reduction

SD1 Storm Water Management Program

Rules and Regulations

October 1, 2011

Discharge Rate

- Post-development Peak SW Discharge Rate Shall Not Exceed Pre-development Peak Discharge Rate

SD1 Storm Water Management Program

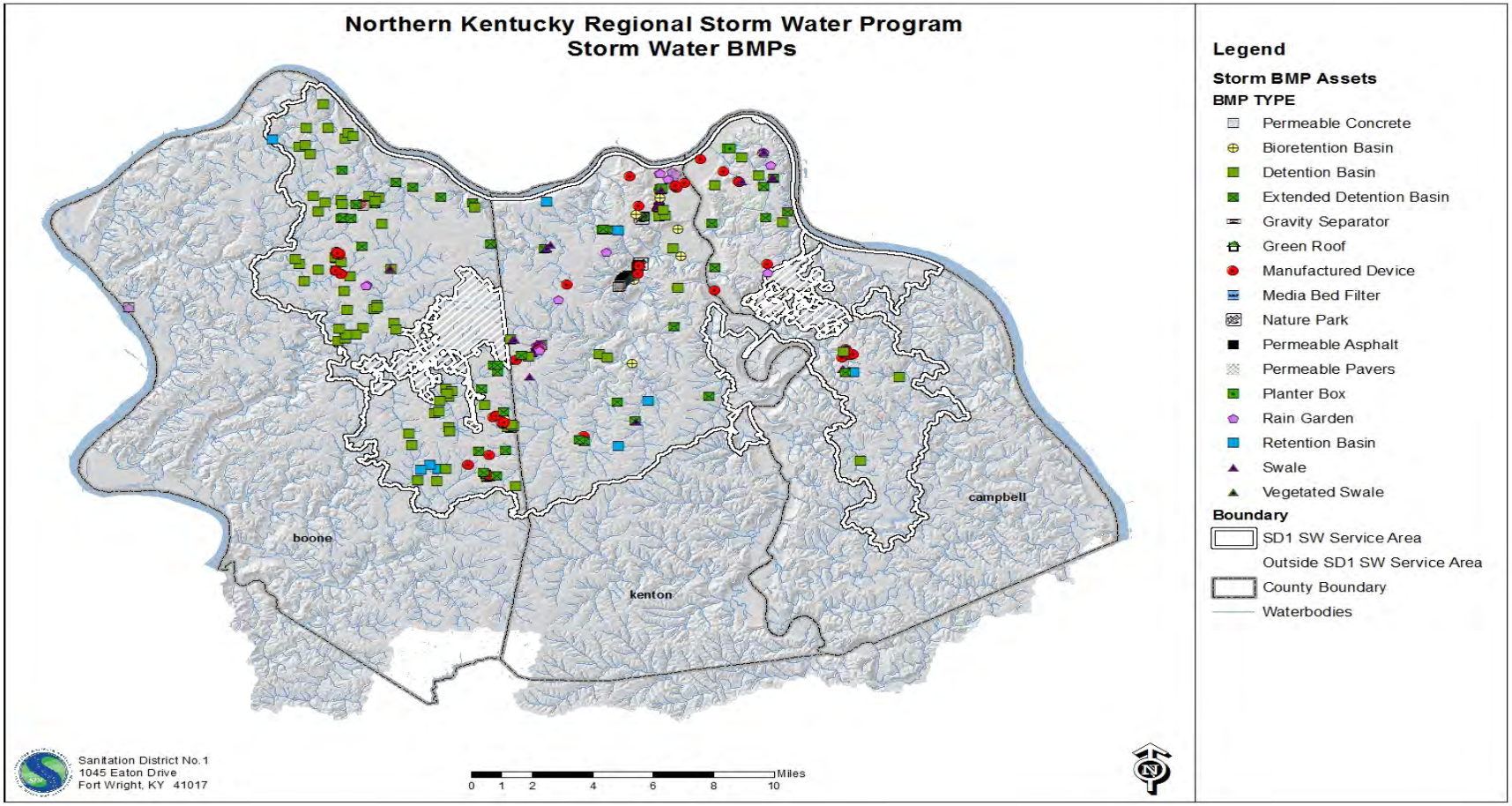
October 1, 2015

Hydromodification Rule

- Storms up to 2 Year Design
- Maximum discharge rate of 0.4 cfs/acre
- 40% Storm Water Credit

