City of Richmond
Municipal Separate Storm Sewer System
2015 - 2016 Annual Report

Introduction

This annual report covers the reporting cycle July 1, 2015 through June 30, 2016 - Permit Year 3. The report includes the status of compliance with the permit conditions, the appropriateness of the best management practices and progress towards achieving the identified measurable goals for each of the minimum control measures, and the reporting requirements of the general permit.

Roles and responsibilities described in the program plan have not changed during this reporting period. DPU administers all aspects of stormwater management including operation and maintenance, design, construction, and regulatory compliance.

The status of the MS4 program plan and a summary of the activities planned for the next reporting cycle are included in the following sections. One significant change from the last reporting period is the increase in and integration of outreach with other water programs through implementation of the RVAH2O program. A description of the integrated outreach prepared by the Utility's communication contractor, West Cary Group, is included in Attachment E. As noted last year and continues this year, the Utility continues to adjust to assuming responsibility for the VSMP Program. The Utility will continue to plan for compliance with both programs during the remainder of the permit cycle. The new MCMs will incorporate the state stormwater regulations into the City's stormwater program.

The City of Richmond does not rely on another government entity to satisfy any of the permit obligations.

Monitoring data collected by city staff during this reporting cycle from the following creeks (Cherokee, Dancing, Dooley's Branch, Horse Swamp, Kanawha Canal, Pittaway, Rock Falls and Stony Run) is included in Attachment (A). Samples collected by volunteers and analyzed by the DPU laboratory are also included in the Attachment. Creeks sampled by volunteers include Crooked Branch, Reedy Creek, Grindall, Pocosham and Upham Brook.

The City investigated 24 potential illicit discharges during this reporting cycle. A summary of illicit discharge investigations is in Attachment (B).

There were 472 regulated land disturbing activities during the reporting cycle and 203.721 acres disturbed.

A full inventory of structural controls located within the City is included in Attachment (C).

A list of new structural controls placed in operation during the reporting cycle is included in Attachment (D).

MS4 Program Plan Compliance Status

1. Public Education & Outreach on stormwater impacts

Purpose

The objective of this BMP is to increase target audience knowledge about steps to take to reduce stormwater pollution and about the hazards of illegal discharges and improper waste disposal.

Measurable Goals

1a. Continue Public Education and Outreach program

1b. Program goals:

1. Increase knowledge on reducing stormwater pollution;
2. Increase knowledge on illegal discharge/improper waste disposal hazards;
3. Target program to audiences most likely to have significant stormwater impacts

1c. Program components:

1. ID three high priority water quality issues, including selection rationale

   The three water quality issues we will focus our efforts on are:

   1. *Pollution Prevention and Illicit Discharge Awareness*
   2. *Reducing bacteria pollution from pet waste*
   3. *Reducing nutrient pollution from improper application of fertilizers*

2. ID and estimate target population size of audience who has most impact
3. Develop messages to targeted audiences
4. Provide for public participation
5. Reach 20% of target audience;
6. Adjust messages as necessary.

Our estimates for target audiences for each of the issues are as follows:

Water Quality Issue	***Target Audience Population***	***Target Audience Population***
PP Awareness	All city residents	215,000
Pet Waste	Dog owners	56,000
Nutrient pollution	City residents, lawn care professionals	50,000

1d. Coordinate with other MS4s

As evidence of our public education and outreach effort, we held the following activities during the reporting period:

Schedule of Activities held this Reporting Cycle

The Utility held the following activities this year and our audience outreach is reported below.

Upham Brook clean up in Bryan Park
April 30, 2016

High Priority Issue #1: Pollution Prevention & Illicit Discharge Awareness

Measureable Goal	Est. # of People Reached	Est. % of Target Audience Reached	Actual # of people reached	Actual % of target audience reached
Household Hazardous Waste Collection	500	0.2 %	500	0.2 %
Distribute commercials/PSAs	200,000 x 10 views	7.5 %	4,000,000	15.0 %
Billboard campaign	200,000 x 10 views	5.0 %	4,000,000	15.0 %
Educate RPS	3263	20%	1086	6.6 %
Civic Association Meetings	1,200	20%	655	10.9 %

High Priority Issue #2: Bacteria

Measureable Goal	Est. # of bags	Est. % of Target Audience Reached	Actual # of people reached	Actual % of target audience reached
Provide pet waste bags to DPR	125,000	12.2 %	150,000	24 %
Billboard campaign	200,000 x 10 views	5.0 %	4,000,000	10 %
Public Service Announcements	200,000 x 10 views	7.5 %	4,000,000	15 %

High Priority Issue #3: Nutrient Reduction

Measureable Goal	Est. # of People Reached	Est. % of Target Audience Reached	Actual # of people reached	Actual % of target audience reached
Public Service Announcement	200,000 x 10 views	7.5 %	4,000,000	15 %
Billboard Campaign	200,000 x 10 views	5%	4,000,000	10 %

Schedule of Activities for Next Reporting Cycle

During the next year, DPU will continue its public education efforts. The list of activities planned for next year is as follows:

High Priority Issue #1: Pollution Prevention & Illicit Discharge Awareness

Measureable Goal	Est. # of People Reached	Est. % of Target Audience Reached
Household Hazardous Waste Collection Insert/Event	500	0.2 %
Distribute commercials/PSAs	200,00 x 10 views	7.5 %
Billboard Campaign	200,00 x 10 views	5.0%
Educate RPS	3,263	13.6 %
Civic Association Meetings	1,200	0.6 %

High Priority Issue #2: Bacteria

Measureable Goal	Est. # of people reached	Est. % of Target Audience Reached
Provide pet waste to DPR	125,000	12.2 %
Billboard Campaign	200,00 x 10 views	5.0%
Public Service Announcements	200,00 x 10 views	7.5%

High Priority Issue #3: Nutrient Reduction

Measureable Goal	Est. # of People Reached	Est. % of Target Audience Reached
Public Service Announcements	200,00 x 10 views	7.5%
Billboard Campaign	200,00 x 10 views	5.0%

2. Public Involvement & Participation

Purpose

The objective of this BMP is to be a tool to promote public involvement in preventing polluted stormwater runoff from reaching the MS4.

Measurable Goals

2a. Maintain & post online an updated MS4 Program Plan and Annual Report.

A link to the MS4 Program Plan is here 2013 - 2018 MS4 Program Plan. A link to the Annual Report is here.

2b.Participate, through promotion, sponsorship, or other involvement, in a minimum of four local activities annually.

As evidence of our Public Participation effort, Stormwater Utility staff participated and/or planned the following activities held during the reporting period:

Colorful rain barrels at the April 2016 Earth Day Celebration

Activity	Pollutant Target	Audience
Drain Marking Program	Pollution Prevention	residents
Host stream cleanup	Pollution Prevention	residents
Participate in other watershed organizations	Pollution Prevention	residents
Host Nutrient Education Event	Nutrients	residents

2c. The MS4 Program Plan shall include written procedures for these items.

Schedule of Activities for Next Reporting Cycle

Activity	Pollutant Target	Audience
Drain Marking Program	Illicit Discharge	residents
Host stream clean up	Pollution Prevention	residents
Participate in other watershed organizations	Pollution Prevention	residents
Host Nutrient Education Event	Nutrients	residents

3. Illicit Discharge Detection and Elimination

Purpose

The objective of this Minimum Control Measure is to reduce the discharge of pollutants from the MS4, to protect water quality and ensure compliance with water quality standards and with the Clean Water Act. DPU has a process to investigate and reduce illicit discharges through the industrial pretreatment program and the Community Assisted Public Safety (CAPS) program.

A list of illicit discharges investigated in 201 - 2016 is in Attachment B.

Measurable Goals

3a. Maintain an accurate storm sewer system map and information table.

DPU has a schedule to map the remaining storm sewer system by the end of the permit term, including all relevant required information. We intend to map points of discharge from the MS4 and outfalls to receiving waters. We expect to coordinate with adjacent MS4 permit holders, including VDOT.

3b. DPU has an ordinance that prohibits non-stormwater discharges into the storm sewer system, in accordance with federal, state, and local laws and regulations.

The ordinance that prohibits non-stormwater discharges is here.

3c. DPU has procedures to inspect and identify unauthorized non-stormwater discharges, including illegal dumping to the MS4.

The department has procedures to inspect and identify unauthorized non-stormwater discharges.

The total number of outfalls screened during the reporting period was **243;150** of the outfalls were dry, leaving **93** outfalls discharging; after reporting the problems to the appropriate department for fixing, samples were collected from these outfalls. Results for the discharging outfalls are in Attachment E.

Pretreatment staff investigated **24** potential illicit discharge activities; a summary of the investigations is included in Attachment B.

Schedule of Activities for Next Reporting Cycle

Throughout the permit term, DPU will continue to investigate and eliminate illicit discharges through the Industrial Waste & Pretreatment and CAPS programs.

4. Construction Site Stormwater Runoff Control

Purpose

The objective is to administer an erosion and sediment control program in accordance with the Virginia Erosion and Sediment Control Regulations, Section 4VAC50-30-40.

Measurable Goals

4a. applicable oversight

The program compiled the following statistics for construction site inspections during the reporting period:

ESC Activity	#
Total # of regulated land-disturbing activities	472
Total # of acres disturbed	203.721
Total # of inspections conducted	1026
Total # of enforcement actions taken	70
Notice to Comply	57
Stop Work Orders	13

Schedule of Activities for Next Reporting Cycle

DPU will continue to manage the ESC program.

5. Post-construction stormwater management in new development and development on prior developed lands

Purpose

The objective is address post-construction stormwater runoff that enters the MS4 from new development and development of prior developed lands.

Measurable Goal

5a. Maintain applicable oversight requirements;

5b. Require design criteria for stormwater runoff controls;

5c. Inspect operate and verify maintenance of stormwater management facilities;

5d. Have an updated Program Plan;

5e. Track stormwater management facilities.

Post-construction Activity	#
Total # of inspections conducted	83
Total # of enforcement actions taken	0
Notice to Comply	0

Schedule of Activities for Next Reporting Cycle

DPU will continue to monitor and track both private and public stormwater management facilities.

6. Pollution prevention/good housekeeping for municipal operations

Purpose

The objective is to minimize or prevent pollutant discharge from daily operations (road and parking lot maintenance, bulk material storage, etc.) The objective is to prevent pollution at operations facilities from entering the MS4.

Measurable Goal

6a. Minimize or prevent pollution from daily operations;

6b. Identify all municipal high priority (9 types) facilities, and their activities that could contribute to pollution and develop SWPPPs for such facilities;

Summary Report of Development of SWPPPs

Dept.	Facility	ESM	MS	PSF	PW	SSF	VSM	SWPPP
DPR	FHP Field Office	X	X	X				Jul '16
DPR	Byrd Park Field Office	X	X	X				Jul '16
DPR	Oakwood Cemetery	X	X					Jul '16
DPR	Riverview Cemetery	X	X	X				Jul '16
DPR	Maury/Mt. Olivet Cemetery	X	X					Jul '16
DPR	Ops Center	X	X	X				Jul '16
DPU	Ops Center – Jeff Davis	X	X	X			X	Jun '16
DPW	Parker Field – Ops Center	X	X			X	X	Sep '15
DPW	Urban Forestry	X					X	Sep '15
DPW	Grounds Maintenance	X	X	X			X	Sep '15
DPW	Richmond Ambulance Authority						X	Sep '15
DPW	Whitcomb Laydown Yard	X	X		X			Sep '15
DPW	First Tee Golf Course			X				Sep '15

Summary report on development and implementation of SOPs:

SOP Topic	Dept.	Date Developed	Date Implemented
Vehicle/Equipment Storage & Maintenance	DPU/Operations Center	2015	2015
Chemical Handling/Transporting & Spill Response	DPU/Operations Center	2015	2015
Chemical Application, Storage & Disposal (Herbicides/Pesticides)	DPU/Operations Center	2015	2015
Spill Kits/Spill Leak Response	DPU/Operations Center	2015	2015
Dumpster Skids	DPU/Operations Center	2015	2015
General Refuse/Dumpsters	DPU/Operations Center	2015	2015
Transporting/Storing Mulch	DPU/Operations Center	2015	2015
Storage Yard Materials	DPU/Operations Center	2015	2015
Storm Drain Cleaning	DPU/Operations Center	2015	2015
Parking Lot Maintenance	DPU/Operations Center	2015	2015
Landscaping – Mowing & Trimming	DPU/Operations Center	2015	2015

6c. Implement turf and landscape management plans for all areas greater than 1 acre that apply nutrients;

Summary report on turf and landscape management plans required

The City is currently developing a Nutrient Management Plan.

6d. Conduct training for employees;

City staff developed a training program for stormwater awareness for all city employees and for those employees involved in areas that are likely to have an effect on the MS4. The program will cover spill prevention, vehicle maintenance, bulk material storage, road and parking lot maintenance and facility maintenance. We developed a biennial training schedule to reach the appropriate personnel.

Summary report on required training – list of events, training date, # of employees attending and objective.

Training Date	Objective	Department/Group	# of employees attending
Various	Stormwater Pollution Prevention	New Employees	101
11/4/15	Stormwater Pollution Prevention	Stormwater, DPW, Distribution, Customer Service, Warehouse	170

6e. Require municipal contractors use appropriate control measures for stormwater discharges.

City staff is developing a program to satisfy this requirement.

Schedule of Activities for Next Reporting Cycle

Employee Pollution Prevention and Training

Description

DPU will implement an employee-training program for operations staff involved with vehicle maintenance and field activities that may affect the MS4. The objective of this BMP is to provide pollution prevention training to City employees to inform them of proper practices to reduce the potential of pollutants entering the MS4.

Dept.	# of emp	EVM	PP Awareness	Recreation, Public works yard	Timeline
Mounted Police Stables & K-9	16		X	X	Jul 2016 – Jun 2017
Additional Maintenance Crews	200		X	X	Jul 2016 – Jun 2017
Animal Care and Control	23		X		Jul 2016 –Jun 2017
All Depart. Make-Up	50				Mar 2016 – Jun 2017

Schedule of Activities for Next Reporting Cycle

The City will continue to follow the Training Plan.

Other Information:

H. Information required for any applicable TMDL special condition contained in Section 1 of the general permit.

The Chesapeake Bay TMDL Action Plan is located on the city's website here.

The James River Bacteria TMDL was completed in June 2016.

Outfall Inventory Screening Data											
Cherokee Creek											
SIDN	DSCR	CDAT	CTIM	SCOL	ANAM	QUAL	ACOM	TPQL	AUNT	AREF	AUSR
AB10959	CHC-002	1/12/2016	11:40	SH	E. Coli		6	1	MPN/100 mL	SM 20 9223 B	KA
AB10959	CHC-002	1/12/2016	11:40	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA
AB10959	CHC-002	1/12/2016	11:40	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	KAA
AB10960	CHC-013	1/12/2016	14:25	SH	E. Coli		1	1	MPN/100 mL	SM 20 9223 B	KA
AB10960	CHC-013	1/12/2016	14:25	SH	Ammonia by TNT		0.1	0.015	mg/L	HACH	KAA
AB10960	CHC-013	1/12/2016	14:25	SH	Total Nitrogen		1.5	1	mg/L	TN HACH	KAA
AB11389	CHC-016	1/21/2016	11:35	SH	E. Coli		11	1	MPN/100 mL	SM 20 9223 B	SF
AB11389	CHC-016	1/21/2016	11:35	SH	Ammonia by TNT		0.1	0.015	mg/L	HACH	KAA
AB11389	CHC-016	1/21/2016	11:35	SH	Total Nitrogen	<	1.0	1	mg/L	TN HACH	KAA
AB11389	CHC-016	1/21/2016	11:35	SH	Temperature in °C		1.0		°C	SM 20 2550 B	SH
AB11389	CHC-016	1/21/2016	11:35	SH	pH		6.5		su	SM18/4500H+ B	SH
AB11390	CHC-018	1/21/2016	12:10	SH	E. Coli		48	1	MPN/100 mL	SM 20 9223 B	SF
AB11390	CHC-018	1/21/2016	12:10	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB11390	CHC-018	1/21/2016	12:10	SH	Total Nitrogen		2.0	1	mg/L	TN HACH	KAA
AB11390	CHC-018	1/21/2016	12:10	SH	Temperature in °C		7.2		°C	SM 20 2550 B	SH
AB11390	CHC-018	1/21/2016	12:10	SH	pH		6.7		su	SM18/4500H+ B	SH
AB11387	CHC-023	1/21/2016	13:20	SH	E. Coli		345	1	MPN/100 mL	SM 20 9223 B	SF
AB11387	CHC-023	1/21/2016	13:20	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB11387	CHC-023	1/21/2016	13:20	SH	Total Nitrogen	<	1.0	1	mg/L	TN HACH	KAA
AB11387	CHC-023	1/21/2016	13:20	SH	Temperature in °C		4.0		°C	SM 20 2550 B	SH
AB11387	CHC-023	1/21/2016	13:20	SH	pH		7.7		su	SM18/4500H+ B	SH
AB11388	CHC-024	1/21/2016	13:35	SH	E. Coli		16	1	MPN/100 mL	SM 20 9223 B	SF
AB11388	CHC-024	1/21/2016	13:35	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB11388	CHC-024	1/21/2016	13:35	SH	Total Nitrogen		3.6	1	mg/L	TN HACH	KAA
AB11388	CHC-024	1/21/2016	13:35	SH	Temperature in °C		4.7		°C	SM 20 2550 B	SH
AB11388	CHC-024	1/21/2016	13:35	SH	pH		7.1		su	SM18/4500H+ B	SH
AB11792	CHC-027	2/1/2016	09:40	SH	E. Coli		84	1	MPN/100 mL	SM 20 9223 B	SF
AB11792	CHC-027	2/1/2016	09:40	SH	Ammonia by TNT		0.09	0.015	mg/L	HACH	MM
AB11792	CHC-027	2/1/2016	09:40	SH	Total Nitrogen		3.1	1	mg/L	TN HACH	MM
AB11792	CHC-027	2/1/2016	09:40	SH	Temperature in °C		6.0		°C	SM 20 2550 B	SH

AB11792	CHC-027	2/1/2016	09:40	SH	pH		6.7		su	SM18/4500H+ B	SH
AB11793	CHC-031	2/1/2016	10:30	SH	E. Coli		29	1	MPN/100 mL	SM 20 9223 B	SF
AB11793	CHC-031	2/1/2016	10:30	SH	Ammonia by TNT		0.10	0.015	mg/L	HACH	MM
AB11793	CHC-031	2/1/2016	10:30	SH	Total Nitrogen		2.3	1	mg/L	TN HACH	MM
AB11793	CHC-031	2/1/2016	10:30	SH	Temperature in °C		7.2		°C	SM 20 2550 B	SH
AB11793	CHC-031	2/1/2016	10:30	SH	pH		7.0		su	SM18/4500H+ B	SH
AB11391	CHC-032	1/21/2016	12:25	SH	E. Coli	<	1	1	MPN/100 mL	SM 20 9223 B	SF
AB11391	CHC-032	1/21/2016	12:25	SH	Ammonia by TNT		0.1	0.015	mg/L	HACH	KAA
AB11391	CHC-032	1/21/2016	12:25	SH	Total Nitrogen	<	1.0	1	mg/L	TN HACH	KAA
AB11391	CHC-032	1/21/2016	12:25	SH	Temperature in °C		10.5		°C	SM 20 2550 B	SH
AB11391	CHC-032	1/21/2016	12:25	SH	pH		7.5		su	SM18/4500H+ B	SH
AB11794	CHC-032	2/1/2016	11:00	SH	E. Coli		10	1	MPN/100 mL	SM 20 9223 B	SF
AB11794	CHC-032	2/1/2016	11:00	SH	Ammonia by TNT		0.22	0.015	mg/L	HACH	MM
AB11794	CHC-032	2/1/2016	11:00	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	MM
AB11794	CHC-032	2/1/2016	11:00	SH	Temperature in °C		6.2		°C	SM 20 2550 B	SH
AB11794	CHC-032	2/1/2016	11:00	SH	pH		7.3		su	SM18/4500H+ B	SH
AB11794	CHC-032	2/1/2016	11:00	SH	Total Suspended Solids		1	1	mg/L	SM18/2540 D	KLP
AB10965	CHC-B1	1/12/2016	13:08	SH	E. Coli		727	1	MPN/100 mL	SM 20 9223 B	KA
AB10965	CHC-B1	1/12/2016	13:08	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA
AB10965	CHC-B1	1/12/2016	13:08	SH	Total Nitrogen		1.9	1	mg/L	TN HACH	KAA
AB10966	CHC-B2	1/12/2016	13:05	SH	E. Coli		276	1	MPN/100 mL	SM 20 9223 B	KA
AB10966	CHC-B2	1/12/2016	13:05	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA
AB10966	CHC-B2	1/12/2016	13:05	SH	Total Nitrogen		1.2	1	mg/L	TN HACH	KAA
AB10961	CHC-LA1	1/12/2016	10:10	SH	E. Coli		124	1	MPN/100 mL	SM 20 9223 B	KA
AB10961	CHC-LA1	1/12/2016	10:10	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA
AB10961	CHC-LA1	1/12/2016	10:10	SH	Total Nitrogen		1.3	1	mg/L	TN HACH	KAA
AB10962	CHC-LA2	1/12/2016	13:25	SH	E. Coli		365	1	MPN/100 mL	SM 20 9223 B	KA
AB10962	CHC-LA2	1/12/2016	13:25	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA
AB10962	CHC-LA2	1/12/2016	13:25	SH	Total Nitrogen		2.0	1	mg/L	TN HACH	KAA
AB10963	CHC-LB1	1/12/2016	11:31	SH	E. Coli		185	1	MPN/100 mL	SM 20 9223 B	KA
AB10963	CHC-LB1	1/12/2016	11:31	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA
AB10963	CHC-LB1	1/12/2016	11:31	SH	Total Nitrogen		1.3	1	mg/L	TN HACH	KAA
AB10964	CHC-LB2	1/12/2016	13:30	SH	E. Coli		411	1	MPN/100 mL	SM 20 9223 B	KA
AB10964	CHC-LB2	1/12/2016	13:30	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA

AB10964	CHC-LB2	1/12/2016	13:30	SH	Total Nitrogen		2.1	1	mg/L	TN HACH	KAA
AB10958	CHC-MOUTH	1/12/2016	10:35	SH	Total Suspended Solids		89	1	mg/L	SM18/2540 D	KLP
AB10958	CHC-MOUTH	1/12/2016	10:35	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA
AB10958	CHC-MOUTH	1/12/2016	10:35	SH	Total Nitrogen		1.0	1	mg/L	TN HACH	KAA
AB10958	CHC-MOUTH	1/12/2016	10:35	SH	E. Coli		91	1	MPN/100 mL	SM 20 9223 B	KA
Dancing Creek											
SIDN	DSCR	CDAT	CTIM	SCOL	ANAM	QUAL	ACOM	TPQL	AUNT	AREF	AUSR
AB10408	DNC-006	1/4/2016	12:00	SH	E. Coli		79	1	MPN/100 mL	SM 20 9223 B	SF
AB10408	DNC-006	1/4/2016	12:00	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB10408	DNC-006	1/4/2016	12:00	SH	pH		7.3		su	SM 20 4500 H+ B	SH
AB10408	DNC-006	1/4/2016	12:00	SH	Temperature in °C		8.0		° C	SM 20 2550 B	SH
AB10444	DNC-010	1/5/2016	10:40	SH	E. Coli		52	1	MPN/100 mL	SM 20 9223 B	SF
AB10444	DNC-010	1/5/2016	10:40	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB10447	DNC-011	1/5/2016	11:10	SH	E. Coli		4	1	MPN/100 mL	SM 20 9223 B	SF
AB10447	DNC-011	1/5/2016	11:10	SH	Ammonia by TNT		0.16	0.015	mg/L	HACH	KAA
AB10445	DNC-013A	1/5/2016	13:35	SH	E. Coli		11	1	MPN/100 mL	SM 20 9223 B	SF
AB10445	DNC-013A	1/5/2016	13:35	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB10498	DNC-014	1/6/2016	10:30	SH	E. Coli		18	1	MPN/100 mL	SM 20 9223 B	KAA
AB10498	DNC-014	1/6/2016	10:30	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB10498	DNC-014	1/6/2016	10:30	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	KAA
AB10498	DNC-014	1/6/2016	10:30	SH	pH		6.3		su	SM 20 4500 H+ B	SH
AB10498	DNC-014	1/6/2016	10:30	SH	Temperature in °C		7.0		°C	SM 20 2550 B	SH
AB10495	DNC-015	1/6/2016	11:10	SH	E. Coli		7	1	MPN/100 mL	SM 20 9223 B	KAA
AB10495	DNC-015	1/6/2016	11:10	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB10495	DNC-015	1/6/2016	11:10	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	KAA
AB10495	DNC-015	1/6/2016	11:10	SH	pH		6.2		su	SM 20 4500 H+ B	SH
AB10495	DNC-015	1/6/2016	11:10	SH	Temperature in °C		8.6		°C	SM 20 2550 B	SH
AB10496	DNC-015A	1/6/2016	11:20	SH	E. Coli		1	1	MPN/100 mL	SM 20 9223 B	KAA
AB10496	DNC-015A	1/6/2016	11:20	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB10496	DNC-015A	1/6/2016	11:20	SH	Total Nitrogen		1.5	1	mg/L	TN HACH	KAA
AB10496	DNC-015A	1/6/2016	11:20	SH	pH		7.3		su	SM 20 4500 H+ B	SH
AB10496	DNC-015A	1/6/2016	11:20	SH	Temperature in °C		4.6		°C	SM 20 2550 B	SH
AB10493	DNC-017	1/6/2016	12:35	SH	E. Coli		816	1	MPN/100 mL	SM 20 9223 B	KAA
AB10493	DNC-017	1/6/2016	12:35	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA

AB10493	DNC-017	1/6/2016	12:35	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	KAA
AB10551	DNC-022	1/7/2016	10:40	SH	E. Coli		7	1	MPN/100 mL	SM 20 9223 B	SF
AB10551	DNC-022	1/7/2016	10:40	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB10553	DNC-023	1/7/2016	12:20	SH	E. Coli		23	1	MPN/100 mL	SM 20 9223 B	SF
AB10553	DNC-023	1/7/2016	12:20	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA
AB10497	DNC-16	1/6/2016	12:06	SH	E. Coli		16	1	MPN/100 mL	SM 20 9223 B	KAA
AB10497	DNC-16	1/6/2016	12:06	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB10497	DNC-16	1/6/2016	12:06	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	KAA
AB10497	DNC-16	1/6/2016	12:06	SH	pH		7.4		su	SM 20 4500 H+ B	SH
AB10497	DNC-16	1/6/2016	12:06	SH	Temperature in °C		4.6		°C	SM 20 2550 B	SH
AB10409	DNC-B1	1/4/2016	13:19	SH	E. Coli		48	1	MPN/100 mL	SM 20 9223 B	SF
AB10409	DNC-B1	1/4/2016	13:19	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB10409	DNC-B1	1/4/2016	13:19	SH	pH		7.1		su	SM 20 4500 H+ B	SH
AB10409	DNC-B1	1/4/2016	13:19	SH	Temperature in °C		6.9		° C	SM 20 2550 B	SH
AB10446	DNC-B2	1/5/2016	12:41	SH	E. Coli		35	1	MPN/100 mL	SM 20 9223 B	SF
AB10446	DNC-B2	1/5/2016	12:41	SH	Ammonia by TNT	<	0.02	0.015	mg/L	HACH	KAA
AB10448	DNC-B3	1/5/2016	12:47	SH	E. Coli		248	1	MPN/100 mL	SM 20 9223 B	SF
AB10448	DNC-B3	1/5/2016	12:47	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB10494	DNC-B4	1/6/2016	10:17	SH	E. Coli		81	1	MPN/100 mL	SM 20 9223 B	KAA
AB10494	DNC-B4	1/6/2016	10:17	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB10494	DNC-B4	1/6/2016	10:17	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	KAA
AB10494	DNC-B4	1/6/2016	10:17	SH	pH		7.1		su	SM 20 4500 H+ B	SH
AB10494	DNC-B4	1/6/2016	10:17	SH	Temperature in °C		3		°C	SM 20 2550 B	SH
AB10407	DNC-MOUTH	1/4/2016	10:15	SH	E. Coli		111	1	MPN/100 mL	SM 20 9223 B	SF
AB10407	DNC-MOUTH	1/4/2016	10:15	SH	Ammonia by TNT		0.07	0.015	mg/L	HACH	KAA
AB10407	DNC-MOUTH	1/4/2016	10:15	SH	Total Suspended Solids		5	1	mg/L	SM18/2540 D	KLP
Dooley's Branch											
SIDN	DSCR	CDAT	CTIM	SCOL	ANAM	QUAL	ACOM	TPQL	AUNT	AREF	AUSR
AB09919	DOC-001	12/21/2015	11:45	SH	E. Coli		86	1	MPN/100 mL	SM 20 9223 B	KAA
AB09919	DOC-001	12/21/2015	11:45	SH	Ammonia by TNT		0.12	0.015	mg/L	HACH	KAA
AB09918	DOC-004	12/21/2015	12:30	SH	E. Coli		2	1	MPN/100 mL	SM 20 9223 B	KAA
AB09918	DOC-004	12/21/2015	12:30	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB09921	DOC-010	12/21/2015	13:35	SH	E. Coli		58	1	MPN/100 mL	SM 20 9223 B	KAA
AB09921	DOC-010	12/21/2015	13:35	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA

AB09917	DOC-011	12/21/2015	13:50	SH	E. Coli		21	1	MPN/100 mL	SM 20 9223 B	KAA
AB09917	DOC-011	12/21/2015	13:50	SH	Ammonia by TNT		0.34	0.015	mg/L	HACH	KAA
AB09916	DOC-014	12/21/2015	14:15	SH	E. Coli		4	1	MPN/100 mL	SM 20 9223 B	KAA
AB09916	DOC-014	12/21/2015	14:15	SH	Ammonia by TNT		0.17	0.015	mg/L	HACH	KAA
AB09920	DOC-B1	12/21/2015	13:30	SH	E. Coli		26	1	MPN/100 mL	SM 20 9223 B	KAA
AB09920	DOC-B1	12/21/2015	13:30	SH	Ammonia by TNT		0.29	0.015	mg/L	HACH	KAA
AB09914	DOC-MOUTH A	12/21/2015	10:25	SH	E. Coli		112	1	MPN/100 mL	SM 20 9223 B	KAA
AB09914	DOC-MOUTH A	12/21/2015	10:25	SH	Ammonia by TNT		0.17	0.015	mg/L	HACH	KAA
AB09914	DOC-MOUTH A	12/21/2015	10:25	SH	Total Suspended Solids		4	1	mg/L	SM18/2540 D	SF
AB09915	DOC-MOUTH C	12/21/2015	10:45	SH	E. Coli		194	1	MPN/100 mL	SM 20 9223 B	KAA
AB09915	DOC-MOUTH C	12/21/2015	10:45	SH	Ammonia by TNT		0.19	0.015	mg/L	HACH	KAA
AB09915	DOC-MOUTH C	12/21/2015	10:45	SH	Total Suspended Solids		2	1	mg/L	SM18/2540 D	SF
Horse Swamp Creek											
SIDN	DSCR	CDAT	CTIM	SCOL	ANAM	QUAL	ACOM	TPQL	AUNT	AREF	AUSR
AB12100	HSC-001	2/8/2016	09:35	SH	Ammonia by TNT		0.04	0.015	mg/L	HACH	TM
AB12100	HSC-001	2/8/2016	09:35	SH	E. Coli	<	1	1	MPN/100 mL	SM 20 9223 B	TM
AB12100	HSC-001	2/8/2016	09:35	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	TM
AB12100	HSC-001	2/8/2016	09:35	SH	pH		6.1		su	SM18/4500H+ B	SH
AB12100	HSC-001	2/8/2016	09:35	SH	Temperature in °C		9.2		°C	SM 20 2550 B	SH
AB12098	HSC-002	2/8/2016	09:55	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	TM
AB12098	HSC-002	2/8/2016	09:55	SH	E. Coli		11	1	MPN/100 mL	SM 20 9223 B	TM
AB12098	HSC-002	2/8/2016	09:55	SH	Total Nitrogen		1.79	1	mg/L	TN HACH	TM
AB12098	HSC-002	2/8/2016	09:55	SH	pH		5.3		su	SM18/4500H+ B	SH
AB12098	HSC-002	2/8/2016	09:55	SH	Temperature in °C		6.6		°C	SM 20 2550 B	SH
AB12096	HSC-003	2/8/2016	10:10	SH	Ammonia by TNT		20.4	0.015	mg/L	HACH	TM
AB12096	HSC-003	2/8/2016	10:10	SH	E. Coli	>	2420	1	MPN/100 mL	SM 20 9223 B	TM
AB12096	HSC-003	2/8/2016	10:10	SH	Total Nitrogen		21.6	1	mg/L	TN HACH	TM
AB12096	HSC-003	2/8/2016	10:10	SH	pH		6.0		su	SM18/4500H+ B	SH
AB12096	HSC-003	2/8/2016	10:10	SH	Temperature in °C		11.0		°C	SM 20 2550 B	SH
AB12099	HSC-006	2/8/2016	13:33	SH	Ammonia by TNT		0.01	0.015	mg/L	HACH	TM
AB12099	HSC-006	2/8/2016	13:33	SH	E. Coli	<	1	1	MPN/100 mL	SM 20 9223 B	TM
AB12099	HSC-006	2/8/2016	13:33	SH	Total Nitrogen		3.22	1	mg/L	TN HACH	TM
AB12099	HSC-006	2/8/2016	13:33	SH	pH		7.5		su	SM18/4500H+ B	SH
AB12099	HSC-006	2/8/2016	13:33	SH	Temperature in °C		12.2		°C	SM 20 2550 B	SH

AB12097	HSC-008	2/8/2016	14:30	SH	Ammonia by TNT		0.10	0.015	mg/L	HACH	TM
AB12097	HSC-008	2/8/2016	14:30	SH	E. Coli		33	1	MPN/100 mL	SM 20 9223 B	TM
AB12097	HSC-008	2/8/2016	14:30	SH	Total Nitrogen		3.6	1	mg/L	TN HACH	TM
AB12097	HSC-008	2/8/2016	14:30	SH	pH		6.9		su	SM18/4500H+ B	SH
AB12097	HSC-008	2/8/2016	14:30	SH	Temperature in °C		13.5		°C	SM 20 2550 B	SH
AB12151	HSC-011	2/9/2016	13:00	SH	Ammonia by TNT		0.45	0.015	mg/L	HACH	TM
AB12151	HSC-011	2/9/2016	13:00	SH	E. Coli		205	1	MPN/100 mL	SM 20 9223 B	MM
AB12151	HSC-011	2/9/2016	13:00	SH	pH		7.0		su	SM18/4500H+ B	SH
AB12151	HSC-011	2/9/2016	13:00	SH	Total Nitrogen		2.58	1	mg/L	TN HACH	TM
AB12151	HSC-011	2/9/2016	13:00	SH	Temperature in °C		11.2		°C	SM 20 2550 B	SH
AB12153	HSC-013	2/9/2016	13:35	SH	Ammonia by TNT		0.08	0.015	mg/L	HACH	TM
AB12153	HSC-013	2/9/2016	13:35	SH	E. Coli	<	1	1	MPN/100 mL	SM 20 9223 B	MM
AB12153	HSC-013	2/9/2016	13:35	SH	Total Nitrogen		5.42	1	mg/L	TN HACH	TM
AB12152	HSC-015	2/9/2016	14:10	SH	Ammonia by TNT		0.24	0.015	mg/L	HACH	TM
AB12152	HSC-015	2/9/2016	14:10	SH	E. Coli		17	1	MPN/100 mL	SM 20 9223 B	MM
AB12152	HSC-015	2/9/2016	14:10	SH	pH		6.7		su	SM18/4500H+ B	SH
AB12152	HSC-015	2/9/2016	14:10	SH	Total Nitrogen		3.97	1	mg/L	TN HACH	TM
AB12152	HSC-015	2/9/2016	14:10	SH	Temperature in °C		13.2		°C	SM 20 2550 B	SH
AB12154	HSC-018	2/9/2016	14:50	SH	Ammonia by TNT		1.25	0.015	mg/L	HACH	TM
AB12154	HSC-018	2/9/2016	14:50	SH	E. Coli	>	2420	1	MPN/100 mL	SM 20 9223 B	MM
AB12154	HSC-018	2/9/2016	14:50	SH	pH		7.1		su	SM18/4500H+ B	SH
AB12154	HSC-018	2/9/2016	14:50	SH	Total Nitrogen		3.61	1	mg/L	TN HACH	TM
AB12154	HSC-018	2/9/2016	14:50	SH	Temperature in °C		10.5		°C	SM 20 2550 B	SH
AB12154	HSC-018	2/9/2016	14:50	SH	Total Suspended Solids		6	1	mg/L	SM18/2540 D	KLP
AB12094	HSC-B1	2/8/2016	11:15	SH	Ammonia by TNT		0.06	0.015	mg/L	HACH	TM
AB12094	HSC-B1	2/8/2016	11:15	SH	E. Coli		248	1	MPN/100 mL	SM 20 9223 B	TM
AB12094	HSC-B1	2/8/2016	11:15	SH	Total Nitrogen		1.4	1	mg/L	TN HACH	TM
AB12094	HSC-B1	2/8/2016	11:15	SH	pH		7.6		su	SM18/4500H+ B	SH
AB12094	HSC-B1	2/8/2016	11:15	SH	Temperature in °C		7.7		°C	SM 20 2550 B	SH
AB12149	HSC-B2	2/9/2016	11:00	SH	Ammonia by TNT		0.14	0.015	mg/L	HACH	TM
AB12149	HSC-B2	2/9/2016	11:00	SH	E. Coli	<	1	1	MPN/100 mL	SM 20 9223 B	MM
AB12149	HSC-B2	2/9/2016	11:00	SH	pH		6.5		su	SM18/4500H+ B	SH
AB12149	HSC-B2	2/9/2016	11:00	SH	Total Nitrogen		2.22	1	mg/L	TN HACH	TM
AB12149	HSC-B2	2/9/2016	11:00	SH	Temperature in °C		8.6		°C	SM 20 2550 B	SH

AB12101	HSC-B3	2/8/2016	11:40	SH	Ammonia by TNT		0.52	0.015	mg/L	HACH	TM
AB12101	HSC-B3	2/8/2016	11:40	SH	E. Coli		117	1	MPN/100 mL	SM 20 9223 B	TM
AB12101	HSC-B3	2/8/2016	11:40	SH	Total Nitrogen		1.86	1	mg/L	TN HACH	TM
AB12101	HSC-B3	2/8/2016	11:40	SH	pH		7.6		su	SM18/4500H+ B	SH
AB12101	HSC-B3	2/8/2016	11:40	SH	Temperature in °C		7.9		°C	SM 20 2550 B	SH
AB12150	HSC-B4	2/9/2016	11:05	SH	Ammonia by TNT		0.57	0.015	mg/L	HACH	TM
AB12150	HSC-B4	2/9/2016	11:05	SH	E. Coli		178	1	MPN/100 mL	SM 20 9223 B	MM
AB12150	HSC-B4	2/9/2016	11:05	SH	pH		6.8		su	SM18/4500H+ B	SH
AB12150	HSC-B4	2/9/2016	11:05	SH	Total Nitrogen		2.46	1	mg/L	TN HACH	TM
AB12150	HSC-B4	2/9/2016	11:05	SH	Temperature in °C		8.8		°C	SM 20 2550 B	SH
AB12095	HSC-MOUTH	2/8/2016	11:50	SH	Ammonia by TNT		0.52	0.015	mg/L	HACH	TM
AB12095	HSC-MOUTH	2/8/2016	11:50	SH	E. Coli		225	1	MPN/100 mL	SM 20 9223 B	TM
AB12095	HSC-MOUTH	2/8/2016	11:50	SH	Total Nitrogen		2.5	1	mg/L	TN HACH	TM
AB12095	HSC-MOUTH	2/8/2016	11:50	SH	Total Suspended Solids		1	1	mg/L	SM18/2540 D	SF
AB12095	HSC-MOUTH	2/8/2016	11:50	SH	Temperature in °C		8.4		°C	SM 20 2550 B	SH
AB12095	HSC-MOUTH	2/8/2016	11:50	SH	pH		6.8		su	SM18/4500H+ B	SH
Kanawha Canal											
SIDN	DSCR	CDAT	CTIM	SCOL	ANAM	QUAL	ACOM	TPQL	AUNT	AREF	AUSR
AB13061	KHC-024	3/2/2016	12:55	SH	Ammonia by TNT		0.045	0.015	mg/L	HACH	KFS
AB13061	KHC-024	3/2/2016	12:55	SH	E. Coli		2	1	MPN/100 mL	SM 20 9223 B	TM
AB13061	KHC-024	3/2/2016	12:55	SH	Total Nitrogen		1.41	1	mg/L	TN HACH	KFS
AB13061	KHC-024	3/2/2016	12:55	SH	pH		7.9		su	SM 20 4500 H+ B	SH
AB13061	KHC-024	3/2/2016	12:55	SH	Temperature in °C		14.4		°C	SM 20 2550 B	SH
AB13112	KHC-027	3/3/2016	10:00	SH	Ammonia by TNT		0.063	0.015	mg/L	HACH	KFS
AB13112	KHC-027	3/3/2016	10:00	SH	E. Coli		38	1	MPN/100 mL	SM 20 9223 B	TOM
AB13112	KHC-027	3/3/2016	10:00	SH	Total Nitrogen		2.01	1	mg/L	TN HACH	KFS
AB13112	KHC-027	3/3/2016	10:00	SH	pH		6.5		su	SM 20 4500 H+ B	SH
AB13112	KHC-027	3/3/2016	10:00	SH	Temperature in °C		11.8		°C	SM 20 2550 B	SH
AB13111	KHC-030	3/3/2016	11:10	SH	Ammonia by TNT		0.062	0.015	mg/L	HACH	KFS
AB13111	KHC-030	3/3/2016	11:10	SH	E. Coli		37	1	MPN/100 mL	SM 20 9223 B	TOM
AB13111	KHC-030	3/3/2016	11:10	SH	Total Nitrogen		3.63	1	mg/L	TN HACH	KFS
AB13111	KHC-030	3/3/2016	11:10	SH	Temperature in °C		10.6		°C	SM 20 2550 B	SH
AB13111	KHC-030	3/3/2016	11:10	SH	pH		6.9		su	SM 20 4500 H+ B	SH
AB13113	KHC-031	3/3/2016	11:45	SH	Ammonia by TNT		0.143	0.015	mg/L	HACH	KFS