Private BMP Totals

- 87 Active Private BMPs
- 202 Under Construction

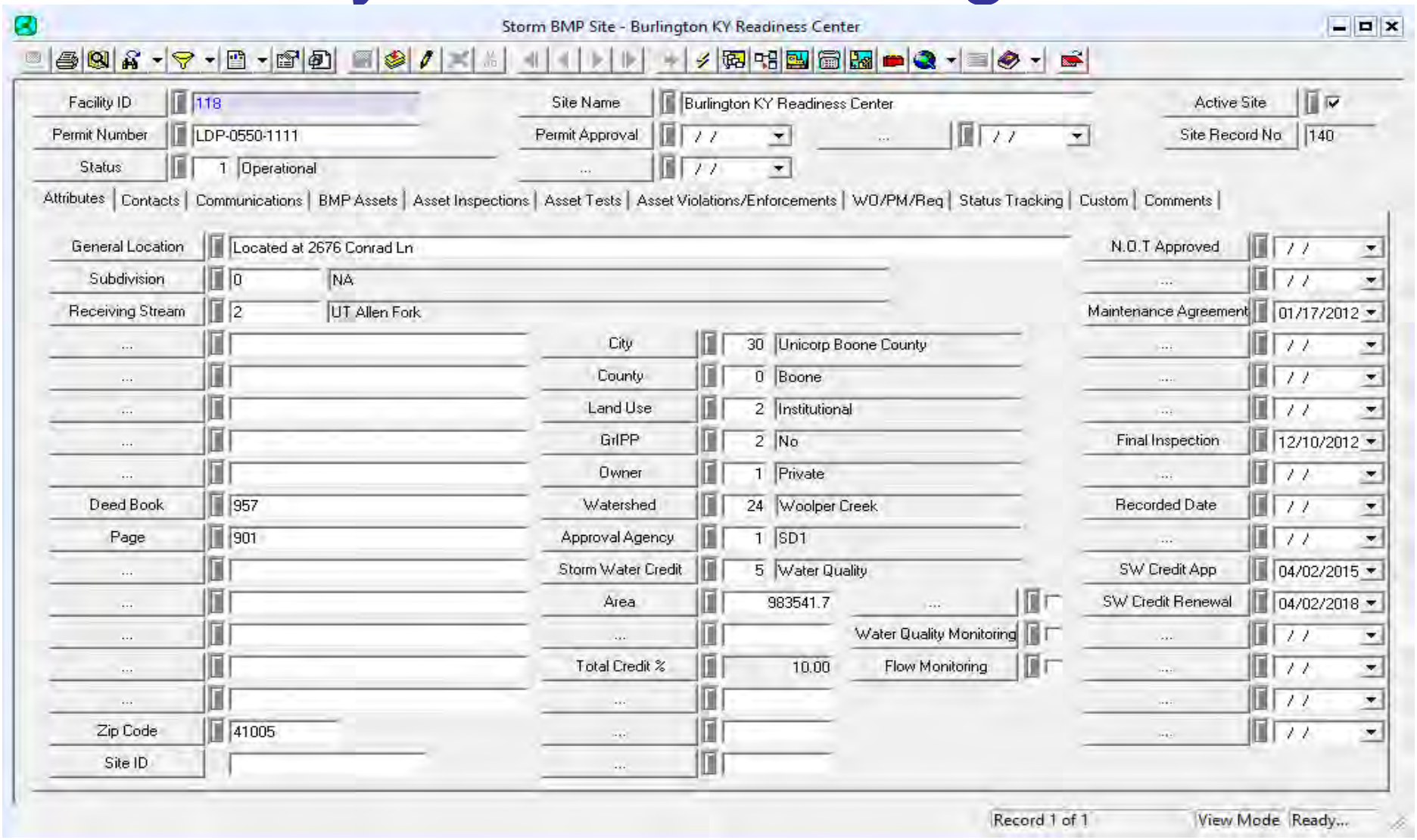


Maintenance Agreement

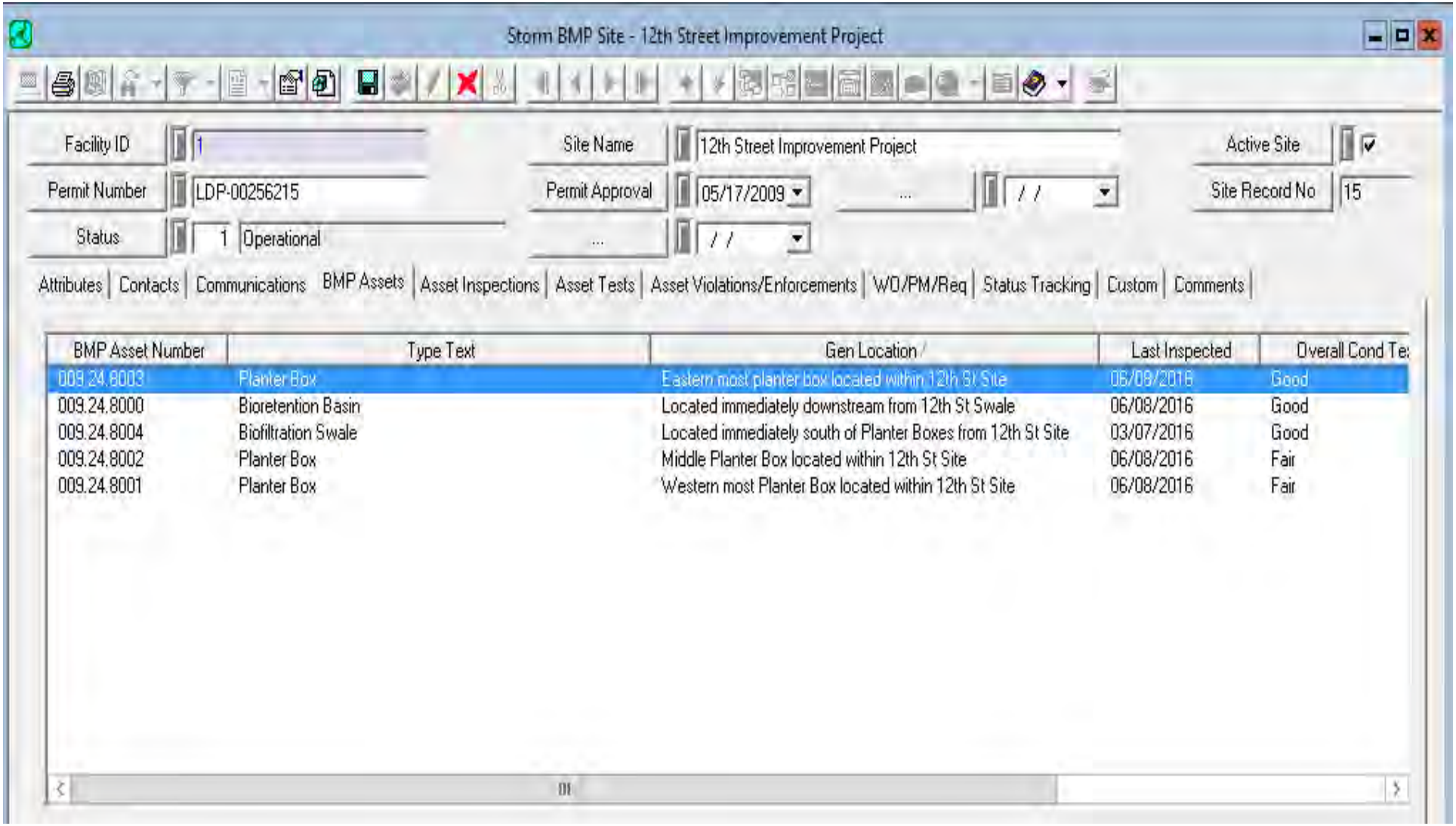
Provides SD1 Regulatory Authority

- Recorded with property deed
- SW facilities must be constructed per plan
- SW facilities must be maintained in working order
- Landowner must conduct annual inspection
- Landowner must grant access to SD1
- SD1 reimbursed for any work performed

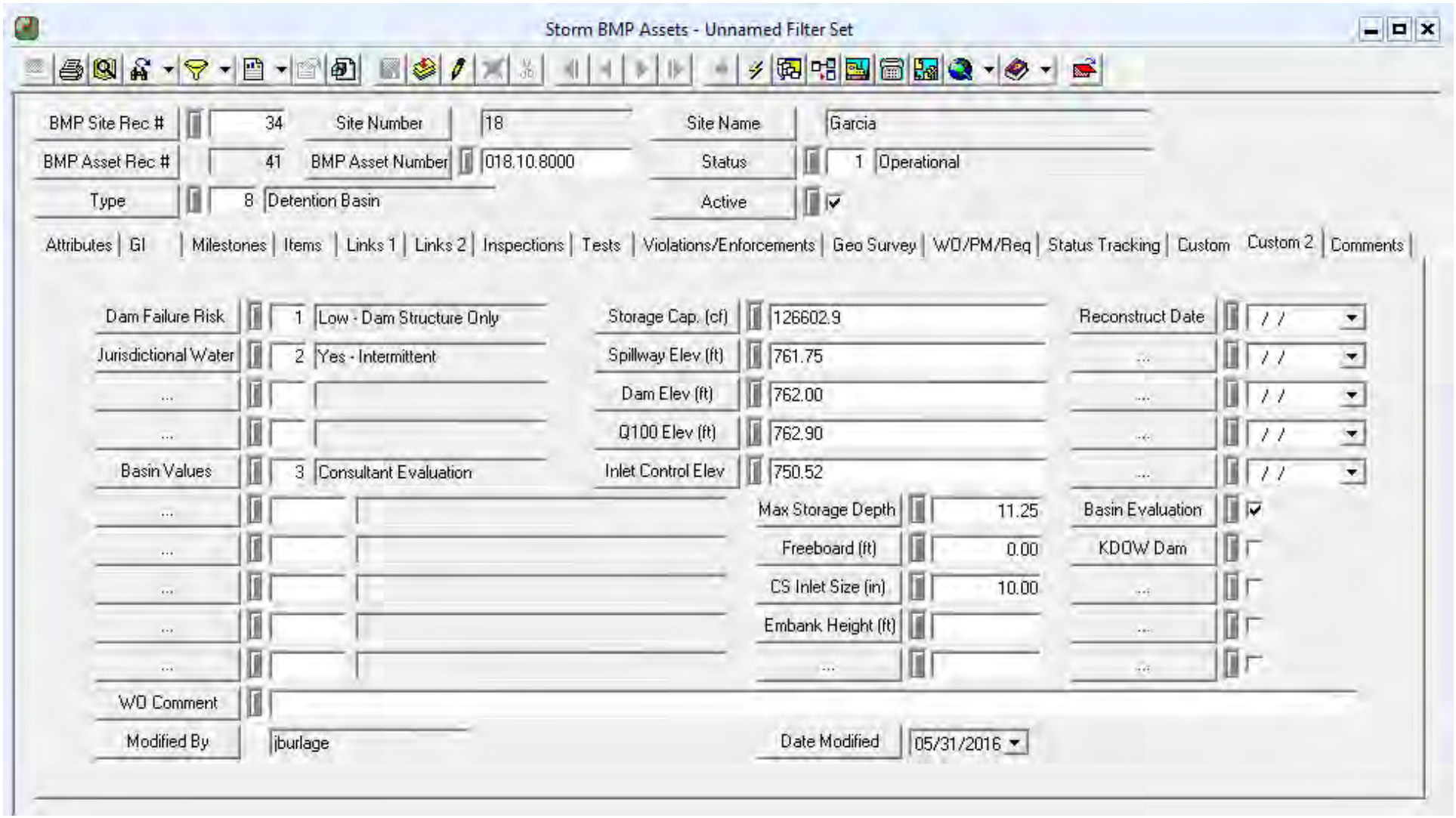
Lucity – Asset Management



Lucity – Asset Management

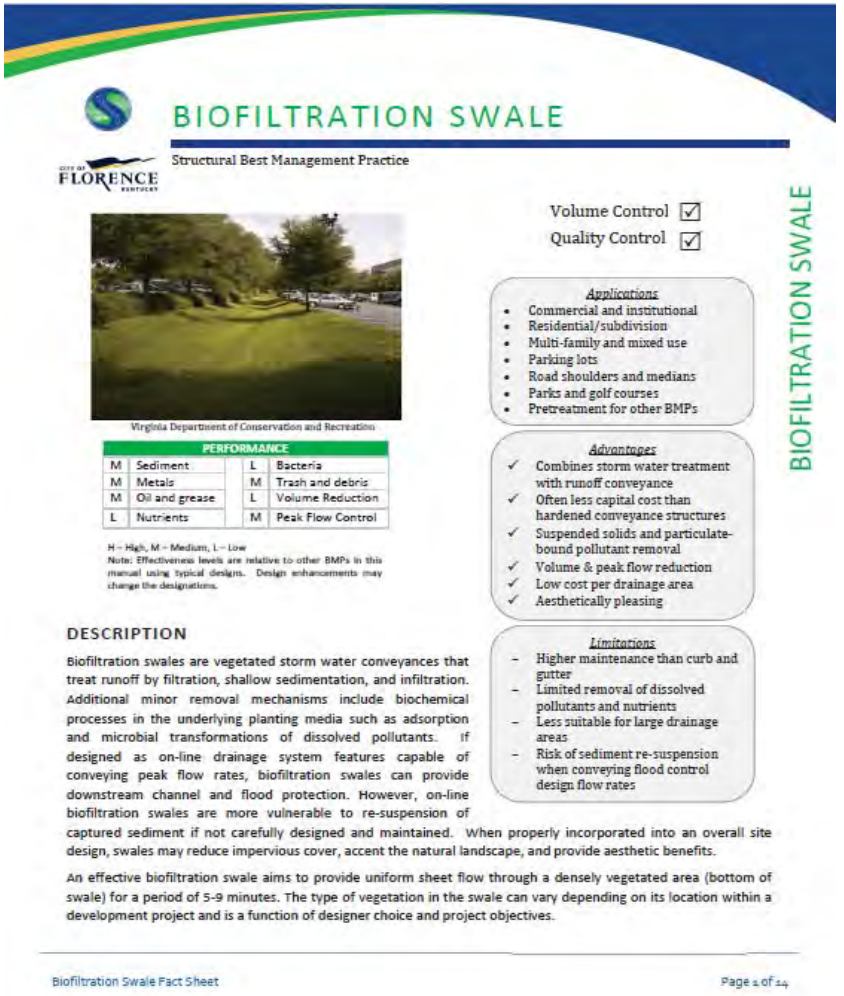


Lucity – Asset Management



Welcome to the Club Packet

- Addressed to Signee of Maintenance Agreement
- Contains
  - Maintenance Agreement Outline
  - Inspection Checklist
  - BMP Fact Sheets from BMP Manual
- Change of Contact



BIOFILTRATION SWALE

Structural Best Management Practice

FLORENCE

Volume Control ☑
Quality Control ☑

Virginia Department of Conservation and Recreation

PERFORMANCE			
M	Sediment	L	Bacteria
M	Metals	M	Trash and debris
M	Oil and grease	L	Volume Reduction
L	Nutrients	M	Peak Flow Control

H – High, M – Medium, L – Low
Note: Effectiveness levels are relative to other BMPs in this manual using typical designs. Design enhancements may change the designations.

Applications
- Commercial and institutional
- Residential/subdivision
- Multi-family and mixed use
- Parking lots
- Road shoulders and medians
- Parks and golf courses
- Pretreatment for other BMPs

Advantages
- ✓ Combines storm water treatment with runoff conveyance
- ✓ Often less capital cost than hardened conveyance structures
- ✓ Suspended solids and particulate-bound pollutant removal
- ✓ Volume & peak flow reduction
- ✓ Low cost per drainage area
- ✓ Aesthetically pleasing

Limitations
- Higher maintenance than curb and gutter
- Limited removal of dissolved pollutants and nutrients
- Less suitable for large drainage areas
- Risk of sediment re-suspension when conveying flood control design flow rates

BIOFILTRATION SWALE

DESCRIPTION

Biofiltration swales are vegetated storm water conveyances that treat runoff by filtration, shallow sedimentation, and infiltration. Additional minor removal mechanisms include biochemical processes in the underlying planting media such as adsorption and microbial transformations of dissolved pollutants. If designed as on-line drainage system features capable of conveying peak flow rates, biofiltration swales can provide downstream channel and flood protection. However, on-line biofiltration swales are more vulnerable to re-suspension of captured sediment if not carefully designed and maintained. When properly incorporated into an overall site design, swales may reduce impervious cover, accent the natural landscape, and provide aesthetic benefits.

An effective biofiltration swale aims to provide uniform sheet flow through a densely vegetated area (bottom of swale) for a period of 5-9 minutes. The type of vegetation in the swale can vary depending on its location within a development project and is a function of designer choice and project objectives.