AB13113	KHC-031	3/3/2016	11:45	SH	E. Coli	<	1	1	MPN/100 mL	SM 20 9223 B	TOM
AB13113	KHC-031	3/3/2016	11:45	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	KFS
AB13113	KHC-031	3/3/2016	11:45	SH	Temperature in °C		10.3		°C	SM 20 2550 B	SH
AB13113	KHC-031	3/3/2016	11:45	SH	pH		6.3		su	SM 20 4500 H+ B	SH
AB13114	KHC-035	3/3/2016	14:00	SH	E. Coli		24	1	MPN/100 mL	SM 20 9223 B	TOM
AB13114	KHC-035	3/3/2016	14:00	SH	Ammonia by TNT		0.030	0.015	mg/L	HACH	KFS
AB13114	KHC-035	3/3/2016	14:00	SH	Total Nitrogen		1.91	1	mg/L	TN HACH	KFS
AB13114	KHC-035	3/3/2016	14:00	SH	Temperature in °C		10.9		°C	SM 20 2550 B	SH
AB13114	KHC-035	3/3/2016	14:00	SH	pH		7.2		su	SM 20 4500 H+ B	SH
AB13273	KHC-041	3/7/2016	12:56	SH	Ammonia by TNT		0.020	0.015	mg/L	HACH	TM
AB13273	KHC-041	3/7/2016	12:56	SH	E. Coli		62	1	MPN/100 mL	SM 20 9223 B	TM
AB13273	KHC-041	3/7/2016	12:56	SH	Total Nitrogen	<	1.0	1	mg/L	TN HACH	MM
AB13309	KHC-047	3/8/2016	09:50	SH	Ammonia by TNT		0.046	0.015	mg/L	HACH	MM
AB13309	KHC-047	3/8/2016	09:50	SH	E. Coli	<	1	1	MPN/100 mL	SM 20 9223 B	TM
AB13309	KHC-047	3/8/2016	09:50	SH	pH		6.6		su	SM 20 4500 H+ B	SF
AB13309	KHC-047	3/8/2016	09:50	SH	Total Nitrogen		1.2	1	mg/L	TN HACH	MM
AB13309	KHC-047	3/8/2016	09:50	SH	Temperature in °C		11.0		°C	SM 20 2550 B	SF
AB13311	KHC-048	3/8/2016	10:40	SH	Ammonia by TNT		0.133	0.015	mg/L	HACH	MM
AB13311	KHC-048	3/8/2016	10:40	SH	E. Coli		29	1	MPN/100 mL	SM 20 9223 B	TM
AB13311	KHC-048	3/8/2016	10:40	SH	pH		7.2		su	SM 20 4500 H+ B	SF
AB13311	KHC-048	3/8/2016	10:40	SH	Total Nitrogen		4.6	1	mg/L	TN HACH	MM
AB13311	KHC-048	3/8/2016	10:40	SH	Temperature in °C		15.9		°C	SM 20 2550 B	SF
AB13310	KHC-051	3/8/2016	11:55	SH	Ammonia by TNT		0.071	0.015	mg/L	HACH	MM
AB13310	KHC-051	3/8/2016	11:55	SH	E. Coli		248	1	MPN/100 mL	SM 20 9223 B	TM
AB13310	KHC-051	3/8/2016	11:55	SH	pH		7.6		su	SM 20 4500 H+ B	SF
AB13310	KHC-051	3/8/2016	11:55	SH	Total Nitrogen		2.7	1	mg/L	TN HACH	MM
AB13310	KHC-051	3/8/2016	11:55	SH	Temperature in °C		14.2		°C	SM 20 2550 B	SF
AB13338	KHC-056	3/9/2016	10:25	SH	Ammonia by TNT		0.242	0.015	mg/L	HACH	MM
AB13338	KHC-056	3/9/2016	10:25	SH	E. Coli		26	1	MPN/100 mL	SM 20 9223 B	MM
AB13338	KHC-056	3/9/2016	10:25	SH	pH		7.2		su	SM18/4500H+ B	SF
AB13338	KHC-056	3/9/2016	10:25	SH	Total Nitrogen		1.9	1	mg/L	TN HACH	MM
AB13338	KHC-056	3/9/2016	10:25	SH	Temperature in °C		12.8		°C	SM 20 2550 B	SF
AB13337	KHC-058	3/9/2016	11:00	SH	Ammonia by TNT		0.026	0.015	mg/L	HACH	MM
AB13337	KHC-058	3/9/2016	11:00	SH	E. Coli		6	1	MPN/100 mL	SM 20 9223 B	MM

AB13337	KHC-058	3/9/2016	11:00	SH	pH		7.1		su	SM18/4500H+ B	SF
AB13337	KHC-058	3/9/2016	11:00	SH	Total Nitrogen		1.2	1	mg/L	TN HACH	MM
AB13337	KHC-058	3/9/2016	11:00	SH	Temperature in °C		14.2		°C	SM 20 2550 B	SF
AB13336	KHC-059	3/9/2016	11:25	SH	Ammonia by TNT		0.019	0.015	mg/L	HACH	MM
AB13336	KHC-059	3/9/2016	11:25	SH	E. Coli		2	1	MPN/100 mL	SM 20 9223 B	MM
AB13336	KHC-059	3/9/2016	11:25	SH	pH		7.4		su	SM18/4500H+ B	SF
AB13336	KHC-059	3/9/2016	11:25	SH	Total Nitrogen		2.2	1	mg/L	TN HACH	MM
AB13336	KHC-059	3/9/2016	11:25	SH	Temperature in °C		13.6		°C	SM 20 2550 B	SF
AB13335	KHC-061	3/9/2016	12:10	SH	Ammonia by TNT		0.037	0.015	mg/L	HACH	MM
AB13335	KHC-061	3/9/2016	12:10	SH	E. Coli		172	1	MPN/100 mL	SM 20 9223 B	MM
AB13335	KHC-061	3/9/2016	12:10	SH	pH		7.1		su	SM18/4500H+ B	SF
AB13335	KHC-061	3/9/2016	12:10	SH	Total Nitrogen		1.9	1	mg/L	TN HACH	MM
AB13335	KHC-061	3/9/2016	12:10	SH	Temperature in °C		17.6		°C	SM 20 2550 B	SF
AB13334	KHC-062	3/9/2016	12:27	SH	Ammonia by TNT		0.031	0.015	mg/L	HACH	MM
AB13334	KHC-062	3/9/2016	12:27	SH	E. Coli		10	1	MPN/100 mL	SM 20 9223 B	MM
AB13334	KHC-062	3/9/2016	12:27	SH	pH		6.9		su	SM18/4500H+ B	SF
AB13334	KHC-062	3/9/2016	12:27	SH	Total Nitrogen		11.1	1	mg/L	TN HACH	MM
AB13334	KHC-062	3/9/2016	12:27	SH	Temperature in °C		12.8		°C	SM 20 2550 B	SF
AB13334	KHC-062	3/9/2016	12:27	SH	Total Suspended Solids		4	1	mg/L	SM18/2540 D	SF
AB13110	KHC-HAXALL GATES	3/3/2016	14:50	SH	Ammonia by TNT		0.032	0.015	mg/L	HACH	KFS
AB13110	KHC-HAXALL GATES	3/3/2016	14:50	SH	E. Coli		5	1	MPN/100 mL	SM 20 9223 B	TOM
AB13110	KHC-HAXALL GATES	3/3/2016	14:50	SH	Total Nitrogen	<	1	1	mg/L	TN HACH	KFS
AB13110	KHC-HAXALL GATES	3/3/2016	14:50	SH	Total Suspended Solids		18	1	mg/L	SM18/2540 D	KLP
AB13007	KHC-Mouth	3/1/2016	10:00	SH	E. Coli		68	1	MPN/100 mL	SM 20 9223 B	SF
AB13007	KHC-Mouth	3/1/2016	10:00	SH	Ammonia by TNT		0.077	0.015	mg/L	HACH	MM
AB13007	KHC-Mouth	3/1/2016	10:00	SH	Total Nitrogen		1.2	1	mg/L	TN HACH	MM
AB13007	KHC-Mouth	3/1/2016	10:00	SH	Temperature in °C		8.9		°C	SM 20 2550 B	SH
AB13007	KHC-Mouth	3/1/2016	10:00	SH	pH		7.1		su	SM18/4500H+ B	SH
AB13007	KHC-Mouth	3/1/2016	10:00	SH	Total Suspended Solids		16	1	mg/L	SM18/2540 D	KLP
AB13060	KHC-MOUTH B	3/2/2016	12:17	SH	Ammonia by TNT		0.030	0.015	mg/L	HACH	KFS
AB13060	KHC-MOUTH B	3/2/2016	12:17	SH	E. Coli		4	1	MPN/100 mL	SM 20 9223 B	TM
AB13060	KHC-MOUTH B	3/2/2016	12:17	SH	Total Suspended Solids		3	1	mg/L	SM18/2540 D	KLP
AB13060	KHC-MOUTH B	3/2/2016	12:17	SH	Temperature in °C		14.2		°C	SM 20 2550 B	SH

Pittaway Creek											
SIDN	DSCR	CDAT	CTIM	SCOL	ANAM	QUAL	ACOM	TPQL	AUNT	AREF	AUSR
AB08807	PIC-007	11/23/2015	11:20	SH	Ammonia by TNT		0.04	0.015	mg/L	HACH	FG
AB08807	PIC-007	11/23/2015	11:20	SH	E. Coli		42	1	MPN/100 mL	SM 20 9223 B	KA
AB08805	PIC-008	11/23/2015	11:52	SH	Ammonia by TNT		0.05	0.015	mg/L	HACH	FG
AB08805	PIC-008	11/23/2015	11:52	SH	E. Coli		185	1	MPN/100 mL	SM 20 9223 B	KA
AB08804	PIC-011	11/23/2015	14:20	SH	E. Coli		172	1	MPN/100 mL	SM 20 9223 B	KA
AB08804	PIC-011	11/23/2015	14:20	SH	Ammonia by TNT	<	0.015	0.015	mg/L	HACH	FG
AB09300	PIC-025	12/7/2015	11:05	SH	E. Coli		1	1	MPN/100 mL	SM 20 9223 B	KA
AB09300	PIC-025	12/7/2015	11:05	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB09298	PIC-026	12/7/2015	11:45	SH	E. Coli		38	1	MPN/100 mL	SM 20 9223 B	KA
AB09298	PIC-026	12/7/2015	11:45	SH	Ammonia by TNT		0.04	0.015	mg/L	HACH	KAA
AB09337	PIC-031	12/8/2015	10:22	SH	E. Coli		291	1	MPN/100 mL	SM 20 9223 B	SF
AB09337	PIC-031	12/8/2015	10:22	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB09340	PIC-032	12/8/2015	13:00	SH	E. Coli		236	1	MPN/100 mL	SM 20 9223 B	SF
AB09340	PIC-032	12/8/2015	13:00	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB09341	PIC-034	12/8/2015	14:00	SH	E. Coli		41	1	MPN/100 mL	SM 20 9223 B	SF
AB09341	PIC-034	12/8/2015	14:00	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB08821	PIC-12	11/24/2015	09:40	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	FG
AB08821	PIC-12	11/24/2015	09:40	SH	E. Coli		65	1	MPN/100 mL	SM 20 9223 B	FG
AB08822	PIC-14	11/24/2015	10:25	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	FG
AB08822	PIC-14	11/24/2015	10:25	SH	E. Coli		1	1	MPN/100 mL	SM 20 9223 B	FG
AB08823	PIC-15	11/24/2015	10:34	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	FG
AB08823	PIC-15	11/24/2015	10:34	SH	E. Coli		28	1	MPN/100 mL	SM 20 9223 B	FG
AB08824	PIC-16	11/24/2015	11:10	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	FG
AB08824	PIC-16	11/24/2015	11:10	SH	E. Coli		73	1	MPN/100 mL	SM 20 9223 B	FG
AB08825	PIC-B1	11/24/2015	14:12	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	FG
AB08825	PIC-B1	11/24/2015	14:12	SH	E. Coli		162	1	MPN/100 mL	SM 20 9223 B	FG
AB09301	PIC-B2	12/7/2015	11:50	SH	E. Coli		44	1	MPN/100 mL	SM 20 9223 B	KA
AB09301	PIC-B2	12/7/2015	11:50	SH	Ammonia by TNT		0.04	0.015	mg/L	HACH	KAA
AB09338	PIC-B3	12/8/2015	10:05	SH	E. Coli		60	1	MPN/100 mL	SM 20 9223 B	SF
AB09338	PIC-B3	12/8/2015	10:05	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB08806	PIC-MOUTH	11/23/2015	10:00	SH	Total Suspended Solids		13	1	mg/L	SM18/2540 D	KLP
AB08806	PIC-MOUTH	11/23/2015	10:00	SH	Ammonia by TNT	<	0.015	0.015	mg/L	HACH	FG

AB08806	PIC-MOUTH	11/23/2015	10:00	SH	E. Coli		83	1	MPN/100 mL	SM 20 9223 B	KA
AB09299	PIC-ST MICHAELS	12/7/2015	09:35	SH	Ammonia by TNT		0.17	0.015	mg/L	HACH	KAA
AB09299	PIC-ST MICHAELS	12/7/2015	09:35	SH	E. Coli		19	1	MPN/100 mL	SM 20 9223 B	KA
AB09339	PIC-ST MICHAELS	12/8/2015	09:55	SH	E. Coli		308	1	MPN/100 mL	SM 20 9223 B	SF
AB09339	PIC-ST MICHAELS	12/8/2015	09:55	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
Rock Falls Creek											
SIDN	DSCR	CDAT	CTIM	SCOL	ANAM	QUAL	ACOM	TPQL	AUNT	AREF	AUSR
AB08445	RFC-002	11/16/2015	10:05	SH	Ammonia by TNT		0.04	0.015	mg/L	HACH	FG
AB08445	RFC-002	11/16/2015	10:05	SH	E. Coli		649	1	MPN/100 mL	SM 20 9223 B	TM
AB08446	RFC-002E	11/16/2015	12:15	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	FG
AB08446	RFC-002E	11/16/2015	12:15	SH	E. Coli		579	1	MPN/100 mL	SM 20 9223 B	TM
AB08447	RFC-004	11/16/2015	12:55	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	FG
AB08447	RFC-004	11/16/2015	12:55	SH	E. Coli		299	1	MPN/100 mL	SM 20 9223 B	TM
AB08559	RFC-028	11/18/2015	11:05	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	FG
AB08559	RFC-028	11/18/2015	11:05	SH	E. Coli		770	1	MPN/100 mL	SM 20 9223 B	TM
AB08558	RFC-030	11/18/2015	11:48	SH	Ammonia by TNT		0.08	0.015	mg/L	HACH	FG
AB08558	RFC-030	11/18/2015	11:48	SH	E. Coli		96	1	MPN/100 mL	SM 20 9223 B	TM
AB08557	RFC-032	11/18/2015	13:40	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	FG
AB08557	RFC-032	11/18/2015	13:40	SH	E. Coli		116	1	MPN/100 mL	SM 20 9223 B	TM
AB08556	RFC-033	11/18/2015	14:23	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	FG
AB08556	RFC-033	11/18/2015	14:23	SH	E. Coli		91	1	MPN/100 mL	SM 20 9223 B	TM
AB08448	RFC-B1	11/16/2015	14:00	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	FG
AB08448	RFC-B1	11/16/2015	14:00	SH	E. Coli		1986	1	MPN/100 mL	SM 20 9223 B	TM
AB08449	RFC-B2	11/16/2015	14:35	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	FG
AB08449	RFC-B2	11/16/2015	14:35	SH	E. Coli		34	1	MPN/100 mL	SM 20 9223 B	TM
AB08444	RFC-MOUTH	11/16/2015	09:40	SH	Total Suspended Solids		21	1	mg/L	SM18/2540 D	SF
AB08444	RFC-MOUTH	11/16/2015	09:40	SH	Ammonia by TNT		0.04	0.015	mg/L	HACH	FG
AB08444	RFC-MOUTH	11/16/2015	09:40	SH	E. Coli		55	1	MPN/100 mL	SM 20 9223 B	TM
Stony Point Creek											
SIDN	DSCR	CDAT	CTIM	SCOL	ANAM	QUAL	ACOM	TPQL	AUNT	AREF	AUSR
AB09397	SPC-003	12/9/2015	12:00	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	FG
AB09397	SPC-003	12/9/2015	12:00	SH	E. Coli		20	1	MPN/100 mL	SM 20 9223 B	SF
AB09396	SPC-005	12/9/2015	13:45	SH	E. Coli		13	1	MPN/100 mL	SM 20 9223 B	SF
AB09396	SPC-005	12/9/2015	13:45	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	FG

AB09446	SPC-007	12/10/2015	11:38	SH	E. Coli		272	1	MPN/100 mL	SM 20 9223 B	SF
AB09446	SPC-007	12/10/2015	11:38	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB09446	SPC-007	12/10/2015	11:38	SH	pH		7.1		su	SM18/4500H+ B	SH
AB09446	SPC-007	12/10/2015	11:38	SH	Temperature in °C		10.6		°C	SM 20 2550 B	SH
AB09443	SPC-009	12/10/2015	10:47	SH	E. Coli		308	1	MPN/100 mL	SM 20 9223 B	SF
AB09443	SPC-009	12/10/2015	10:47	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB09443	SPC-009	12/10/2015	10:47	SH	pH		7.4		su	SM18/4500H+ B	SH
AB09443	SPC-009	12/10/2015	10:47	SH	Temperature in °C		9.9		°C	SM 20 2550 B	SH
AB09445	SPC-B5	12/10/2015	10:24	SH	E. Coli		2.0	1	MPN/100 mL	SM 20 9223 B	SF
AB09445	SPC-B5	12/10/2015	10:24	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	KAA
AB09445	SPC-B5	12/10/2015	10:24	SH	pH		7.5		su	SM18/4500H+ B	SH
AB09445	SPC-B5	12/10/2015	10:24	SH	Temperature in °C		8.9		°C	SM 20 2550 B	SH
AB09447	SPC-B6	12/10/2015	10:36	SH	E. Coli		8	1	MPN/100 mL	SM 20 9223 B	SF
AB09447	SPC-B6	12/10/2015	10:36	SH	Ammonia by TNT		0.08	0.015	mg/L	HACH	KAA
AB09447	SPC-B6	12/10/2015	10:36	SH	pH		7.7		su	SM18/4500H+ B	SH
AB09447	SPC-B6	12/10/2015	10:36	SH	Temperature in °C		8.0		°C	SM 20 2550 B	SH
AB09395	SPC-MOUTH	12/9/2015	10:50	SH	Ammonia by TNT		0.02	0.015	mg/L	HACH	FG
AB09395	SPC-MOUTH	12/9/2015	10:50	SH	E. Coli		47	1	MPN/100 mL	SM 20 9223 B	SF
AB09444	SPC-POND1	12/10/2015	10:04	SH	E. Coli		58	1	MPN/100 mL	SM 20 9223 B	SF
AB09444	SPC-POND1	12/10/2015	10:04	SH	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB09444	SPC-POND1	12/10/2015	10:04	SH	pH		6.9		su	SM18/4500H+ B	SH
AB09444	SPC-POND1	12/10/2015	10:04	SH	Temperature in °C		10.4		°C	SM 20 2550 B	SH