Biofiltration Swale Fact Sheet

Page 1 of 14

Privately-owned BMP Inspections

- Inspections began August 2014

BMP Inspections

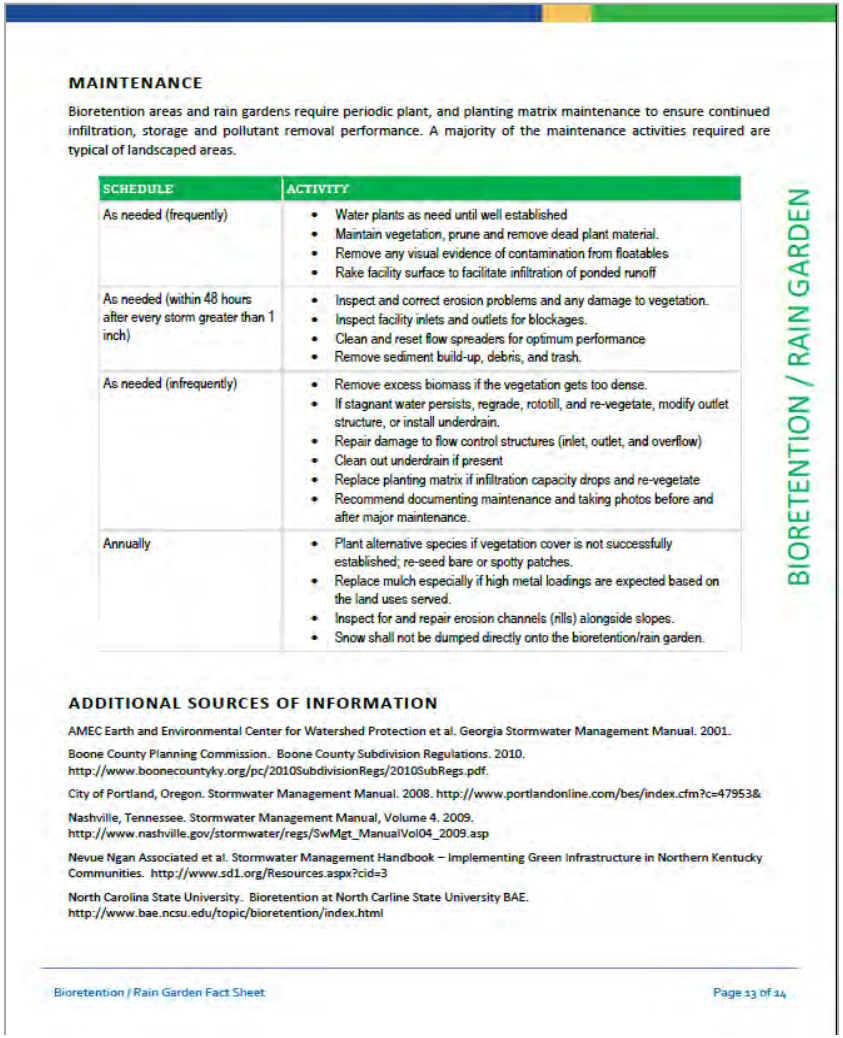
- **Why we do them**
  - BMPs are not “Complete and Forget” projects
  - Constantly evolve with changing weather conditions
  - Performance is directly proportional to maintenance
  - Failure due to improper design

Inspection & Assessment

- Levels of Assessment
  - *Visual Inspection*
    - Checklist Evaluation
  - *Testing*
    - Measurement or Controlled Field Experiments
  - *Monitoring*
    - Measure Natural Runoff Events

Visual Inspections & Testing

BMP Design Manual



MAINTENANCE

Bioretention areas and rain gardens require periodic plant, and planting matrix maintenance to ensure continued infiltration, storage and pollutant removal performance. A majority of the maintenance activities required are typical of landscaped areas.

SCHEDULE	ACTIVITY
As needed (frequently)	• Water plants as need until well established • Maintain vegetation, prune and remove dead plant material. • Remove any visual evidence of contamination from floatables • Rake facility surface to facilitate infiltration of ponded runoff
As needed (within 48 hours after every storm greater than 1 inch)	• Inspect and correct erosion problems and any damage to vegetation. • Inspect facility inlets and outlets for blockages. • Clean and reset flow spreaders for optimum performance • Remove sediment build-up, debris, and trash.
As needed (infrequently)	• Remove excess biomass if the vegetation gets too dense. • If stagnant water persists, regrade, rototill, and re-vegetate, modify outlet structure, or install underdrain. • Repair damage to flow control structures (inlet, outlet, and overflow) • Clean out underdrain if present • Replace planting matrix if infiltration capacity drops and re-vegetate • Recommend documenting maintenance and taking photos before and after major maintenance.
Annually	• Plant alternative species if vegetation cover is not successfully established; re-seed bare or spotty patches. • Replace mulch especially if high metal loadings are expected based on the land uses served. • Inspect for and repair erosion channels (rills) alongside slopes. • Snow shall not be dumped directly onto the bioretention/rain garden.

BIORETENTION / RAIN GARDEN

ADDITIONAL SOURCES OF INFORMATION

AMEC Earth and Environmental Center for Watershed Protection et al. Georgia Stormwater Management Manual. 2001.

Boone County Planning Commission. Boone County Subdivision Regulations. 2010. http://www.boonecountyky.org/pc/2010SubdivisionRegs/2010SubRegs.pdf.