Volunteer Monitoring Data											
SIDN	DSCR	CDAT	CTIM	SCOL	ANAM	QUAL	ACOM	TPQL	AUNT	AREF	AUSR
AB03383	Crooked Branch	7/29/2015	08:45	JM	E. Coli	>	2420	1	MPN/100 mL	SM 20 9223 B	TH
AB04579	Crooked Branch	8/26/2015	09:01	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	FB
AB04579	Crooked Branch	8/26/2015	09:01	JM	Dissolved Oxygen		3.4		mg/L	SM18/4500-O G	JM
AB04579	Crooked Branch	8/26/2015	09:01	JM	pH		7.3		su	SM18/4500H+ B	JM
AB07182	Crooked Branch	10/19/2015	13:28	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB07182	Crooked Branch	10/19/2015	13:28	JM	Dissolved Oxygen		9.0		mg/L	SM18/4500-O G	JM
AB07182	Crooked Branch	10/19/2015	13:28	JM	E. Coli		71	1	MPN/100 mL	SM 20 9223 B	KLP
AB07182	Crooked Branch	10/19/2015	13:28	JM	Temperature in °C		10.6		°C	SM 20 2550 B	JM
AB07182	Crooked Branch	10/19/2015	13:28	JM	pH		9.2		su	SM18/4500H+ B	JM
AB08302	Crooked Branch	11/12/2015	11:10	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	FB
AB08302	Crooked Branch	11/12/2015	11:10	JM	Dissolved Oxygen		7.0		mg/L	SM18/4500-O G	JM
AB08302	Crooked Branch	11/12/2015	11:10	JM	E. Coli		387	1	MPN/100 mL	SM 20 9223 B	KLP
AB08302	Crooked Branch	11/12/2015	11:10	JM	pH		8.8		su	SM 20 4500 H+ B	JM
AB08302	Crooked Branch	11/12/2015	11:10	JM	Temperature in °C		13.3		°C	SM 20 2550 B	JM
AB09153	Crooked Branch	12/3/2015	11:19	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	MM
AB09153	Crooked Branch	12/3/2015	11:19	JM	Dissolved Oxygen		9.0		mg/L	SM18/4500-O G	JM
AB09153	Crooked Branch	12/3/2015	11:19	JM	E. Coli		517	1	MPN/100 mL	SM 20 9223 B	KA
AB09153	Crooked Branch	12/3/2015	11:19	JM	pH		7.1		su	SM18/4500H+ B	JM
AB09153	Crooked Branch	12/3/2015	11:19	JM	Temperature in °C		11.8		°C	SM 20 2550 B	JM
AB03383	Crooked Branch	7/29/2015	08:45	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB03383	Crooked Branch	7/29/2015	08:45	JM	Dissolved Oxygen		5.2		mg/L	SM18/4500-O G	JM
AB03383	Crooked Branch	7/29/2015	08:45	JM	pH		7.5		su	SM18/4500H+ B	JM
AB03383	Crooked Branch	7/29/2015	08:45	JM	Temperature in °C		25.0		°C	SM 20 2550 B	JM
AB04579	Crooked Branch	8/26/2015	09:01	JM	E. Coli		866	1	MPN/100 mL	SM 20 9223 B	SF
AB04579	Crooked Branch	8/26/2015	09:01	JM	Temperature in °C		21.0		°C	SM 20 2550 B	JM
AB02436	Grindall Creek	7/7/2015	08:29	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB02436	Grindall Creek	7/7/2015	08:29	JM	Dissolved Oxygen		5.0		mg/L	SM18/4500-O G	JM
AB02436	Grindall Creek	7/7/2015	08:29	JM	E. Coli		166	1	MPN/100 mL	SM 20 9223 B	SF
AB02436	Grindall Creek	7/7/2015	08:29	JM	pH		7.6		su	SM18/4500H+ B	JM
AB02436	Grindall Creek	7/7/2015	08:29	JM	Temperature in °C		22.7		°C	SM 20 2550 B	JM
AB03662	Grindall Creek	8/5/2015	09:31	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA

AB03662	Grindall Creek	8/5/2015	09:31	JM	Dissolved Oxygen		5.8		mg/L	SM18/4500-O G	JM
AB03662	Grindall Creek	8/5/2015	09:31	JM	E. Coli		183	1	MPN/100 mL	SM 20 9223 B	CEC
AB03662	Grindall Creek	8/5/2015	09:31	JM	pH		7.8		su	SM18/4500H+ B	JM
AB03662	Grindall Creek	8/5/2015	09:31	JM	Temperature in °C		24.0		°C	SM 20 2550 B	JM
AB04818	Grindall Creek	9/1/2015	09:05	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB04818	Grindall Creek	9/1/2015	09:05	JM	Dissolved Oxygen		6.5		mg/L	SM18/4500-O G	JM
AB04818	Grindall Creek	9/1/2015	09:05	JM	E. Coli		137	1	MPN/100 mL	SM 20 9223 B	CC
AB04818	Grindall Creek	9/1/2015	09:05	JM	pH		7.8		su	SM18/4500H+ B	JM
AB04818	Grindall Creek	9/1/2015	09:05	JM	Temperature in °C		22.2		°C	SM 20 2550 B	JM
AB07181	Grindall Creek	10/19/2015	11:30	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB07181	Grindall Creek	10/19/2015	11:30	JM	Dissolved Oxygen		9.8		mg/L	SM18/4500-O G	JM
AB07181	Grindall Creek	10/19/2015	11:30	JM	E. Coli		80	1	MPN/100 mL	SM 20 9223 B	KLP
AB07181	Grindall Creek	10/19/2015	11:30	JM	pH		10.3		su	SM18/4500H+ B	JM
AB07181	Grindall Creek	10/19/2015	11:30	JM	Temperature in °C		106		°C	SM 20 2550 B	JM
AB08301	Grindall Creek	11/12/2015	10:19	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	FB
AB08301	Grindall Creek	11/12/2015	10:19	JM	Dissolved Oxygen		8.1		mg/L	SM18/4500-O G	JM
AB08301	Grindall Creek	11/12/2015	10:19	JM	E. Coli		62	1	MPN/100 mL	SM 20 9223 B	KLP
AB08301	Grindall Creek	11/12/2015	10:19	JM	pH		8.4		su	SM 20 4500 H+ B	JM
AB08301	Grindall Creek	11/12/2015	10:19	JM	Temperature in °C		13.6		°C	SM 20 2550 B	JM
AB02437	Pocosham Creek	7/7/2015	08:12	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB02437	Pocosham Creek	7/7/2015	08:12	JM	Dissolved Oxygen		5.5		mg/L	SM18/4500-O G	JM
AB02437	Pocosham Creek	7/7/2015	08:12	JM	E. Coli		387	1	MPN/100 mL	SM 20 9223 B	SF
AB02437	Pocosham Creek	7/7/2015	08:12	JM	pH		7.4		su	SM18/4500H+ B	JM
AB02437	Pocosham Creek	7/7/2015	08:12	JM	Temperature in °C		22.7		°C	SM 20 2550 B	JM
AB03661	Pocosham Creek	8/5/2015	08:22	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB03661	Pocosham Creek	8/5/2015	08:22	JM	Dissolved Oxygen		4.2		mg/L	SM18/4500-O G	JM
AB03661	Pocosham Creek	8/5/2015	08:22	JM	E. Coli		326	1	MPN/100 mL	SM 20 9223 B	CEC
AB03661	Pocosham Creek	8/5/2015	08:22	JM	pH		7.1		su	SM18/4500H+ B	JM
AB03661	Pocosham Creek	8/5/2015	08:22	JM	Temperature in °C		23.7		°C	SM 20 2550 B	JM
AB04817	Pocosham Creek	9/1/2015	08:37	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB04817	Pocosham Creek	9/1/2015	08:37	JM	Dissolved Oxygen		4.2		mg/L	SM18/4500-O G	JM
AB04817	Pocosham Creek	9/1/2015	08:37	JM	E. Coli		313	1	MPN/100 mL	SM 20 9223 B	CC
AB04817	Pocosham Creek	9/1/2015	08:37	JM	pH		7.5		su	SM18/4500H+ B	JM
AB04817	Pocosham Creek	9/1/2015	08:37	JM	Temperature in °C		22.0		°C	SM 20 2550 B	JM

AB07180	Pocosham Creek	10/19/2015	11:00	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB07180	Pocosham Creek	10/19/2015	11:00	JM	Dissolved Oxygen		9.2		mg/L	SM18/4500-O G	JM
AB07180	Pocosham Creek	10/19/2015	11:00	JM	E. Coli		345	1	MPN/100 mL	SM 20 9223 B	KLP
AB07180	Pocosham Creek	10/19/2015	11:00	JM	Temperature in °C		9.6		°C	SM 20 2550 B	JM
AB07180	Pocosham Creek	10/19/2015	11:00	JM	pH		9.3		su	SM18/4500H+ B	JM
AB08300	Pocosham Creek	11/12/2015	09:29	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	FB
AB08300	Pocosham Creek	11/12/2015	09:29	JM	Dissolved Oxygen		7.6		mg/L	SM18/4500-O G	JM
AB08300	Pocosham Creek	11/12/2015	09:29	JM	E. Coli		152	1	MPN/100 mL	SM 20 9223 B	KLP
AB08300	Pocosham Creek	11/12/2015	09:29	JM	pH		8.3		su	SM 20 4500 H+ B	JM
AB08300	Pocosham Creek	11/12/2015	09:29	JM	Temperature in °C		13.6		°C	SM 20 2550 B	JM
AB09154	Pocosham Creek	12/3/2015	10:05	JM	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	MM
AB09154	Pocosham Creek	12/3/2015	10:05	JM	Dissolved Oxygen		8.2		mg/L	SM18/4500-O G	JM
AB09154	Pocosham Creek	12/3/2015	10:05	JM	E. Coli		101	1	MPN/100 mL	SM 20 9223 B	KA
AB09154	Pocosham Creek	12/3/2015	10:05	JM	Temperature in °C		11.5		°C	SM 20 2550 B	JM
AB09154	Pocosham Creek	12/3/2015	10:05	JM	pH		8.3		su	SM18/4500H+ B	JM
AB10491	Pocosham Creek	1/6/2016	11:40	JM	E. Coli		73	1	MPN/100 mL	SM 20 9223 B	KAA
AB10491	Pocosham Creek	1/6/2016	11:40	JM	Ammonia by TNT		0.05	0.015	mg/L	HACH	KAA
AB10491	Pocosham Creek	1/6/2016	11:40	JM	pH		8.4		su	SM 20 4500 H+ B	SF
AB10491	Pocosham Creek	1/6/2016	11:40	JM	Temperature in °C		3.3		° C	SM 20 2550 B	SF
AB02894	Reedy Creek	7/16/2015	20:30	JO	Ammonia		0.2	0.1	mg/L	EPA 350.1	FB
AB02894	Reedy Creek	7/16/2015	20:30	JO	E. Coli		30	1	MPN/100 mL	SM 20 9223 B	SF
AB04671	Reedy Creek	8/27/2015	18:23	JO	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	KAA
AB04671	Reedy Creek	8/27/2015	18:23	JO	E. Coli		84	1	MPN/100 mL	SM 20 9223 B	KLP
AB06654	Reedy Creek	10/8/2015	18:36	JO	Ammonia by TNT		0.03	0.015	mg/L	HACH	FG
AB08174	Reedy Creek	11/8/2015	13:05	JO	E. Coli		70	1	MPN/100 mL	SM 20 9223 B	KLP
AB08174	Reedy Creek	11/8/2015	13:05	JO	Ammonia by TNT		0.05	0.015	mg/L	HACH	FG
AB09576	Reedy Creek	12/13/2015	11:45	JO	Ammonia by TNT		0.03	0.015	mg/L	HACH	KAA
AB09576	Reedy Creek	12/13/2015	11:45	JO	E. Coli		18	1	MPN/100 mL	SM 20 9223 B	SF
AB09576	Reedy Creek	12/13/2015	11:45	JO	Total Nitrogen	<	1.0	1	mg/L	TN HACH	FG
AB13702	Reedy Creek	3/17/2016	18:30	JO	E. Coli		99	1	MPN/100 mL	SM 20 9223 B	TM
AB13702	Reedy Creek	3/17/2016	18:30	JO	Ammonia by TNT		0.042	0.015	mg/L	HACH	MM
AB13702	Reedy Creek	3/17/2016	18:30	JO	Total Nitrogen		1.0	1	mg/L	TN HACH	MM
AB15367	Reedy Creek	4/26/2016	18:30	JO	E. Coli		96	1	MPN/100 mL	SM 20 9223 B	FAB
AB15367	Reedy Creek	4/26/2016	18:30	JO	Ammonia by TNT		0.068	0.015	mg/L	HACH	MM

AB15367	Reedy Creek	4/26/2016	18:30	JO	Total Nitrogen		1.0	1	mg/L	TN HACH	MM
AB17249	Reedy Creek	6/9/2016	19:30	JO	E. Coli		61	1	MPN/100 mL	SM 20 9223 B	MM
AB17249	Reedy Creek	6/9/2016	19:30	JO	Ammonia by TNT		0.074	0.015	mg/L	HACH	MM
AB17249	Reedy Creek	6/9/2016	19:30	JO	Total Nitrogen	<	1	1	mg/L	TN HACH	MM
AB06654	Reedy Creek	10/8/2015	18:36	JO	E. Coli		53	1	MPN/100 mL	SM 20 9223 B	KAA
AB05820	Upham Brook	9/22/2015	18:45	LC	E. Coli		46	1	MPN/100 mL	SM 20 9223 B	SF
AB05820	Upham Brook	9/22/2015	18:45	LC	Ammonia	<	0.1	0.1	mg/L	EPA 350.1	FB
AB05820	Upham Brook	9/22/2015	18:45	LC	Dissolved Oxygen		6.2		mg/L	SM18/4500-O G	LC
AB05820	Upham Brook	9/22/2015	18:45	LC	pH		7.3		su	SM 20 4500 H+ B	LC
AB05820	Upham Brook	9/22/2015	18:45	LC	Temperature in °C		22.4		°C	SM 20 2550 B	LC
AB07814	Upham Brook	10/29/2015	17:30	LC	E. Coli		649	1	MPN/100 mL	SM 20 9223 B	FG
AB07814	Upham Brook	10/29/2015	17:30	LC	Ammonia		0.1	0.1	mg/L	EPA 350.1	KAA
AB08853	Upham Brook	11/25/2015	08:00	LC	Ammonia		0.2	0.1	mg/L	EPA 350.1	MM
AB08853	Upham Brook	11/25/2015	08:00	LC	E. Coli		54	1	MPN/100 mL	SM 20 9223 B	FG
AB08853	Upham Brook	11/25/2015	08:00	LC	pH		7.6		su	SM 20 4500 H+ B	LC
AB08853	Upham Brook	11/25/2015	08:00	LC	Temperature in °C		6.0		°C	SM 20 2550 B	LC
AB12969	Upham Brook	2/28/2016	16:10	LC	Ammonia		0.3	0.1	mg/L	EPA 350.1	FB
AB12969	Upham Brook	2/28/2016	16:10	LC	E. Coli		14	1	MPN/100 mL	SM 20 9223 B	KLP
AB12969	Upham Brook	2/28/2016	16:10	LC	pH		7.6		su	SM 20 4500 H+ B	LC
AB12969	Upham Brook	2/28/2016	16:10	LC	Temperature in °C		10.4		°C	SM 20 2550 B	LC

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070115 Boulevard Auto IDDE	7/1/2015	3308 N. Boulevard Avenue	COR IDDEP followed-up on a VDEQ-forwarded complaint regarding employees at the Boulevard Auto facility improperly disposing of gray water from recreational vehicles (RV). Personnel spoke with a Boulevard Auto employee who said that gray water from the RV sink and shower wastewater tank is regularly discharged onto a landscaped area along the westernmost boundary of the parcel.	A problem notification was issued to the operator of the facility.	Periodic observation of the impacted area has not revealed evidence of additional illicit discharges. Final inspection of the area occurred on July 14, 2016.	7/14/2016
070215 CFS Citizen Complaint IDDE	7/2/2015	801 E Main Street	COR-IDDEP followed-up on a citizen complaint of a CFS refuse collection vehicle leaking what appeared to be leachate onto the ground. Although COR-IDDEP were not able to view the leaking vehicle, a corrective actions report was requested from CFS regarding the leachate release.	When the corrective actions report was not received by the requested date, COR IDDEP requested help from the City of Richmond's procurement department - since CFS is currently contracted as the City's waste hauler. The Procurement Department requested the documentation via their CFS contract. The requested material was received on August 6, 2015.	Not required.	08/06/2016
071615 ARCenter Line Blockage IDDE	7/16/2015	3600 Saunders Avenue	COR-IDDEP responded to a request for assistance submitted by the DPU Sewer Collections group stemming from a sewer blockage near ARCenter. A discussion with site contractors and the site president Mr. Butler revealed that the improper disposal of diapers and other personal care items is constricting the flow in the sanitary line and is a reoccurring issue with the staff of ARCenter requiring immediate attention.	A problem notification was issued requiring corrective actions to address the improper disposal of personal care items. The corrective actions were received and were found to be adequate.	A follow up inspection performed on 7/1/16 revealed no obvious blockages or issues in the sanitary line down stream of the ARC facility on Seddon Way.	7/1/2016
072215 Southwood Apartments Overflow IDDE	7/22/2015	1600 Clarkson Road	COR-IDDEP responded to a request for assistance submitted by the DPU Sewer Collections group stemming from a sewer overflow near Southwood Apartments. The sanitary back-up was associated with a failing pump at a privately owned pump station. Sanitary sewage from the pump station was discharging into a channelized branch of Broad Rock Creek (BRC). Sewer maintenance crews were able to locate Southwood Apartments maintenance staff and alert them of the issue. Southwood Apartments maintenance staff stated they would respond immediately to the issue.	This incident was forwarded to VDEQ for review on July 22, 2015. On August 6, 2015 a follow up site visit revealed continued release of sanitary waste into Broad Rock Creek. Mr. Racine of Richmond Code Enforcement responded to the scene and issued a violation notice. VDEQ issued an NOV on September 17, 2015.	A follow up inspection revealed that the main pump had been replaced, the pump house floor drain was sealed, and a berm was installed on the down slope side of the pump house to contain any future releases.	8/11/2015
072815 Tredegar Petroleum IDDE	7/28/2015	Tredegar Street, near Brown’s Island	COR-IDDEP responded to an internal report of a potential petroleum release near Brown's Island. Upon arrival to the scene a bright orange foam, a dark brown substance that appeared to be weathered oil, and a sheen were observed on the water surface. No obvious source for the sheen was identified.	Sample results did not indicate elevated levels of petroleum product.	A follow up inspection performed on 7/1/16 did not reveal the continued presence of the orange foam or brown substance that was initially observed.	7/1/2016

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072915 Los Amigos IDDE	7/29/2015	6835 Midlothian Turnpike	COR-IDDEP observed evidence of a discharge from a sanitary cleanout located in a parking area associated with Los Amigos restaurant during routine field operations. A strong grease odor and accumulation of grease and wet wipes were observed on the pavement surrounding the cleanout. No active discharge was observed. Damp pavement was observed from the cleanout stretching approximately 25' down the parking lot.	Mr. Dickerson of PDR is issuing an NOV to the facility owner. A follow up site inspection is slated to occur upon notice of sanitary line maintenance and spill remediation.	A follow up inspection performed on 7/1/2016 revealed no obvious impact or continued release of sanitary waste.	7/1/2016
091015 Taphouse IDDE	9/10/2015	111 Virginia Street Suite #100	COR-IDDEP observed uncontained washing of restaurant hood filters during routine field operations.	An NOV was issued to the Taphouse general manager since a verbal notification of MS4 policy had been issued during a FOG inspection performed in May 2015 with the facility manager.	Periodic observation of the area has not revealed evidence of continued uncontained filter cleaning operations. Final inspection of the area occurred on July 1, 2016.	7/1/2016
092415 PolyChem Environmental IDDE	9/18/2015	1400 Ingram Avenue	On September 24th, COR IDDEP responded to a forwarded citizen complaint from the VDEQ. According to the citizen complaint, employees at the Polychem Environmental facility were dumping "chemicals" into a nearby storm drain. The original complaint was logged on September 18, 2015. Although no dumping or obvious evidence of dumping was observed during site reconnaissance, COR IDDEP were able to speak with the owner of the property, Carl Rogers, regarding the complaint. Mr. Rogers stated that he was unaware of any sort of dumping by his employees. Mr. Rogers also suggested that the report may have been fraudulently submitted by a recently terminated employee. While onsite, COR IDDEP observed an uncovered materials storage area which included multiple unlabeled 55-gallon drums and 5-gallon pails. COR IDDEP informed Mr. Rogers that the material as it was stored was considered a threatened discharge to the MS4 and that the storage area would need to be mitigated.	While onsite, COR IDDEP observed an uncovered materials storage area which included multiple unlabeled 55-gallon drums and 5-gallon pails. COR IDDEP informed Mr. Rogers that the material as it was stored was considered a threatened discharge to the MS4 and that the storage area would need to be mitigated. Mr. Rogers agreed to make sure the materials stored in this area were properly stored and or disposed of. A follow-up meeting at the Polychem Environmental facility is scheduled to occur on October 16, 2015. 10/16/15 - Follow-Up inspection did not reveal a change in site conditions. NOV issued. Abatement must occur by 11/20/2015.	A follow-up site inspection performed on November 20, 2015 revealed that the site had been adequately mitigated.	11/20/2015
110615 Minefee Discharge IDDE	11/06/2015	1411 Minefee Drive	COR-IDDEP responded to an internal request to determine if there was a sanitary component in a ponded area under a residential property. Tenants believed a potable water leak was occurring in the crawl space of the property. COR IDDEP observed a large area of ponded water in the crawl space. Samples of the ponded water and analyzed for Fluoride, E. Coli and AMM (TNT).	Sample results revealed the ponded water was potable water. A summary of the analytical results was forwarded to the PDR complainant.	Not required.	11/06/2015