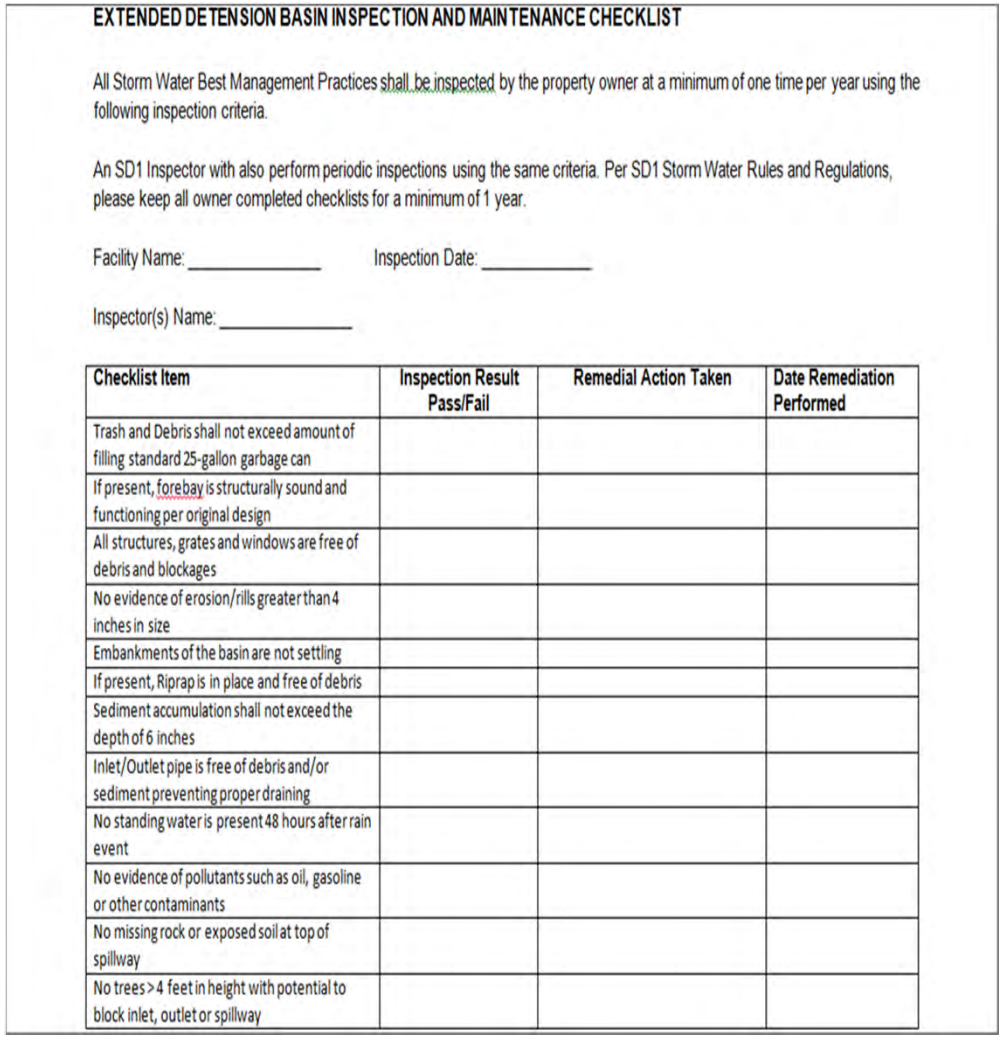
City of Portland, Oregon. Stormwater Management Manual. 2008. http://www.portlandonline.com/bes/index.cfm?c=47953&

Nashville, Tennessee. Stormwater Management Manual, Volume 4. 2009. http://www.nashville.gov/stormwater/regs/SwMgt_ManualVol04_2009.asp

Nevue Ngan Associated et al. Stormwater Management Handbook – Implementing Green Infrastructure in Northern Kentucky Communities. http://www.sd1.org/Resources.aspx?cid=3

North Carolina State University. Bioretention at North Carline State University BAE. http://www.bae.ncsu.edu/topic/bioretention/index.html

Inspection Checklists



EXTENDED DETENSION BASIN INSPECTION AND MAINTENANCE CHECKLIST

All Storm Water Best Management Practices shall be inspected by the property owner at a minimum of one time per year using the following inspection criteria.

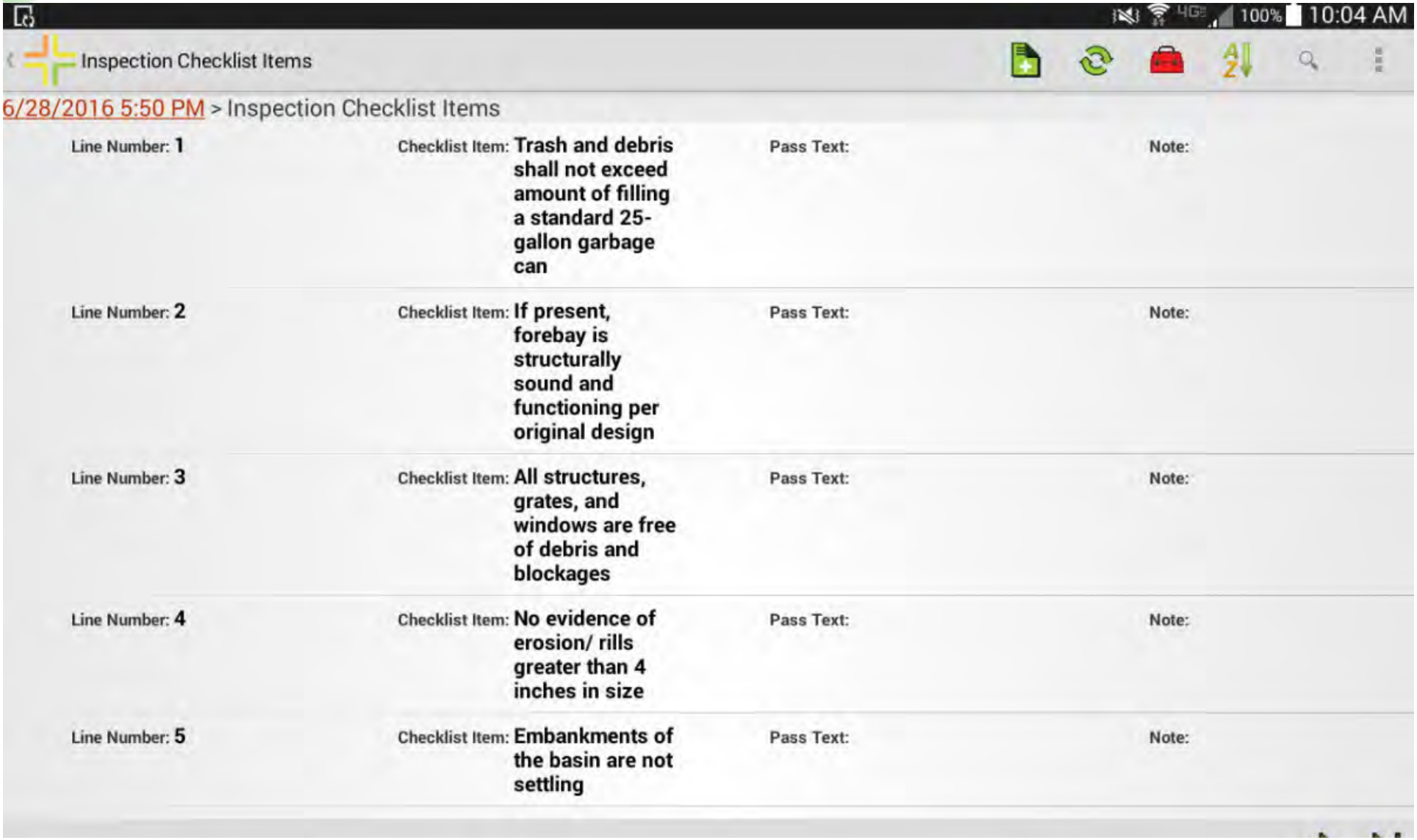
An SD1 Inspector with also perform periodic inspections using the same criteria. Per SD1 Storm Water Rules and Regulations, please keep all owner completed checklists for a minimum of 1 year.