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111615 Sonoco Release IDDE	11/16/2015	1850 Commerce Road	COR IDDEP investigated a self-reported release of process wastewater from Sonoco Products to nearby Goode's Creek on November 16, 2016. Sonoco contract employees were observed to have initiated mitigation activities during inspection. A full account of the incident can be found on the shared server at G:\Illicit Discharge\2015\111615 Sonoco Richmond Plant IDDE.	Sonoco Products Company initiated mitigation upon discovery of the release. In addition to cleaning up solid material associated with release, the Sonoco remediation plan included the construction of an earthen berm around the perimeter of sensitive and impacted areas to prevent any future releases from impacting Goode's Creek.	Follow-up correspondence from Sunoco stated that the earthen berm construction was completed on April 6, 2016. A photo of the bermed area was included with the correspondence.	04/06/2016
112515 Cronin Drive IDDE	11/25/2015	4737 Cronin Drive	COR-IDDEP responded to an internal report of a potential illicit discharge from a recreational vehicle located on a residential property. Inspection of the RV revealed no evidence of a sanitary release or an illicit sanitary connection.	Not applicable.	Not required.	11/25/2015
120815 Archer Springs Sediment IDDE	12/08/2015	Duryea Drive, near Huguenot Avenue	COR IDDEP observed failing erosion and sediment controls associated with new construction at Archer Springs while performing outfall reconnaissance activities. The failing erosion and sediment controls had resulted in an unplanned culvert facilitating sediment migration to Pittaway Creek.	COR IDDEP contacted DPU Water Resources regarding the issue.	Follow-up inspection of the impacted area revealed the ESC controls had been repaired.	12/10/2015
020316 The Continental IDDE	2/3/2016	5704 Grove Avenue	During a FOG inspection, excessive grease drippings were observed around the Continentals' Valley Protein rendering bins. The grease was uncontained and observed to be migrating down the restaurant driveway onto Granite Ave. A grease smell and minor grease accumulation was observed in the stormwater drop inlet located on the corner of York Rd and Granite Ave.	An NOV was mailed to the owner of the restaurant, Mr. John Giavos, requesting remediation of the spill within 10 days.	A follow up inspection performed on 2/17/2016 revealed that the surface grease was removed from the pavement in the restaurant service area. The grease bins have been replaced and re-located onto the service area pad. Grease staining and order remains in the sloped driveway behind the restaurant. No obvious grease accumulation or smell was observed in or around the drop inlet on the corner of York Rd and Granite Ave.	2/17/2016
022216 Stratford Hills UST IDDE	2/22/2016	2805 Hathaway Road	COR IDDEP responded to a VDEQ pollution complaint. VDEQ pollution response coordinator was onsite. Diesel impact likely due to nearby leaking UST. The majority of the released material is anticipated to have migrated downstream of the release point.	VDEQ to initiate pollution clean-up response.	A follow-up investigation of the impacted area did not reveal obvious evidence of continued petroleum impact.	07/12/2016

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041816 St. David's Lane IDDE	4/18/2016	312 St. David's Lane	COR-IDDEP responded to the following forwarded citizen report: "Citizen concerned tributary behind his house may be impacted by sanitary sewer. Citizen states that in the recent past, a sanitary sewer overflow associated with a manhole casing behind his house had occurred." Evidence of this incident was observed. However, no discharge was observed during site reconnaissance. Citizen stated he was concerned about the odor and that sanitary may be entering the tributary upstream of his property. Samples were collected and the interior of the sanitary casing was observed. Flow on the interior of the casing did not appear to be impaired.	A summary of the investigation will be issued to the VDEQ and the homeowner.	Analytical results collected from the property did not reveal a sanitary impact. A summary of the findings was forwarded to the homeowner.	4/22/2016
052316 Chimborazo Dog Park IDDE	4/28/2016	Chimborazo Dog Park Parking Area	COR-IDDEP responded to an internal report of a possible illicit discharge near a spring in Chimborazo Park. Flow was observed and water quality samples were collected. No odor or other indicators of an illicit discharge were observed in association with the flow.	Water quality samples did not identify a sanitary component in the flow. It is anticipated that the discharge is related to the nearby spring.	Not required.	5/23/2016
051216 Pizza Hut Midlothian IDDE	5/12/2016	5817 Midlothian Turnpike	Environmental Tech II observed illicit discharge from clean out at Pizza Hut Restaurant located at 5817 Midlothian Turnpike.	Issued Notice of Violation	Follow-up inspection of the facility on 05/13/2016 revealed that the issue had been adequately mitigated.	5/13/2016
051916 133 Belt Boulevard IDDE	5/19/2016	133 Belt Boulevard	While on site inspection at the property at 133 Belt Boulevard, COR IDDEP noted that poor housekeeping from onsite vehicle operations were resulting in a potential discharge of vehicle fluids to the MS4.	Notice of Violation issued 05/19/16 for threatened discharge to the MS4.	Follow-up inspection of the facility on 05/31/2016 revealed that the issue had been adequately mitigated.	5/31/2016
051916 Trestle Release IDDE	5/19/2016	Flood wall, near the City of Richmond retention basin	COR-IDDEP responded to a forwarded citizen report of a petroleum release near the canal walk / Kanawha Canal. The release of petroleum product was sourced to train trestles over access road leading to retention basin entrance.	Released mitigated with sorbent. Sorbent disposed of at WWTP.	On 05/2016, the remainder of sorbent cleared and disposed of.	5/20/2016
060816 Aspen Products IDDE	6/8/2016	1416 Enfield Road	COR-IDDEP responded to a forwarded citizen report of a possible release to Albro Creek. Upon arrival , DPU IDDEP observed a milky substance in nearby Albro Creek. COR IDDEP tracked the release to a nearby industry, Aspen Products located at 1500 Jefferson Davis Highway. According to a site manager, an accidental release of food-grade lacquer had occurred while refilling a 250-gallon tote. DPU IDDEP noted that while an attempt had been made to mitigate the release, the lacquer continued to discharge to Albro Creek. Since the release was directly to waters of the state, COR IDDEP notified the VDEQ.	COR IDDEP contacted the VDEQ and waited onsite until the Pollution Response Coordinator arrived. VDEQ instructed Aspen Products to contract a clean-up company to adequately respond to the release. Since the release occurred directly to waters of the state, any further enforcement will be pursued by VDEQ.	A follow-up inspection of the Aspen Products release site and the impacted area on June 09, 2016 revealed that the issue had been adequately mitigated. Follow-up photos can be viewed at G:\Illicit Discharge\2016\060816 Aspen Products IDDE\Photos.	06/09/2016

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060916 HSC Follow-Up IDDE	6/9/2016	Laburnum Avenue and Edgewood Street	COR IDDEP observed indications of a sanitary impact to outfall HSC-018 during initial outfall reconnaissance operations along Horse Swamp Creek performed in Spring of 2016. Outfall HSC-018 consists of two RCP barrels situated in a concrete headwall. The north barrel heads west down Laburnum Avenue, while the south barrel heads southeast towards Edgewood Road. A subsequent investigation of each barrel revealed that both barrels were likely being impacted by sanitary sewage. COR IDDEP were unsuccessful in determining the exact source(s) of the impacts or whether the impact was from inflow/infiltration or cross connection.	A summary of the investigation along with a request for assistance in repairing the impact was forwarded to the sewer collections group (P. Wyatt/J. Wyatt) on June 15, 2016. Sewer collections crews investigated the issue on June 16, 2016. Based on a conversation with the collections group supervisor, crews were able to determine the cause of the sanitary impacts and mitigate the issues. Follow-up sampling of HSC-018 to determine if if the sanitary impact has been adequately mitigated is slated to occur.	Samples from both the north and south barrels of the headwall at the headwaters of HSC were collected on 08/31/2016. Samples were collected in dry weather conditions. Analytical results did not reveal a continued sanitary impact to either barrel.	09/02/2016
061616 Abandoned Drums IDDE	6/16/2016	6290 Old Warwick Road	While performing routine field operations, COR-IDDEP observed two 55-gallon drums and 2 canisters of used petroleum product to be lacking cover and secondary containment. Staining on the ground surrounding the containers indicated a release of the inadequately stored materials.	A violation notice requiring remediation of drums and spilled petroleum product was issued to the property owner on 6/16/16. A Second NOV was issued for incomplete abatement of the spilled petroleum product on 7/1/16.	A follow up inspection performed on 7/22/2016 revealed that the spilled petroleum product was properly abated.	7/22/2016
062115 Longview Court IDDE	06/21/2016	7325 Longview Court	COR IDDEP received a forwarded citizen complaint from Howard Glenn regarding a seep discharge at a residential property at 7325 Longview Court. DPU personnel had been to the residence once before to investigate the flow. The previous investigation consisted of a chorine sample of the flow and a sonic test of the line to determine if the flow was associated with a faulty water main. These samples did not indicate a potable water impact. COR IDDEP sampled the flow for both sanitary and potable components. Neither sanitary nor potable water components were identified in the flow. A CFL comparison of the analytical results indicate that the flow at the property at 7325 Longview Court is likely groundwater.	Once the flow was determined not to be sourced to any sort of COR Utility, the homeowner requested that the City of Richmond assess the cul-de-sac at Longview Court for MS4 installation to reduce stormwater flow across his property during rain events. DPU's Deputy Director volunteered to forward the homeowner's request to the DPU's Engineering Department to determine if the area could reviewed for Capital Improvements.	Not required.	06/29/2016
062216 Bellemeade Community Center IDDE	6/22/2016	1800 Lynnhaven Ave Richmond, VA 23224	COR-IDDEP observed sanitary wastewater leaking from under bare soil slope adjacent to Albro Creek while performing routine field operations. Heavy equipment tracks on the slope indicated a crushed sewer pipe.	Pipe Vision Crew and Richmond Sewer Collections Crew arrived on site within 40 min of initial report of sanitary release. The sanitary line was crushed during stream bank restoration work. The sanitary line was jetted and the release was stopped around 3:45 on 6/22. Pipe repairs are slated to occur.	A follow up inspection on 7/1/16 revealed abatement of the sanitary release from a crushed sewer pipe. Silt fence was installed at the toe of the denuded slope adjacent to Albro Creek.	7/1/2016

Street Number	Street Name	Zip Code	GPS Coordinates Latitude	GPS Coordinates Longitude	HUC 12	VAHU6 (6th Order)	Impaired Water Segments within VAHU6	Drains to:	SCM	SCM Type	Total Treated Area (Acres)	Impervious Treated Area (Acres)	Pervious Treated Area (Acres)	Soil Type/ Underlying Conditions	Sediment	Phosphorus	Nitrogen	Date Brought Online	Owner Type	Owner	Maintenance Agreement	Most Recent Inspection
8201	Ammonett Drive	23235	37.5379450	-77.5478520	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Infiltration Trench	Infiltration Practices w/o Sand, Vegetation	0.03	0.03	0	B	19.3	0.0	0.2	7/20/2007	Private	Hormachea & Moody	None	6/19/2012
4210	Apache Court	23235	37.5523690	-77.5799990	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Forebay	Wet Ponds	351.2	58.91	292.29	B	41653.9	112.4	519.3	5/12/2014	Private	Louise T. Hoffman	None	5/12/2014
708	Bainbridge Street	23224	37.5238530	-77.4412160	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Bio-filtration	Bioswale	1.17	1.05	0.12	D	578.3	1.4	7.5	2/16/2008	Private	W M J Richmond LLC	None	10/31/2011
1000	Bainbridge Street	23224	37.5223350	-77.4434890	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Raingarden/basin	Bioretention A/B Soils, Underdrain	0.71	0.5	0.21	B	287.8	0.7	4.3	9/21/2012	Private	City View Place Limited	None	9/21/2012
2409	Bainbridge Street	23225	37.5174070	-77.4561950	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Hydraulic Detention	No Water Quality Credit Given	0.52	0.18	0.34	C	0.0	0.0	0.0	9/27/2011	Private	Boys & Girls Club of Richmond	None	3/22/2014
2409	Bainbridge Street	23225	37.5174070	-77.4561950	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Hydraulic Detention	No Water Quality Credit Given	0.94	0.29	0.65	C	0.0	0.0	0.0	9/27/2011	Private	Boys & Girls Club of Richmond	None	3/22/2014
1708	Belleville Street	23230	37.5737650	-77.4727710	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	CSS	Grassed Swale	Bioswale	0.09	0.04	0.05	D	25.7	0.1	0.5	9/27/2014	Private	Inland Harbor LLC	None	6/24/2014
1708	Belleville Street	23230	37.5737650	-77.4727710	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	CSS	Grassed Swale	Bioswale	0.15	0.12	0.03	D	67.4	0.2	0.9	9/27/2014	Private	Inland Harbor LLC	None	6/24/2014
301	Belt Boulevard	23224	37.5067330	-77.4790500	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.46	0.46	0	Impermeable Barrier	249.1	0.5	1.7	1/15/2010	Private	GRTC Transit System	None	5/15/2014
301	Belt Boulevard	23224	37.5067330	-77.4790500	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.5	0.5	0	Impermeable Barrier	270.8	0.5	1.9	1/15/2010	Private	GRTC Transit System	None	5/15/2014
301	Belt Boulevard	23224	37.5067330	-77.4790500	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.32	0.32	0	Impermeable Barrier	173.3	0.3	1.2	1/15/2010	Private	GRTC Transit System	None	5/15/2014
301	Belt Boulevard	23224	37.5067330	-77.4790500	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.5	0.5	0	Impermeable Barrier	270.8	0.5	1.9	1/15/2010	Private	GRTC Transit System	None	5/15/2014
301	Belt Boulevard	23224	37.5067330	-77.4790500	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.33	0.33	0	Impermeable Barrier	178.7	0.3	1.2	1/15/2010	Private	GRTC Transit System	None	5/15/2014
301	Belt Boulevard	23224	37.5067330	-77.4790500	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.5	0.5	0	Impermeable Barrier	270.8	0.5	1.9	1/15/2010	Private	GRTC Transit System	None	5/15/2014
301	Belt Boulevard	23224	37.5067330	-77.4790500	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.36	0.36	0	Impermeable Barrier	195.0	0.4	1.4	1/15/2010	Private	GRTC Transit System	None	5/15/2014
301	Belt Boulevard	23224	37.5067330	-77.4790500	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Piped Detention	No Water Quality Credit Given	11.55	10.71	0.84	Impermeable Barrier	0.0	0.0	0.0	1/15/2010	Private	GRTC Transit System	None	5/15/2014
23B	Boatwright Drive	23226	37.5803680	-77.5387340	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Piped Detention	No Water Quality Credit Given	0.52	0.52	0	Impermeable Barrier	0.0	0.0	0.0	7/15/2010	Private	University of Richmond	None	3/17/2014
2845	Broad Rock Blvd	23224	37.4788250	-77.4799730	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	MS4	Detention Basin	Dry Detention Ponds	0.22	0	0.22	B	2.2	0.0	0.1	11/9/2010	Private	Edak LLC	None	5/12/2014
2990	Broad Rock Blvd	23224	37.4760390	-77.4828900	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	MS4	Concrete Swale with Weir for Detention	No Water Quality Credit Given	0.45	0.23	0.22	Impermeable Barrier	0.0	0.0	0.0	3/2/2012	Private	Atlantic Korean American	None	6/19/2012
6501	Buckhill Road	23225	37.5414510	-77.5112840	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Bioretention filter	Bioretention A/B Soils, Underdrain	0.125	0.125	0	B	67.7	0.2	0.8	9/10/2009	Private	Gardner Edward DJR	None	9/21/2011
4004	Cary Street Road	23221	37.5602150	-77.4930730	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Piped Detention	No Water Quality Credit Given	0.9	0.67	0.23	Impermeable Barrier	0.0	0.0	0.0	4/16/2010	Private	Malvern Manor Apartments LLC	None	6/19/2012
4004	Cary Street Road	23221	37.5602150	-77.4930730	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Piped Detention	No Water Quality Credit Given	0.66	0.45	0.21	Impermeable Barrier	0.0	0.0	0.0	4/16/2010	Private	Malvern Manor Apartments LLC	None	6/19/2012
4004	Cary Street Road	23221	37.5602150	-77.4930730	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Piped Detention	No Water Quality Credit Given	1.4	0.66	0.74	Impermeable Barrier	0.0	0.0	0.0	4/16/2010	Private	Malvern Manor Apartments LLC	None	6/19/2012
4200	Cary Street Road	23221	37.5605980	-77.4959580	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Filterra™	Filtering Practices	0.777	0.59	0.187	Impermeable Barrier	334.6	0.7	2.7	5/2/2012	Private	Reveille United Methodist Church Trust	None	5/15/2013
4200	Cary Street Road	23221	37.5605980	-77.4959580	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Filterra™	Filtering Practices	0.749	0.572	0.177	Impermeable Barrier	324.1	0.7	2.6	5/2/2012	Private	Reveille United Methodist Church Trust	None	5/15/2013
4200	Cary Street Road	23221	37.5605980	-77.4959580	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Piped Detention	No Water Quality Credit Given	2.15	1.663	0.487	Impermeable Barrier	0.0	0.0	0.0	5/2/2012	Private	Reveille United Methodist Church Trust	None	5/15/2013
1904	Cedar Street	23223	37.5374360	-77.4211930	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Piped Detention	No Water Quality Credit Given	2.02	1.65	0.37	Impermeable Barrier	0.0	0.0	0.0	6/26/2015	Private	Cedar Street Genesis LLC	None	6/26/2015
1415	Chamberlayne Parkway	23220	37.5556040	-77.4374120	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Extended Detention Pond	Dry Extended Detention Ponds	9.62	7.526	2.094	Impermeable Barrier	3183.8	2.9	17.1	12/4/2012	Private	VCU Holdings LLC	Draft to City Attorney	5/15/2013
2219	Chamberlayne Parkway	23220	37.5634420	-77.4429630	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	StormTech Chamber System	Filtering Practices	1.83	1.83	0	Impermeable Barrier	991.0	1.9	6.9	1/7/2009	Public	City of Richmond	Not required	9/29/2015