Facility Name: _____ Inspection Date: _____

Inspector(s) Name: _____

Checklist Item	Inspection Result Pass/Fail	Remedial Action Taken	Date Remediation Performed
Trash and Debris shall not exceed amount of filling standard 25-gallon garbage can			
If present, forebay is structurally sound and functioning per original design			
All structures, grates and windows are free of debris and blockages			
No evidence of erosion/rills greater than 4 inches in size			
Embankments of the basin are not settling			
If present, Riprap is in place and free of debris			
Sediment accumulation shall not exceed the depth of 6 inches			
Inlet/Outlet pipe is free of debris and/or sediment preventing proper draining			
No standing water is present 48 hours after rain event			
No evidence of pollutants such as oil, gasoline or other contaminants			
No missing rock or exposed soil at top of spillway			
No trees>4 feet in height with potential to block inlet, outlet or spillway			

Lucity Mobile

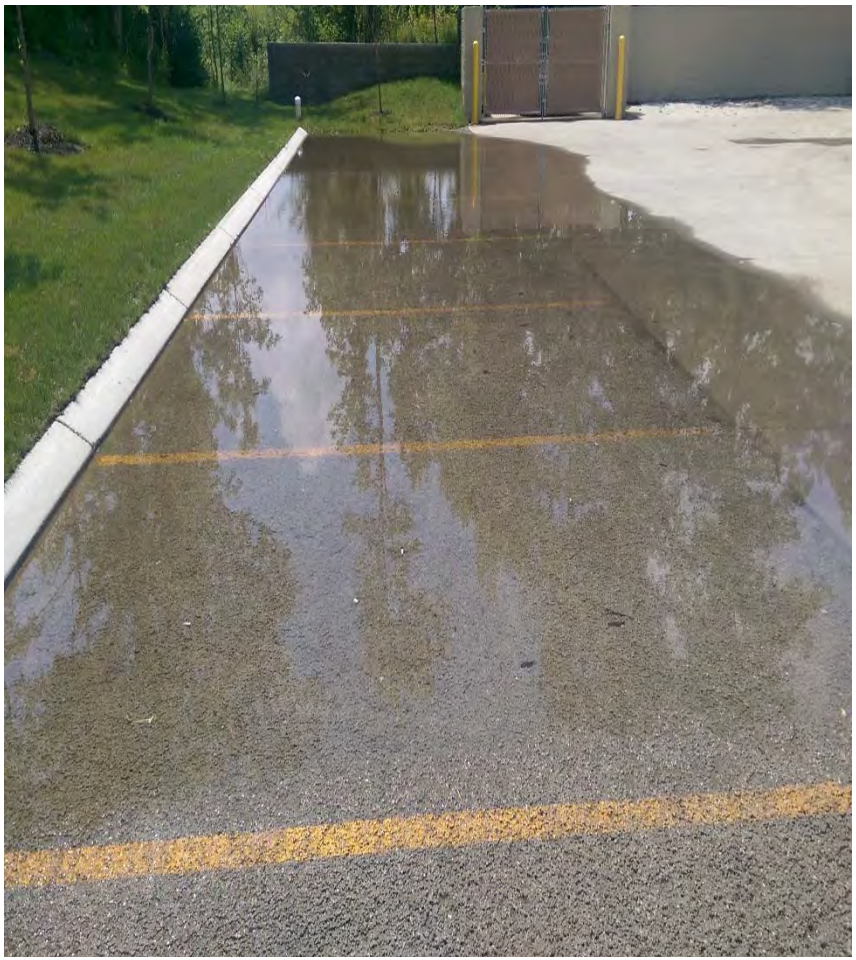


Violations
Manufactured Device

Sediment Accumulation Extended Detention

Berm Failure
Bioswale

Sediment Accumulation Permeable Concrete



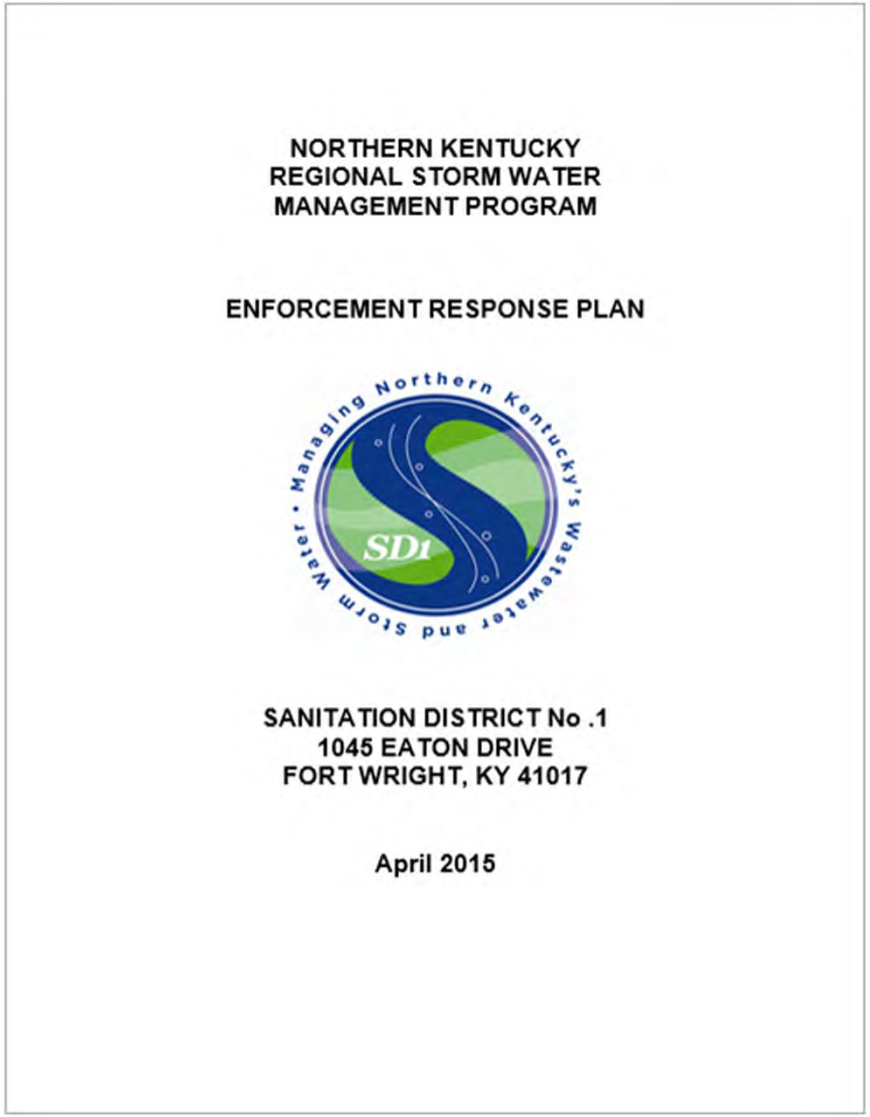
Erosion
Bioretention Basin

Failed Water Quality Features

SD1 Storm Water Management Program

- This information will test the effectiveness of these controls and aid in decisions about additional levels of control
- Help make informed decisions about cost-effective projects in the future
- Identify key design parameters that impact overall performance and future design of storm water BMPs.
- Verify the performance assumptions that SD1 has incorporated into the Watershed Plans (i.e., actual and modeled infiltration rates, percent reduction in storm water runoff)

Enforcement Response Plan


NORTHERN KENTUCKY
REGIONAL STORM WATER
MANAGEMENT PROGRAM

ENFORCEMENT RESPONSE PLAN

SANITATION DISTRICT No .1
1045 EATON DRIVE
FORT WRIGHT, KY 41017

April 2015

- General Procedure for Administering Enforcement
- Eliminates Uncertainty Concerning Enforcement Options
  - Illicit Discharge – MCM 3
  - Erosion Protection & Sediment Control – MCM 4
  - Post-Construction Storm Water BMPs – MCM 5

Enforcement Response Plan

Enforcement Criteria

- Magnitude of the Violation
- Duration of the Violation