9131	Cherokee Road	23235	37.5547410	-77.5639800	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Filterra™	Filtering Practices	0.26	0.26	0	D	140.8	0.3	1.0	9/30/2009	Private	Stony Point Land INC	None	7/27/2011
9131	Cherokee Road	23235	37.5547410	-77.5639800	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Filterra™	Filtering Practices	0.75	0.75	0	D	406.2	0.8	2.8	9/30/2009	Private	Stony Point Land INC	None	7/27/2011
9131	Cherokee Road	23235	37.5547410	-77.5639800	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Filterra™	Filtering Practices	1.05	1.05	0	D	568.6	1.1	3.9	9/30/2009	Private	Stony Point Land INC	None	7/27/2011
9131	Cherokee Road	23235	37.5547410	-77.5639800	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Filterra™	Filtering Practices	1.05	1.05	0	D	568.6	1.1	3.9	9/30/2009	Private	Stony Point Land INC	None	7/27/2011
9131	Cherokee Road	23235	37.5547410	-77.5639800	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Filterra™	Filtering Practices	0.23	0.23	0	D	124.6	0.2	0.9	9/30/2009	Private	Stony Point Land INC	None	7/27/2011
10655	Cherokee Road	23235	37.5536610	-77.5939180	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Extended Detention	Dry Extended Detention Ponds	0.89	0.89	0	B	361.5	0.3	1.7	9/1/2009	Private	Drs. James Crichton	None	9/30/2015
4300	Commerce Road	23234	37.4669050	-77.4274780	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Filterra™	Filtering Practices	0.22	0.16	0.06	Impermeable Barrier	91.5	0.2	0.8	7/22/2009	Private	Shamin Hospitality Group	None	7/3/2014
4300	Commerce Road	23234	37.4669050	-77.4274780	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Filterra™	Filtering Practices	0.16	0.12	0.04	Impermeable Barrier	68.2	0.1	0.6	7/22/2009	Private	Shamin Hospitality Group	None	7/3/2014
4300	Commerce Road	23234	37.4669050	-77.4274780	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Filterra™	Filtering Practices	0.11	0.08	0.03	Impermeable Barrier	45.8	0.1	0.4	7/22/2009	Private	Shamin Hospitality Group	None	7/3/2014
315	Cowardin Ave	23224	37.5221670	-77.4506690	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Piped Detention	No Water Quality Credit Given	0.69	0.69	0	Impermeable Barrier	0.0	0.0	0.0	11/24/2014	Private	Cole Properties LLC	None	4/1/2014
600	Cowardin Ave	23224	37.5240250	-77.4526440	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Tank Detention	No Water Quality Credit Given	0.36	0.36	0	Impermeable Barrier	0.0	0.0	0.0	11/12/2014	Private	Richmond Overlook LP	None	11/12/2014
45	Crenshaw Way	23226	37.5731250	-77.5425660	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Grassed Swale	Vegetated Open Channels A/B Soils, No Underdrain	5.07	1.85	3.22	B	1104.5	2.2	17.9	7/10/2014	Private	University of Richmond	None	9/29/2015
1800	Crenshaw Way	23226	37.5721820	-77.5415730	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Filterra™	Filtering Practices	0.54	0.38	0.16	B	217.8	0.4	1.9	4/27/2011	Public	University of Richmond	Not required	9/29/2015
4321	Custis Road	23225	37.5554100	-77.5362290	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Grassed Swale	Vegetated Open Channels A/B Soils, No Underdrain	3.25	0.27	2.98	B	338.8	0.9	10.5	6/30/2008	Private	Neuner John IV & Corbin W	None	6/19/2012
815	Decatur Street	23224	37.5220760	-77.4409030	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Detention Pond	Dry Detention Ponds	1.08	0	0	D	0.0	0.0	0.0	3/5/2009	Public	City Of Richmond Real Estate Services	Not required	6/5/2015
3600	Deepwater Terminal Road	23234	37.4753570	-77.4259720	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Detention Basin	Dry Detention Ponds	37.3	17.7	19.6	D	1396.3	4.1	15.2	4/15/2014	Private	3800 Deepwater Terminal LLC	None	4/14/2014
5000	Deepwater Terminal Road	23234	37.4548170	-77.4226990	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Detention Basin	Dry Detention Ponds	0.89	0.89	0	D	60.2	0.2	0.4	Expired permit	Public	City of Richmond	Not required	6/19/2015
2803	Dock Street	23223	37.5262670	-77.4209990	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Bioretention Basin	Bioretention C/D Soils, Underdrain	0.41	0.236	0.174	D	97.5	0.2	0.9	6/1/2014	Public	City of Richmond	Not required	6/5/2015
1132	Dove Street	23222	37.5630990	-77.4251020	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Wet Pond	Wet Ponds	7.92	4.51	3.41	C	2040.1	4.3	13.2	2/5/2015	Private	RRHA	None	2/5/2015
102	East 10th Street	23224	37.5209220	-77.4410720	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	StormTech Underground Detention	Filtering Practices	0.4	0.32	0.08	C	179.8	0.4	1.4	4/8/2008	Public	City of Richmond	Not required	5/15/2014
801	East 4th Street	23224	37.5185980	-77.4317060	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Infiltration Trench	Infiltration Practices w/o Sand, Vegetation	0.91	0.74	0.17	D	492.2	1.2	6.5	9/20/2011	Private	Gordon Avenue Investments	None	9/20/2011
1200	East Byrd Street	23219	37.5336040	-77.4348980	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Manufactured System - Storm Filter	Filtering Practices	0.55	0.55	0	Impermeable Barrier	297.9	0.6	2.1	4/17/2015	Private	The Locks Building 5 LLC	None	4/17/2015
1810	East Cary Street	23223	37.5320250	-77.4284150	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Focal Point™	Bioretention C/D Soils, Underdrain	0.82	0.82	0	Impermeable Barrier	305.3	0.6	1.9	4/1/2014	Private	Bacon Housing SCP LP	None	4/1/2014
2100	East Cary Street	23223	37.5303460	-77.4250260	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Stormpure Unit	Infiltration Practices w/o Sand, Vegetation	0.107	0.107	0	D	68.8	0.2	0.8	4/20/2007	Private	Fc Edgeworth Lessor LLC	None	9/29/2015
2101	East Cary Street	23223	37.5299640	-77.4254530	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Stormpure Unit	Infiltration Practices w/o Sand, Vegetation	0.15	0.15	0	D	96.5	0.2	1.1	5/16/2007	Private	Fc Consolidated Lessor LLC Forest City Residential Group	None	6/30/2011
2600	East Cary Street	23223	37.5276490	-77.4204790	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Filterra™	Filtering Practices	0.06	0.06	0	Impermeable Barrier	32.5	0.1	0.2	11/7/2008	Private	Fc Lucky Strike Lessor LLC C/O Forest City Tax Dept. Shared	None	6/12/2013
2600	East Cary Street	23223	37.5276490	-77.4204790	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Filterra™	Filtering Practices	0.06	0.06	0	Impermeable Barrier	32.5	0.1	0.2	11/7/2008	Private	Fc Lucky Strike Lessor Llc C/O Forest City Tax Dept. Shared	None	6/12/2013
1015	East Clay Street	23219	37.5417949	-77.4310947	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Bioretention Cell	Bioretention C/D Soils, Underdrain	0.08	0.08	0	D	29.8	0.1	0.2	10/13/2011	Private	Valentine Richmond History Center	Yes	10/31/2011
1709	East Clay Street	23223	37.5374400	-77.4242920	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Rain Garden	Bioretention C/D Soils, Underdrain	0.388	0.384	0.004	D	143.2	0.3	0.9	11/16/2011	Private	1709 East Clay Street LLC	None	4/21/2014
1533	East Main Street	23219	37.5335620	-77.4299320	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	CSS	Filterra™	Filtering Practices	0.3	0.3	0	Impermeable Barrier	162.5	0.3	1.1	9/10/2007	Public	City of Richmond	Not required	6/18/2015

1533	East Main Street	23219	37.5335620	-77.4299320	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	CSS	Filterra™	Filtering Practices	0.24	0.22	0.02	Impermeable Barrier	120.8	0.2	0.9	9/10/2007	Public	City of Richmond	Not required	6/18/2015
2823	East Main Street	23223	37.5263900	-77.4191740	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Detention Pond	Dry Detention Ponds	1.05	0.68	0.37	D	49.8	0.1	0.4	12/11/2012	Private	Rocketts View LP	none	12/11/2012
2823	East Main Street	23223	37.5263900	-77.4191740	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Filterra™	Filtering Practices	0.41	0.32	0.09	Impermeable Barrier	178.6	0.4	1.4	12/11/2012	Private	Rocketts View LP	none	12/11/2012
4804	East Main Street	23231	37.5174560	-77.4149630	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Stormceptor™	Hydrodynamic Structures	1.5	1.5	0	Impermeable Barrier	101.5	0.3	0.7	4/1/2011	Private	Central Virginia Investments Rocketts Landing LLC	Yes*	11/10/2011
3000	East Marshall Street	23223	37.5300480	-77.4128020	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Bioretention	Bioretention C/D Soils, Underdrain	0.58	0.46	0.12	C	177.9	0.4	1.3	5/1/2013	Public	City of Richmond	Not required	9/29/2015
3000	East Marshall Street	23223	37.5300480	-77.4128020	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Bioretention	Bioretention C/D Soils, Underdrain	0.56	0.37	0.19	C	148.3	0.3	1.2	5/1/2013	Public	City of Richmond	Not required	9/29/2015
3000	East Marshall Street	23223	37.5300480	-77.4128020	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Planter	Infiltration Practices w/ Sand, Vegetation	0.42	0.3	0.12	C	204.5	0.5	3.1	10/9/2013	Public	City of Richmond	Not required	9/29/2015
3000	East Marshall Street	23223	37.5300480	-77.4128020	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Planter	Infiltration Practices w/o Sand, Vegetation	0.62	0.27	0.35	C	207.2	0.6	4.0	10/9/2013	Public	City of Richmond	Not required	9/29/2015
3000	East Marshall Street	23223	37.5300480	-77.4128020	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Planter	Infiltration Practices w/o Sand, Vegetation	0.37	0.37	0	C	237.9	0.6	2.8	10/9/2013	Public	City of Richmond	Not required	9/29/2015
1701	Fairfield Way	23223	37.5467640	-77.4230350	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Underground detention	No Water Quality Credit Given	5.67	2.86	2.81	Impermeable Barrier	0.0	0.0	0.0	3/12/2015	Public	City of Richmond	Not required	3/12/2015
4615	Ferguson Lane	23234	37.4764100	-77.4786680	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	MS4	Bioretention	Bioretention C/D Soils, Underdrain				B/C	0.0	0.0	0.0	5/1/2013	Public	City Of Richmond School Board	Not required	4/17/2015
5916	Ferguson Road	23225	37.5081600	-77.4918590	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Bioretention Cell	Bioretention A/B Soils, Underdrain	0.63	0.63	0	B	341.2	0.8	4.1	5/1/2013	Private	Church Schools in the Diocese	yes	12/6/2011
5916	Ferguson Road	23225	37.5081600	-77.4918590	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Raintank	No Water Quality Credit Given	2.69	0.99	1.7	B	0.0	0.0	0.0	5/1/2013	Private	Church Schools in the Diocese	None	12/6/2011
7846	Forest Hill Ave	23225	37.5336300	-77.5414740	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Detention Basin	Dry Detention Ponds	0.49	0.26	0.23	B	19.9	0.1	0.2	12/1/2006	Private	Howard Worrell W JR	None	6/19/2012
7945	Forest Hill Ave	23225	37.5306240	-77.5421750	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Bioretention	Bioretention C/D Soils, Underdrain	1.13	1.13	0	D	420.7	0.9	2.7	1/16/2015	Public	City of Richmond	Not required	1/16/2015
7945	Forest Hill Ave	23225	37.5306240	-77.5421750	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Mid-Parking WQ Swale	Bioswale	0.33	0.33	0	D	178.7	0.4	2.2	1/17/2015	Public	City of Richmond	Not required	1/16/2015
7945	Forest Hill Ave	23225	37.5306240	-77.5421750	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Lower-Parking WQ Swale	Bioswale	1.49	1.49	0	D	806.9	2.0	9.8	1/18/2015	Public	City of Richmond	Not required	1/16/2015
7945	Forest Hill Ave	23225	37.5306240	-77.5421750	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.81	0.81	0	D	438.7	0.9	3.0	1/19/2015	Public	City of Richmond	Not required	1/16/2015
7945	Forest Hill Ave	23225	37.5306240	-77.5421750	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.46	0.46	0	D	249.1	0.5	1.7	1/20/2015	Public	City of Richmond	Not required	1/16/2015
7945	Forest Hill Ave	23225	37.5306240	-77.5421750	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Underground Extended Detention	No Water Quality Credit Given	11.83	11.83	0	D	0.0	0.0	0.0	1/21/2015	Public	City of Richmond	Not required	1/16/2015
7945	Forest Hill Ave	23225	37.5306240	-77.5421750	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Wet Pond	Wet Ponds	13.05	13.05	0	D	5300.4	10.3	24.5	1/22/2015	Public	City of Richmond	Not required	1/16/2015
1	Gateway Road	23226	37.5780830	-77.5358430	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Piped Detention	No Water Quality Credit Given	1.06	0.68	0.38	Impermeable Barrier	0.0	0.0	0.0	12/6/2010	Private	University of Richmond	None	9/29/2015
2807	Grant Street	23221	37.5500910	-77.4894640	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	CSS	Bioretention Basin	Bioretention C/D Soils, Underdrain	0.1343	0.0723	0.062	C	30.4	0.1	0.3	7/28/2015	Public	City of Richmond	Not required	7/28/2015
301	Hillwood Road	23226	37.5625160	-77.5148960	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Infiltration Trench	Infiltration Practices w/o Sand, Vegetation	0.043	0.043	0	D	27.7	0.1	0.3	10/1/2011	Private	Yuen Pui Fung	None	6/19/2012
301	Hillwood Road	23226	37.5625160	-77.5148960	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Infiltration Trench	Infiltration Practices w/o Sand, Vegetation	0.039	0.039	0	D	25.1	0.1	0.3	10/1/2011	Private	Yuen Pui Fung	None	6/19/2012
200	Hioaks Road	23225	37.5055720	-77.5256150	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Detention Basin	Dry Detention Ponds	4.2	2.52	1.68	B	187.6	0.5	1.8	3/19/2009	Private	Medical Facilities of America	None	8/18/2011
111	Hull Street	23224	37.5269850	-77.4368130	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra	Filtering Practices	0.32	0.32	0	D	173.3	0.3	1.2	pending permit	Private	South Canal LLC	draft to applicant	active permit
721	Hull Street	23224	37.5232810	-77.4410020	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Biofiltration Swale	Bioswale	1.17	1.05	0.12	D	578.3	1.4	7.5	2/16/2008	Private	W M J Richmond LLC	None	5/12/2014
913	Hull Street	23224	37.5224530	-77.4422990	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Detention Basin	Dry Detention Ponds	0.25			B	0.0	0.0	0.0	11/16/2009	Public	City Of Richmond General Services	Not required	6/19/2015
920	Hull Street	23224	37.5223430	-77.4418150	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	StormTech Chamber North	Filtering Practices	1.08	1.06	0.02	C	575.7	1.1	4.0	3/5/2009	Public	City of Richmond	Not required	6/19/2015

920	Hull Street	23224	37.5223430	-77.4418150	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	StormTech Chamber West	Filtering Practices	0.25	0.19	0.06	C	107.7	0.2	0.9	3/5/2009	Public	City of Richmond	Not required	6/19/2015
920	Hull Street	23224	37.5223430	-77.4418150	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	StormTech Chamber East	Filtering Practices	0.4	0.31	0.09	C	175.2	0.4	1.4	3/5/2009	Public	City of Richmond	Not required	6/19/2015
2128	Hull Street	23224	37.5155070	-77.4512710	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Detention Basin	Dry Detention Ponds	1.25	0.44	0.81	Impermeable Barrier	38.0	0.1	0.5	5/15/2014	Private	Par 3 Development LLC	None	5/15/2014
500	Hull Street	23224	37.5239560	-77.4383470	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Bioretention	Bioretention C/D Soils, Underdrain	0.23	0.23	0	C/D	85.6	0.2	0.5	active permit	Private	500 Hull Street LLC	draft to applicant	active permit
500	Hull Street	23224	37.5239560	-77.4383470	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Piped Detention	No Water Quality Credit Given	0.54	0.54	0	Impermeable Barrier	0.0	0.0	0.0	active permit	Private	500 Hull Street LLC	draft to applicant	active permit
5228	Hull Street Road	23224	37.4931790	-77.4884390	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Detention Pond	Dry Detention Ponds	1.16	0.98	0.18	B	68.2	0.2	0.5	9/24/2013	Private	O'Reilly Auto Parts	None	9/24/2013
5326	Hull Street Road	23224	37.4917220	-77.4930950	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Hydraulic Structure - Ditch	No Water Quality Credit Given	8.5	3.28	8.49	D	0.0	0.0	0.0	5/10/2010	Private	Meadow Creek Apartments LLC	None	4/30/2015
1250	Ingram Ave	23224	37.5076220	-77.4345780	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Detention Basin	Dry Detention Ponds	2.54	2.54	0	D	171.9	0.4	1.2	1/3/2014	Private	City Central LLC	None	1/3/2014
1250	Ingram Ave	23224	37.5076220	-77.4345780	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Detention Basin	Dry Detention Ponds	3.28	3.28	0	D	222.0	0.6	1.5	1/3/2014	Private	City Central LLC	None	1/3/2014
6101	Jahnke Road	23225	37.5199550	-77.5098650	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Detention Basin	Dry Extended Detention Ponds	0.46	0.19	0.27	B	93.5	0.1	0.7	5/10/2013	Private	Uncle Properties LLC	None	5/10/2013
6643	Jahnke Road	23225	37.5166730	-77.5188770	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Piped Detention	No Water Quality Credit Given	0	0	0	Impermeable Barrier	0.0	0.0	0.0	1/14/2009	Private	Elijah House Academy	None	11/14/2011
1517	Jefferson Davis Hwy	23224	37.4997940	-77.4460220	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Hydraulic Detention/Ditch	No Water Quality Credit Given	0.67	0.2	0.47	D	0.0	0.0	0.0	4/9/2008	Private	James River Apartments	None	7/27/2011
2600	Jefferson Davis Hwy	23234	37.4879190	-77.4469760	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Contech CDS Vortex Separator	Hydrodynamic Structures	0.51	0.51	0	Impermeable Barrier	34.5	0.1	0.2	8/1/2013	Private	Carpenter E R INC	None	6/12/2013
3911	Jefferson Davis Hwy	23234	37.4713520	-77.4431300	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	MS4	Reduction in Impervious Area - No SCM Require	No Water Quality Credit Given	0.65	0.52	0.13	D	0.0	0.0	0.0	7/25/2014	Private	O'Reily Automotive Stores	reduction in Impervious area no Maintenance agreement needed	7/25/2014
1012	Lafayette Street	23221	37.5675470	-77.4863320	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Piped Detention	No Water Quality Credit Given	0.19	0.16	0.03	Impermeable Barrier	0.0	0.0	0.0	6/24/2011	Private	CDI Lafayette St.	None	5/12/2014
2412	Lakeview Ave	23220	37.5456251	-77.4745972	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.073	0.073	0	Impermeable Barrier	39.5	0.1	0.3	1/13/2012	Private	McCollum Rudolph C. Jr.	None	2/4/2016
508	Libbie Ave	23226	37.5766560	-77.5173570	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Piped Detention	No Water Quality Credit Given	0.207	0.12	0.087	Impermeable Barrier	0.0	0.0	0.0	6/28/2012	Private	Falls Investment LLC	None	6/28/2012
1100	Libbie Ave	23226	37.5813320	-77.5131910	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Piped Detention	No Water Quality Credit Given	1.3	0.704	0.596	Impermeable Barrier	0.0	0.0	0.0	5/5/2014	Private	Bon Secours St Marys Hospital	None	5/5/2014
302	Long Lane	23221	37.5543290	-77.5050430	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Vegetated Filter Strip	Vegetated Open Channels A/B Soils, No Underdrain	0.94	0.28	0.66	B	179.4	0.4	3.3	8/5/2013	Private	Boehling Francis R & Dorian	None	8/2/2013
901	McDonough Street	23224	37.5260350	-77.4458620	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Piped Detention	No Water Quality Credit Given	1.86	1.86	0	Impermeable Barrier	0.0	0.0	0.0	4/10/2013	Private	GII Corp. & Ginn George HTRS	None	4/10/2013
3076	Meadow Bridge Road	23222	37.5716860	-77.4194790	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Piped Detention	No Water Quality Credit Given	0.414	0.324	0.09	Impermeable Barrier	0.0	0.0	0.0	-	Private	Northside Outreach Center Inc.	None	Not Completed
1538	Mechanicsville Tpke	23223	37.5485920	-77.4150390	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Parking Lot Detention	No Water Quality Credit Given	0.44	0.32	0.12	C	0.0	0.0	0.0	3/13/2014	Private	Jamal Investments LLC	None	3/13/2014
3200	Monument Ave	23221	37.5633044	-77.4762319	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Green Alley - Permeable Pavers Between West Franklin St & Monument Ave at 3200 Block	Permeable Pavement w/o Sand, Vegetation C/D Soils, Underdrain	2.18	2.18	0	C	811.7	0.8	2.0	6/25/2012	Public	City of Richmond	Not required	6/10/2015
5609	New Kent Road	23225	37.5314910	-77.4981190	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Bioretention	Bioretention A/B Soils, No Underdrain	0.035	0.035	0	B	21.3	0.1	0.3	7/27/2012	Private	Spiva Tiffany's	None	5/3/2013
5615	New Kent Road	23225	37.5318740	-77.4982160	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Bioretention	Bioretention A/B Soils, No Underdrain	0.063	0.063	0	B	38.4	0.1	0.5	5/4/2013	Private	R.E. Collier Inc.	None	5/3/2013
3200	Norfolk Street	23230	37.5701940	-77.4701540	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Bioretention	Bioretention C/D Soils, Underdrain	1.16	1.16	0	D	431.9	0.9	2.7	9/24/2008	Private	Moseley Architects	None	6/19/2012
3200	Norfolk Street	23230	37.5701940	-77.4701540	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Underground Cistern	No Water Quality Credit Given	0.93	0.93	0	Impermeable Barrier	0.0	0.0	0.0	9/24/2008	Private	Moseley Architects	None	6/19/2012
500	North 18th Street	23223	37.5378880	-77.4233630	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Underground Storage Tank	No Water Quality Credit Given	0.78	0.71	0.06	D	0.0	0.0	0.0	2/25/2012	Private	Bacon Housing SCP LP	None	10/19/2011
202	North 20th Street	23223	37.5339100	-77.4242090	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Piped Detention	No Water Quality Credit Given	0.36	0.36	0	Impermeable Barrier	0.0	0.0	0.0	1/14/2014	Private	202 North 20th LLC	None	1/14/2014
418	North 25th Street	23223	37°-32'-0.388"	-77°-25'3-0.755"	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Underground Storage Tank	No Water Quality Credit Given	0.055	0.044	0.011	C	0.0	0.0	0.0	7/7/2015	Private	Sterling Management LLC	Yes	7/7/2015