- Compliance History
- Good Faith of Owners

Enforcement Response Plan

Enforcement Options

- Verbal Notice
- Corrective Notice
- Notice of Violation
- Administrative Actions
  - Cease and Desist Order
  - Administrative Fine

COMPLIANCE REQUIREMENT	*NATURE OF VIOLATION*	*ENFORCEMENT RESPONSE*	*ENFORCEMENT NOTIFICATION*	*REMEDIATION TIME*
BMP Installation	Failure to install post-construction BMP per approved plans	CN	Email w/ Violation Form	3 days
	Failure to adequately protect post-construction BMP with EPSC controls	CN	Email w/ Violation Form	3 days
SD1 BMP Inspection	Failure to maintain BMP in accordance with BMP maintenance checklist & maintenance agreement*	CN	Certified Mail	30 days
	Denial of Access to SD1 with Proper Identification*	NOV	Certified Mail	5 days
	Unauthorized Alteration of BMP from SD1 Approved Design - **Does Not** Immediately Impact Functionality of BMP*	CN	Certified Mail	30 days
	Unauthorized Alteration of BMP from SD1 Approved Design – **Does** Immediately Impact Functionality of BMP*	NOV	Certified Mail	30 days
	Failure to follow provided maintenance schedule	CN	Certified Mail	- - -
	Failure to provide annual inspection report upon request	NOV	Certified Mail	- - -
Previous Non-Compliance	Failure to correct any items issued a CN within the allotted timeframe*	NOV	Certified Mail	30 days
	Failure to correct any items issued a NOV within the allotted timeframe*	Administrative Action/ Administrative Fine	Certified Mail	30 days
	Failure to Reimburse SD1 for Work Performed/Pay Fine	Refer to Legal for Small Claims	- - -	- - -

Enforcement Response Plan

Fine Schedule

Fine Amount	Violation Type
$1 - $299	o Violation is minor in nature and results in no harm to the environment o Short duration or one-time violations o Failure to address previous enforcement actions o Documentation violations
$300 - $799	o Results in minimal harm to the environment o One-time offense
$800 - $1,000	o Violation is major in nature and results in significant harm to the environment o Violation is willful or intentional o Duration is ongoing or repetitive

Lessons Learned/Factors for Success

- Plan Review
- Pre-Construction Meeting
- Construction/Post Construction Inspections
- Installation Inspections
- Education and Training
- Partnerships
- Tracking Results
- Monitoring

Questions?