1207	North 28th Street	23223	37.3215554	-77.2429837	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Vortex Filter	No Water Quality Credit Given	0.69	0.56	0.13	C	0.0	0.0	0.0	12/14/2011	Private	Beckstoffer's Mill	Yes but not signed by CAO	12/14/2011
1207	North 28th Street	23223	37.3215554	-77.2429837	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Vortex Filter	No Water Quality Credit Given	0.99	0.79	0.2	C	0.0	0.0	0.0	12/14/2011	Private	Beckstoffer's Mill	Yes but not signed by CAO	12/14/2011
1207	North 28th Street	23223	37.3215554	-77.2429837	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Vortex Filter	No Water Quality Credit Given	0.08	0.01	0.07	C	0.0	0.0	0.0	12/14/2011	Private	Beckstoffer's Mill	Yes but not signed by CAO	12/14/2011
528	North 2nd Street	23219	37.5472660	-77.4380920	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Piped Detention	No Water Quality Credit Given	0.129	0.129	0	Impermeable Barrier	0.0	0.0	0.0	9/14/2011	Private	Hippodrome Taylor Mansion LLC	Yes but not signed by CAO	2/4/2016
1400 - 1424	North 33rd Street	23223	37.5370241	-77.4025805	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Bioretention Cell	Bioretention C/D Soils, Underdrain	2.91	1.46	1.46	D	623.6	1.5	6.0	8/3/2011	Private	Richmond Metropolitan Habitat for Humanity	none	4/23/2013
1301	North Boulevard	23230	37.5673970	-77.4671820	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Rain Tank A	No Water Quality Credit Given	0.99	0.99	0	Impermeable Barrier	0.0	0.0	0.0	12/9/2008	Private	BTP Boulevard Square LLC	None	3/12/2013
1301	North Boulevard	23230	37.5673970	-77.4671820	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Rain Tank B	No Water Quality Credit Given	1.14	1.14	0	Impermeable Barrier	0.0	0.0	0.0	12/9/2008	Private	BTP Boulevard Square LLC	None	3/12/2013
2101	North Hamilton Street	23230	37.5748800	-77.4745160	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Piped Detention	No Water Quality Credit Given	0.57	0.57	0	Impermeable Barrier	0.0	0.0	0.0	1/27/2015	Private	Aragon Group	None	1/27/2015
1500	North Lombardy Street	23220	37.5619130	-77.4510880	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Detention Pond	Dry Detention Ponds	3.48	2.26	1.22	C	165.3	0.5	1.5	8/15/2014	Private	Virginia Union University	None	8/15/2014
1600	Overlook Street	23224	37.4968150	-77.4393010	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Bioretention	Bioretention C/D Soils, Underdrain	2.44	0.54	1.9	C	306.7	0.9	4.6	4/14/2015	Public	City of Richmond	None	6/11/2015
3016	Patterson Avenue	23221	37.5606870	-77.4753500	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Infiltration Trench	Infiltration Practices w/ Sand, Vegetation	0.162	0.147	0.015	C	96.0	0.2	1.3	9/13/2014	Private	Museum District LLC	None	8/27/2014
9	Paxton Road	23226	37.5669830	-77.5150440	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Infiltration Trench	Infiltration Practices w/o Sand, Vegetation	0.26	0.135	0.125	C	98.8	0.3	1.7	1/18/2013	Private	Polk Charles M III & Kelly S	None	1/18/2013
908	Perry Street	23224	37.5254180	-77.4444720	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Piped Detention	No Water Quality Credit Given	0.836	0.689	0.147	Impermeable Barrier	0.0	0.0	0.0	6/11/2014	Private	908 Perry LLC	None	6/11/2014
909	Perry Street	23224	37.5250280	-77.4448780	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Piped Detention	No Water Quality Credit Given	0.883	0.684	0.199	Impermeable Barrier	0.0	0.0	0.0	7/11/2012	Private	909 Perry LLC	None	7/11/2012
1004	Perry Street	23224	37.5244050	-77.4450190	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Infiltration Trench	Infiltration Practices w/o Sand, Vegetation	0.129	0.075	0.054	B	53.4	0.1	0.9	7/27/2011	Private	Urban Development Associates LLC	None	7/1/2011
1000	Porter Street	23224	37.5233310	-77.4440900	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Cistern	No Water Quality Credit Given	0.101	0.101	0	B	0.0	0.0	0.0	6/18/2010	Private	Urban Development Associates LLC	None	10/31/2011
1000	Porter Street	23224	37.5233310	-77.4440900	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Permeable Paver (north)	Permeable Pavement w/o Sand, Vegetation A/B Soils, Underdrain	0.037	0.022	0.015	B	11.5	0.0	0.1	6/18/2010	Private	Urban Development Associates LLC	None	10/31/2011
1000	Porter Street	23224	37.5233310	-77.4440900	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Permeable Paver (south)	Permeable Pavement w/o Sand, Vegetation A/B Soils, Underdrain	0.038	0.015	0.023	B	8.7	0.0	0.1	6/18/2010	Private	Urban Development Associates LLC	None	10/31/2011
1020	Porter Street	23224	37.5234100	-77.4445370	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Piped Detention	No Water Quality Credit Given	0.201	0.105	0.051	Impermeable Barrier	0.0	0.0	0.0	5/2/2013	Private	Urban Development Associates LLC	None	5/2/2013
5619	Pride Road	23224	37.5020040	-77.5014490	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Detention Basin and Parking Lot Detention	Dry Detention Ponds	0.51	0.51	0	D	34.5	0.1	0.2	9/19/2007	Private	UTZ Quality Foods Inc.	None	6/19/2012
5619	Pride Road	23224	37.5020040	-77.5014490	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Detention Wall - Parking Lot Detention	No Water Quality Credit Given	0.49	0.49	0	Impermeable Barrier	0.0	0.0	0.0	9/19/2007	Private	UTZ Quality Foods Inc.	None	6/19/2012
1831	Rady Ct	23222	37.5645220	-77.4144820	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Bioretention	Bioretention C/D Soils, Underdrain	0.03	0	0	D	0.0	0.0	0.0	3/4/2011	Private	Cellco Partnership	None	6/19/2012
1601	Rhoadmiller St	23220	37.5664750	-77.4572450	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Piped Detention	No Water Quality Credit Given	0.61	0.48	0.13	Impermeable Barrier	0.0	0.0	0.0	2/20/2013	Private	Feed More INC	None	3/17/2014
5204	Riverside Dr.	23225	37.5297190	-77.4900390	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Rain Garden	Bioretention C/D Soils, Underdrain	0.059	0.039	0.02	C	15.6	0.0	0.1	10/15/2012	Private	Johnson Tracey L	None	6/19/2012
701	Saint James Street	23220	37.5498450	-77.4378360	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Infiltration Trench	Infiltration Practices w/ Sand, Vegetation	0.626	0.626	0	C	402.6	0.9	5.0	7/6/2011	Private	Jackson Commons Partnership LLC	Yes but not signed by CAO	7/6/2011
4301	Saratoga Road	23235	37.5531960	-77.5755390	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Vegetated Swale	Bioswale	0.0145	0.0145	0	B	7.9	0.0	0.1	3/28/2008	Private	Manville Juston	None	6/19/2012
4311	Saratoga Road	23235	37.5535470	-77.5754850	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Vegetated Swale	Bioswale	0.0163	0.0163	0	B	8.8	0.0	0.1	3/28/2008	Private	Eberle Keith D	None	6/19/2012
1200	Semmes Ave	23224	37.5251010	-77.4484320	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Piped Detention	No Water Quality Credit Given	0.77	0.741	0.029	Impermeable Barrier	0.0	0.0	0.0	7/16/2014	Private	1200 Semmes LLC	None	7/16/2014
1200	Semmes Ave	23224	37.5251010	-77.4484320	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Piped Detention	No Water Quality Credit Given	0.508	0.47	0.038	Impermeable Barrier	0.0	0.0	0.0	7/16/2014	Private	1200 Semmes LLC	None	7/16/2014
2211	Semmes Ave	23225	37.5214000	-77.4567950	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Piped Detention	No Water Quality Credit Given	0.97	0.76	0.21	Impermeable Barrier	0.0	0.0	0.0	10/22/2012	Public	City of Richmond	Not required	9/3/2015

621	South 2nd Street	23219	37.5366330	-77.4455720	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.16	0.15	0.01	Impermeable Barrier	82.0	0.2	0.6	12/6/2012	Public	City of Richmond	Not required	9/29/2015
621	South 2nd Street	23219	37.5366330	-77.4455720	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.18	0.14	0.04	Impermeable Barrier	79.1	0.2	0.6	12/6/2012	Public	City of Richmond	Not required	9/29/2015
401	South Harrison Street	23220	37.5418540	-77.4571010	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Rain Garden	Bioretention C/D Soils, Underdrain	0.99	0.53	0.46	C	222.9	0.5	2.0	5/20/2008	Private	Pyramid Richmond Properties	None	9/18/2015
615, 617, 619	South Laurel Street	23220	37.5371020	-77.4514070	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Stone Reservoir with underdrain going to CS	Filtering Practices	0.150	0.038	0.112	Impermeable Barrier	29.6	0.1	0.5	3/21/2012	Private	Oregon Hill Home Improvement	Yes	5/15/2013
210	South Wilton Road	23226	37.5636250	-77.5196990	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Infiltration Trench	Infiltration Practices w/o Sand, Vegetation	0.114	0.114	0	C	73.3	0.2	0.9	3/21/2012	Private	Peter and Kimberly Marcia	None	6/19/2012
210	South Wilton Road	23226	37.5636250	-77.5196990	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Infiltration Trench	Infiltration Practices w/o Sand, Vegetation	0.095	0.095	0	C	61.1	0.1	0.7	3/21/2012	Private	Peter and Kimberly Marcia	None	6/19/2012
206	South Wilton Street	23226	37.5641060	-77.5193710	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Infiltration System	Infiltration Practices w/o Sand, Vegetation	0.0477	0.0477	0	C	30.7	0.1	0.4	3/20/2008	Private	Clark James T and Joelle B	None	6/19/2012
9200	Stony Point Pkwy	23235	37.5496291	-77.5717103	20802050606	JM85	James River, James River UT (XZE), Slate River, Salles Creek, Salles Creek UT	MS4	Stormceptor™	Hydrodynamic Structures	1.48	1.48	0	Impermeable Barrier	100.2	0.3	0.7	3/1/2010	Private	Stonypoint Fashion Pk Assoc	None	6/28/2014
5720	Swanson Road	23225	37.4903980	-77.4978100	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	MS4	Detention Basin	Dry Detention Ponds	0.93	0.57	0.36	B	42.2	0.1	0.4	2/19/2008	Private	Southside Congregation Kingdom Hall of Jahovahs Witnesses	None	5/12/2014
16	Tow Path Lane	23221	37.5399730	-77.4875890	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	MS4	Filterra™	Filtering Practices	0.32	0.11	0.21	Impermeable Barrier	76.6	0.2	1.0	5/15/2013	Private	Johnson Lydia J	None	5/15/2013
2101	Venable Street	23223	37.5380550	-77.4189830	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Piped Detention	No Water Quality Credit Given	0.69	0.69	0	C	0.0	0.0	0.0	3/20/2008	Private	Great Hope Baptist Church Tr	None	6/19/2012
301	Virginia Street	23219	37.5326690	-77.4334720	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Stormceptor™	Hydrodynamic Structures	0.53	0.53	0	Impermeable Barrier	35.9	0.1	0.2	9/28/2006	Private	Vistas On The James Condominium Unit Owners Association	None	9/18/2015
3903	Walmsley Blvd	23234	37.4682620	-77.4681700	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	MS4	Biofilter Media	Filtering Practices	0.36	0.36	0	B	195.0	0.4	1.4	6/13/2012	Private	New Hopkins Center LLC	None	5/15/2014
2409	Webber Ave	23224	37.4965860	-77.4431000	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Bioretention	Bioretention C/D Soils, Underdrain	0.22	0.17	0.05	C	66.1	0.1	0.5	6/20/2013	Public	City of Richmond	Not required	6/19/2013
2409	Webber Ave	23224	37.4965860	-77.4431000	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Bioretention	Bioretention C/D Soils, Underdrain	0.36	0.29	0.07	C	111.9	0.2	0.8	6/20/2013	Public	City of Richmond	Not required	6/19/2013
2409	Webber Ave	23224	37.4965860	-77.4431000	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Bioretention	Bioretention C/D Soils, Underdrain	0.67	0.56	0.11	C	214.6	0.5	1.5	6/20/2013	Public	City of Richmond	Not required	6/19/2013
2409	Webber Ave	23224	37.4965860	-77.4431000	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Bioretention	Bioretention C/D Soils, Underdrain	0.3	0.27	0.03	C	102.2	0.2	0.7	6/20/2013	Public	City of Richmond	Not required	6/19/2013
2409	Webber Ave	23224	37.4965860	-77.4431000	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Bioretention	Bioretention C/D Soils, Underdrain	0.35	0.32	0.03	C	120.8	0.3	0.8	6/20/2013	Public	City of Richmond	Not required	6/19/2013
2409	Webber Ave	23224	37.4965860	-77.4431000	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Extended Detention Basin	Dry Extended Detention Ponds	1.84	1.17	0.67	C	515.8	0.5	3.1	6/20/2013	Public	City of Richmond	Not required	6/19/2013
101	West 12th Street	23224	37.5220530	-77.4448090	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Piped Detention	No Water Quality Credit Given	0.505	0.404	0.101	Impermeable Barrier	0.0	0.0	0.0	6/19/2014	Private	12th and Bainbridge LLC	None	6/18/2014
8 1/2	West Canal Street	23220	37.5416655	-77.4464686	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Rainwater Tank	No Water Quality Credit Given	1.206	1.004	0.201	Impermeable Barrier	0.0	0.0	0.0	5/12/2011	Private	GD Richmond LLC	None	7/27/2011
1320	West Cary Street	23220	37.5456700	-77.4586410	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	StormTech Detention System	Filtering Practices	0.495	0.495	0	C	268.1	0.5	1.9	10/4/2007	Private	ECK Enterprises Inc.	None	3/22/2014
219	West Graham Road	23222	37.5637780	-77.4357680	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Bioretention	Bioretention C/D Soils, Underdrain	0.71	0.41	0	C	152.6	0.3	1.0	11/12/2011	Public	City of Richmond	Not required	11/12/2011
219	West Graham Road	23222	37.5637780	-77.4357680	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Bioretention	Bioretention C/D Soils, Underdrain	0.24	0.18	0.06	C	70.4	0.2	0.5	11/12/2011	Public	City of Richmond	Not required	11/12/2011
1	West Jackson Street	23220	37.5492510	-77.4387400	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Piped Detention	No Water Quality Credit Given	1.309	0.874	0.435	Impermeable Barrier	0.0	0.0	0.0	6/19/2013	Private	Jackson Commons Partnership LLC	None	6/20/2013
1600	West Laburnum Ave	23227	37.5854950	-77.4614490	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Bioretention Basin	Bioretention C/D Soils, Underdrain	0.87	0.71	0.16	C	273.2	0.6	1.9	1/13/2015	Public	City of Richmond	Not required	6/21/2015
1200	West Marshall Street	23220	37.5534400	-77.4517590	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	CSS	Piped Detention	No Water Quality Credit Given	0.88	0.88	0	Impermeable Barrier	0.0	0.0	0.0	7/10/2013	Private	GD Richmond Two LLC	None	7/10/2013
33A	Westhampton Way	23226	37.5743230	-77.5415210	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Bioretention	Bioretention A/B Soils, Underdrain	0.23	0.13	0.1	B	78.5	0.2	1.3	10/7/2009	Private	University of Richmond	None	3/17/2014
33A	Westhampton Way	23226	37.5743230	-77.5415210	20802060403	JL18	Chickahominy River, North Run, Upham Brook, Upham Brook UT (XAR), Upham Brook UT (XXP)	MS4	Piped Detention	No Water Quality Credit Given	0.23	0.13	0.1	Impermeable Barrier	0.0	0.0	0.0	10/7/2009	Private	University of Richmond	None	3/17/2014
603	Westover Hills Blvd	23225	37.5142100	-77.4873580	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.72	0.64	0.08	Impermeable Barrier	353.1	0.7	2.6	7/11/2013	Private	Brentwood South Associates	None	7/11/2013

603	Westover Hills Blvd	23225	37.5142100	-77.4873580	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Filterra™	Filtering Practices	0.71	0.63	0.08	Impermeable Barrier	347.6	0.7	2.6	7/11/2013	Private	Brentwood South Associates	None	7/11/2013
2511	Wise Street	23225	37.5156520	-77.4564290	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Underground detention	No Water Quality Credit Given	0.153	0.051	0.007	C	0.0	0.0	0.0	2/20/2010	Private	Sullivan Walter F Bishop C/O Catholic Diocese Of Richmond	None	3/22/2014
4524	Arrowhead Road	23235	37.5563190	-77.5434320	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Infiltration Trench	Infiltration Practices w/o Sand, Vegetation	0.514	0.1275	0.3862	B	119.1	0.4	3.1	6/14/2000	Private	Jennifer L Lee	None	9/30/2015
4682	Arrowhead Road	23235	37.5584960	-77.5393980	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	MS4	Infiltration/Dry Well	Infiltration Practices w/o Sand, Vegetation	0.007	0.007	0	B	4.5	0.0	0.1	11/12/2001	Private	Rebecca W. & Edgar G. Adams	None	9/1/2015
2100	Bellemeade Rd	23224	37.4928060	-77.4349290	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Extended Detention Basin	Dry Extended Detention Ponds	1.21	0.847	0.363	D	366.0	0.3	2.1	6/30/1998	Private	Kcc Holdings Llc	None	9/30/2015
2120	Bellemeade Rd	23224	37.4907128	-77.4375026	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Extended Detention Basin	Dry Extended Detention Ponds	2.650	2.38	0.27	D	983.0	0.9	4.8	6/30/1998	Private	Dmh Commercial Properties Llc Attn: Barb Hill	None	9/30/2015
2709	Calverton St	23234	37.4628720	-77.4451750	20802060102	JL02	Falling Creek, Falling Creek Reservoir, Falling Creek UT, Horners Run, James River Tidal Freshwater (Upper) Estuary, Licking Creek, Pocoshock Creek	MS4	Dry Well	Infiltration Practices w/o Sand, Vegetation	0.015	0.015	0	C	9.6	0.0	0.1	10/24/2002	Private	Virginia Knight	None	6/17/2011
2301	East Cary St	23223	37.5278130	-77.4219440	20802060101	JL01	Almond Creek, Almond Creek UT (XYA), Broad Rock Creek, Gillies Creek, Goode Creek, James River, James River Tidal Freshwater (Upper) Estuary, Stony Run, XVO and XVP (Almond Creek, UTS)	MS4	Infiltration	Infiltration Practices w/o Sand, Vegetation	0.500	0	0	D	0.0	0.0	0.0	6/12/2000	Private	Forest City Enterprises	None	9/30/2015
1320-1322	West Cary St	23220	37.5456700	-77.4586410	20802050607	JM86	James River, Slate River, Powhite Creek, Rattlesnake Creek, Reedy Creek	CSS	Stormtech Chamber	Filtering Practices	0.495	0.495	0	C	268.1	0.5	1.9	10/4/2007	Private	ECK Enterprises Inc	None	9/30/2015

Attachment D: List of new structural controls placed in operation during July 1 2015 - June 30, 2016

address		zip	Latitude	Longitude	HUC	Impaired segments in HUC	SCM	Acres Treated By Facility			Date Facility Brought On Line	Ownership Of Facility	Owner	Maintenance Agreement on file	Operator's Most Recent Inspection
								Total	Imp	Perv					
2807	Grant Street	23221	37.5500910	-77.4894640	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Basin	0.1343	0.0723	0.062	7/28/2015	Public	City of Richmond	Not required	7/28/2015
418	North 25th Street	23223	37˚-32'-0.388"	-77˚-25'3-0.755"	JL01	Almond Creek, Broad Rock Creek	Underground Storage Tank	0.055	0.044	0.011	7/7/2015	Private	Sterling Management LLC	Yes	7/7/2015
2500	West Leigh St	23220	37.56417	-77.46356	JL01	Almond Creek, Broad Rock Creek	Pipe Detention	4.11	3.51	0.6	8/7/2015	private	Virginia Electric And Power Co	Draft to City Attorney	6/19/2015
2926	P Street	23223	37.53524	-77.4086	JL01	Almond Creek, Broad Rock Creek	Pipe Detention	0.248	0.109	0.139	7/9/2015	private	Restoration Builders of Virginia Incorporated	Draft to City Attorney	5/22/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Pond (BMP 3.1, 3.2)	0.201	0.04	0.161	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Tree Trench (BMP 4.1) Bioretention Pond (BMP 4.2)	0.215	0.13	0.086	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Pond (BMP 5)	0.078	0.054	0.024	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Pond (BMP 6)	0.093	0.073	0.02	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Pond (BMP 7)	0.117	0.055	0.062	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Infiltration Lawn w/ Recharge Bed (BMP 8.1) Bioretention Pond (BMP 8.2)	0.399	0.205	0.194	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Pond (BMP 9)	0.127	0.068	0.06	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Infiltration Lawn w/ Recharge Bed (BMP 10.1) Permeable Paver System (BMP 10.2)	0.042	0.016	0.027	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Pond (BMP 11)	0.079	0.043	0.036	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Pond (BMP 12)	0.093	0.032	0.061	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Pond (BMP 13.1, 13.2)	0.098	0.023	0.074	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Bioretention Pond (BMP 14)	0.048	0.009	0.039	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3550 and 3600	Saunders Avenue	23227	37.58148	-77.47248	JL18	Chickahominy River, North Run, Upham Brook	Infiltration Lawn w/ Recharge Bed (BMP 15)	0.09	0.023	0.067	8/26/2015	private	Richmond ARC	Draft to City Attorney	8/26/2015
3628	East Broad (3628) and East Marshall (3611)	23223	37.40914	-77.40717	JL01	Almond Creek, Broad Rock Creek	Detention pipe	0.97	0.67	0.3	11/6/2015	Private	Dgm Properties LLC	yes	11/6/2015

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City of Richmond Bacteria TMDL Action Plan

Prepared for
Department of Public Utilities
Richmond, VA
May 2, 2016

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City of Richmond Bacteria TMDL Action Plan

Prepared for
Department of Public Utilities, Richmond, VA
May 2, 2016

Brown AND Caldwell
301 Bendix Road Suite 400
Virginia Beach, VA 23452

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List of Abbreviations

ac	Acre
BMP	Best Management Practices
CCC	Clean City Commission
CCTV	Closed Circuit Television
CFU	Colony-Forming Unit
CIPP	Cured-In-Place Pipe
CSMP	Collection System Master Plan
CSS	Combined Sewer System
DEQ	Virginia Department of Environmental Quality
DPU	Department of Public Utilities
DPW	Department of Public Works
DPRCF	Department of Parks, Recreation, and Community Facilities
EMA	Easement and Maintenance Agreement
EPA	U.S. Environmental Protection Agency
FIB	Fecal Indicator Bacteria
FOG	Fats, Oils, and Grease
GIS	Geographic Information System
IDDE	Illicit Discharge Detection and Elimination
IM	Integrated Monitoring
IP	Implementation Plan
LA	Load Allocation
LID	Low Impact Development
LMIR	Low to Medium Intensity Residential
MH	Manhole
MS4	Municipal Separate Storm Sewer Systems
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
ORI	Outfall Reconnaissance Inventory
POC	Pollutant of Concern
PS	Pump Station
SCAT	Sewage Collection and Treatment
SOP	Standard Operating Procedure
SSES	Sanitary Sewer Evaluation Study
SSOs	Sanitary Sewer Overflows
SWCB	State Water Control Board
TMDL	Total Maximum Daily Load
VDOT	Virginia Department of Transportation
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
WLA	Waste Load Allocation
WWTP	Wastewater Treatment Plant

Executive Summary

The City of Richmond (City) developed this Total Maximum Daily Load (TMDL) Action Plan (Plan) as required in the Special Condition of the 2013-2018 General Permit for Discharges of Stormwater from Small (Phase II) Municipal Separate Storm Sewer Systems (MS4s). This plan addresses bacteria TMDLs developed between July 9, 2008 and July 1, 2013 within nine watersheds throughout the City. The Phase II MS4 Permit requires an evaluation of each locally impaired watershed, with an established TMDL within the City MS4, to identify the pollutant loading and Waste Load Allocations (WLAs). The City must evaluate the structural Best Management Practices (BMPs) and programmatic measures to address required reductions and identify measurable goals for reporting purposes. The City is also required to identify Facilities of Concern (FOCs), review the City's legal authority to meet the requirements of the Plan, and identify methods for assessing the effectiveness of the Plan. Table ES-1 provides an overview of the Phase II MS4 Permit Special Condition requirements for local TMDLs and the corresponding section where the requirement is addressed within the plan.

Table ES-1. Overview of the Bacteria Local TMDL Action Plan Document Requirements

General Permit Section	Description of Requirement	Corresponding Section/Appendix of this TMDL Action Plan
I.B	Identification of Pollutants of Concern (POCs) for each watershed	Section 2.3
I.B.1	Identification of WLAs assigned to MS4	Sections 3.2 and 3.3
I.B.2.a	List of legal authorities applicable to reducing the POC	Section 7
I.B.2.b	List of management practices applicable to reducing the POCs	Section 4
I.B.2.c	Enhancements to public education and outreach and employee training to address POCs	Section 4
I.B.2.d	Assess all significant sources of POCs from facilities of concern	Section 5
I.B.2.e	Develop and implement a method to assess the Plan for its effectiveness	Section 6

There are two approved TMDL documents describing requirements for watersheds within the City and revised requirements in an Implementation Plan (IP). The documents are:

1. *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond* prepared by MapTech, Inc., dated November 2010.
2. *Total Maximum Daily Load Development for the Upham Brook Watershed* prepared by MapTech, Inc., dated March 2008.
3. *Bacterial Implementation Plan Development for the James River and Tributaries – City of Richmond Technical Report* prepared by MapTech, Inc., dated December 2011.

Table ES-2 identifies the impaired watersheds addressed within each TMDL report, the Environmental Protection Agency (EPA) and State Water Control Board (SWCB) approval dates, impairments, and the POCs. Current permit requirements state that TMDLs approved through July 1, 2013 must be included in the TMDL Action Plan.

Table ES-2. Watershed TMDL Overview					
Report	Watershed	EPA Approval Date	SWCP Approval Date	Impairment Listing[1]	Pollutant of Concern[1]
MapTech (2010)	Almond Creek	11/4/2010	6/29/2012	Primary Contact	E. coli
	Falling Creek	11/4/2010	6/29/2012	Primary Contact	E. coli
	Gillies Creek	11/4/2010	6/29/2012	Primary Contact	E. coli
	Goodes Creek	11/4/2010	6/29/2012	Primary Contact	E. coli
	James River (tidal)	11/4/2010	6/29/2012	Primary Contact	E. coli
	James River (lower)	11/4/2010	6/29/2012	Primary Contact	E. coli
	Powhite Creek	11/4/2010	6/29/2012	Primary Contact[2]	E. coli[2]
	Reedy Creek	11/4/2010	6/29/2012	Primary Contact	E. coli
MapTech (2008)	Upham Brook	7/24/2009	4/28/2009	Primary Contact	E. coli

[1]Information was sourced from DEQ Draft 2014 Water Quality Assessment Any Use Map Service

[2]Based on DEQ Draft 2014 Water Quality Assessment Data, Powhite Creek is expected to be delisted for bacteria impairments

The MS4 service area utilized in the calculation of the City's WLAs is the same as the MS4 service area delineated for the Chesapeake Bay TMDL Action Plan. The Chesapeake Bay TMDL Action Plan used the US census 2000 urbanized areas as a starting point to define the MS4 service area. The MS4 service area then excluded the following areas: Virginia Pollutant Discharge Elimination System (VPDES) permittees, with individual stormwater discharge requirements; the Combined Sewer System (CSO) areas; Virginia Department of Transportation (VDOT) right-of-ways; and federal land.

The existing load and WLA calculations for the City's MS4 service area within each watershed were developed by duplicating the calculation methodology utilized in each TMDL report. Where calculation methodologies were non-transparent, the closest approximation method was utilized. Table ES-3 provides a summary of the existing loads, WLAs, and required percent reductions in each watershed.

The report, *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond* (MapTech, Inc., 2010), identifies WLAs for the City in the following watersheds: Almond Creek, Falling Creek, Gillies Creek, Goodes Creek, James River (lower), James River (tidal), Powhite Creek, and Reedy Creek. The TMDL WLAs in the report were calculated using a land use-based approach. The existing loads, WLAs, and required percent reductions were determined by taking the ratio of the MS4 service area to the total watershed area by land cover group and multiplying it by the land cover loads, as provided in the report. All loads from the MS4 service area were assumed to be from non-point source land-based loadings.

The report, *Total Maximum Daily Load Development for the Upham Brook Watershed* (MapTech, Inc., 2008), identifies WLAs for the City's MS4 service area within the Upham Brook watersheds. The existing loads, WLA, and required percent reductions were determined by taking the ratio of the MS4 service area to the total watershed area and multiplying it by the loads, as calculated by the report. All loads from the MS4 service area were assumed to be from non-point source land-based loadings.

Table ES-3. Existing Loads, WLAs, and Required Reductions per Watershed			
Watershed	Existing Load (cfu/yr.)	Waste Load Allocation (cfu/yr.)	Total Required Reduction (%)
Almond Creek	8.88E+11	1.54E+11	83%

Table ES-3. Existing Loads, WLAs, and Required Reductions per Watershed			
Watershed	Existing Load (cfu/yr.)	Waste Load Allocation (cfu/yr.)	Total Required Reduction (%)
Falling Creek	1.30E+13	1.14E+13	12%
Gillies Creek	2.86E+12	2.86E+11	90%
Goodes Creek	5.57E+13	4.05E+12	93%
James River (lower)	8.72E+15	2.03E+14	98%
James River (tidal)	2.90E+12	2.90E+12	0%
Powhite Creek	4.29E+14[1]	9.17E+13[1]	79%[1]
Upham Brook	4.29E+12	5.21E+10	99%

[1]Based on DEQ Draft 2014 Water Quality Assessment Data, Powhite Creek is expected to be delisted for bacteria impairments

The reductions for Reedy Creek were revised during the development of the DEQ TMDL implementation plan. The revised reductions are included in Table ES-4. The percent reduction required values in Table ES-4 were obtained from the TMDL Implementation Plan: *Bacterial Implementation Plan Development for the James River and Tributaries – City of Richmond Technical Report (2011).* The implementation plan contains updated model results based upon citizen monitoring conducted between 2006 and 2008. The update includes additional required percent reductions not present in the approved TMDL report. Values for existing loads and WLAs were not included in the implementation plan.

Table ES-4. Reedy Creek MS4 Service Area Required Reductions From Land Based Sources			
Land Cover	Total Area in Watershed[2] (ac)	City of Richmond MS4 Service Area[3] (ac)	Percent Reduction Required[1]
Barren[4]	10	0	97%
Commercial[4]	248	160	
Forest[4]	614	265	
Open Space[4]	1,014	852	
Wetland[4]	20	20	
Low-Medium Intensity Residential[5] (LMIR)	1,202	1,159	100%

[1]Reduction Data was sourced from the TMDL Implementation Plan *Bacterial Implementation Plan Development for the James River and Tributaries – City of Richmond Technical Report*

[2]Data was sourced from the TMDL report *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond (2010)*

[3]Values were calculated utilizing data developed in GIS

[4]Loading from these land cover types were categorized as wildlife land based loads

[5]Loading from LMIR land cover was categorized as human and pet land based

Table ES-5 lists the BMPs that went online after 2006. The year 2006 was the last year of bacteria monitoring utilized for the development of TMDLs. The structural BMPs accounted for in Table ES-5, have various theoretical mechanisms for bacteria removal such as runoff reduction, filtration, sedimentation, UV radiation exposure, etc. Since 2007, the City added treatment for over 400 acres of its MS4 service area within TMDL watersheds. A map of the BMPs within the City's MS4 is shown in Figure 4.2 in Appendix A.

Table ES-5. Total Structural BMPs and Acres Treated by Watershed

Watershed	Number of BMPs		Total MS4 Area in Watershed (ac)	Total Area Treated by BMPs[1] (ac)		Percent of Total MS4 Area Treated
	Public	Private		Public	Private	
Almond Creek	0	0	113	0	0	0%
Falling Creek	1	3	3,738	0	2	0%
Gillies Creek	1	1	1,585	0	0	0%
Goodes Creek	7	3	3,015	6	7	0%
James River (lower)[2]	1	18	5,003	1	362	7%
James River (tidal)[3]	0	3	1,009	0	0	0%
Powhite Creek	6	1	1,599	17	4	1%
Reedy Creek	0	5	2,478	0	3	0%
Upham Brook	1	3	2,983	1	2	0%
Total	**54**		**21,523**	**405**		**2%**

[1]Acres treated are from BMPs constructed 2007 to present

[2]BMPs in the James River (lower) are BMPs in the MS4 service area not already accounted by overlapping watersheds

[3]BMPs in the James River (tidal) are BMPs in the MS4 service area not already accounted by overlapping watersheds

In addition to structural BMPS, the City also employs a number of programmatic BMPs which also contribute to reducing bacteria loads to receiving waters. A brief summary of each programmatic BMP is included in the following subsections with more detailed descriptions in Sections 4.3 to 4.12.

Department of Public Utilities (DPU) Outfall Inventory and IDDE Program

To meet MS4 Phase II permit requirements, the City developed a Standard Operating Procedure (SOP) to inventory of stormwater outfalls in priority waterways. The SOP includes instructions on how to select a waterway based on a tier system. The City currently uses an Outfall Reconnaissance Inventory (ORI) sheet to document stormwater outfalls conditions. In addition, City staff document any dry weather flows from the stormwater system and track these illicit discharges to their upstream source and look for any possible illicit connections and straight pipes.

DPU Sewer CCTV Program

The City currently implements a sewer system closed-circuit television (CCTV) program. Sewer segments are selected from the Collection System Master Plan (CSMP), which includes a prioritized list of sanitary sewer sheds. A sanitary sewer evaluation study (SSES) is performed, which includes 50% manhole (MH) checks, 50% MH inspections, and 25-40% CCTV. The sewer sheds are divided into sub-sheds and further prioritized based on the field data. Segments are selected for rehabilitation, point repairs, replacement (MH to MH) or any combination of the three. In some cases, additional CCTV is required for segments not previously looked at during field data gathering. These segments then go through a similar process to determine what method of rehabilitation, if any, is required.

Pet Waste Program

The City is currently implementing a pet waste program that includes distributing pet waste bags to citizens and placing posters with information about picking up pet waste throughout the City. The posters can also be sourced from DPU's website and printed out for use. This activity is part of the

City's public participation and outreach program designed to educate citizens about stormwater impacts on the environment.

Distribute Fog Brochures

The City currently implements a fats, oils, and grease (FOG) education program which informs citizens of the dangers of putting these materials in the sewer systems. Educating the citizens is accomplished by distribution of brochures with information about the FOG program. Providing public outreach on this subject and enacting public behavioral changes is an important step in reducing the number of SSOs that occur. Reducing SSOs will help contribute to bacteria reduction in surface waters.

Television Commercials

The City currently airs television commercials which contain information about the importance of pollution prevention and illicit discharge awareness. Preventing pollution and illicit discharges may help to reduce bacteria in surface waters by reducing nutrients and organic matter in surface waters.

Articles for Newsletters

The City currently writes articles for newsletters about stormwater education and pollution prevention and illicit discharge awareness. Educating the public on stormwater issues is an important step in enacting behavior changes which may help to reduce bacteria in surface waters.

School Outreach

The City currently implements several programs to reach out to school age children and teach them about topics such as pollution prevention, illicit discharges, and stormwater. Some examples of programs involving school children are educating 5th and 8th graders about pollution prevention and illicit discharge awareness, hosting a rain barrel decorating contest for middle school children, and presenting stormwater topics to 4th and 5th graders. Reaching out to children can be an effective way to enact public behavior changes because children's behavior may also influence their parents' behavior.

Civic Association Meetings

The City currently attends a number of civic association meetings annually to educate the public on the importance of pollution prevention and illicit discharge awareness. Examples of civic associations are neighborhood groups, community garden groups, and parks groups. Attending civic group meetings helps to spread public awareness of important pollution issues and may help to alter public behavior.

The City's programmatic BMPs along with their measureable goals for reporting purposes for year 4 and 5 are shown in Table ES-6.

Employee Training

The City currently implements training programs for new employees that address pollution prevention and illicit discharge awareness. Training new employees helps to ensure environmental protocols are followed by each employee. The program may be expanded to include regular refresher courses for existing employees.

Additionally, City staff developed a required training program with a biennial training schedule for stormwater awareness for all City employees and for those employees involved in areas that are likely to have an effect on the MS4. The program covers spill prevention, vehicle maintenance, bulk material storage, road and parking lot maintenance, and facility maintenance.

During fiscal year 2015, MS4 training sessions were held for the Department of Public Utilities (DPU), the Department of Public Works (DPW), and the Department of Parks, Recreation, and Community Facilities (DPRCF). A total of 8 sessions were scheduled for DPU, 5 sessions for DPW, and 4 sessions for DPRCF. The number of employees who attended the sessions was 85 from DPU, 42 from DPW, and 57 from DPRCF.

Table ES-6. Programmatic BMPs and Measurable Goals

BMP	Measurable Goal(s)	Year 4 Goals	Year 5 Goals
DPU Outfall Inventory and IDDE Program	• Percentage of total watersheds inventoried annually • Number of illicit discharges at outfalls detected and resolved • Number of outfalls inspected annually	• Identify the percentage of total watersheds inventoried • Identify the number of illicit discharges detected and resolved • Identify the number of outfalls inspected	• Identify the percentage of total watersheds inventoried • Identify the number of illicit discharges detected and resolved • Identify the number of outfalls inspected
DPU Sewer CCTV Program	• Length of sewer CCTV'd annually	• Identify the length of sewer CCTV'd	• Identify the length of sewer CCTV'd
Pet Waste Program	• Number of bags distributed annually • Number of posters distributed annually	• Identify the number of bags distributed with a goal of 56,000 • Identify the number of posters distributed	• Identify the number of bags distributed with a goal of 56,000 • Identify the number of posters distributed
Host Household Hazardous Waste Pick Up	• Number of citizens reached annually	• Identify the number of citizens reached with a goal of 500	• Identify the number of citizens reached with a goal of 500
Distribute Fog Brochures	• Number of brochures distributed annually	• Identify the number of brochures distributed with a goal of 200	• Identify the number of brochures distributed with a goal of 200
Television Commercials	• Number of commercial views annually	• Identify the number of views with a goal of 200,000 people with 10 views each	• Identify the number of views with a goal of 200,000 people with 10 views each
Articles for Newsletters	• Number of articles written and the number of people reached annually	• Identify the number of articles written with a goal of 3 and the number of people reached with a goal of 6,000	• Identify the number of articles written with a goal of 3 and the number of people reached with a goal of 6,000
School Outreach	• Number of schoolchildren reached annually	• Identify the number of schoolchildren reached annually	• Identify the number of schoolchildren reached annually
Employee Training	• Number of employees who receive training annually	• Identify the number of employees who receive training with a goal of 100	• Identify the number of employees who receive training with a goal of 100
Civic Association Meetings	• Number of people in attendance and the number of meetings attended annually	• Identify the number people in attendance with a goal of 1,200 people and the number of meetings attended	• Identify the number people in attendance with a goal of 1,200 people and the number of meetings attended

The City evaluated its facilities of concern (FOCs) by identifying all land areas within the MS4 with an expected pollutant loading higher than normal for its land use and fall within a bacteria impaired watershed. The FOCs identified within the City are pump stations and dog parks. The list of FOCs,

294 including watershed location, is shown in Table ES-7. The locations of these facilities are also
295 depicted on Figure 5.1 in Appendix A.

Table ES-7. City of Richmond Facilities of Concern Within MS4 Service Area and TMDL Watershed

Facility	Watershed
Barker Field Dog Park	James River (lower)
Church Hill Dog Park	Gillies Creek
Pump Station	James River (lower)
Pump Station	Reedy Creek

296

297 In order to assess the effectiveness of the planned BMPs and programmatic measures, the City will
298 utilize sample results from DEQ and citizen monitoring stations and long-term ambient monitoring
299 stations and future exploratory sites from their Integrated Monitoring Plan (IM Plan). A list of the
300 available DEQ and citizen monitoring stations and stations from the IM Plan within the City boundary
301 per watershed is shown in Table ES-8. The list of DEQ and citizen monitoring stations was sourced
302 from the DEQ draft 2014 datasets and is shown in Appendix C. Single sample maximums and
303 geometric means (if available) will be evaluated to establish trends in bacteria counts. In addition,
304 the City will continue to maintain its FOCs.

Table ES-8. Monitoring Stations within the City

Watershed	Number of DEQ and Citizen Stations	Number of Long Term Ambient Stations	Number of Future Exploratory Stations
James River-Almond Creek	38	0	0
James River-Falling Creek	0	0	2
James River-Gillies Creek	0	2	0
James River-Goodes Creek	0	1	1
James River (lower)	0	0	3
James River (tidal)	0	0	0
James River-Powhite Creek	0	1	0
James River-Reedy Creek	0	1	0
James River-Little Westham Creek	19	0	0
Upham Brook	4	1	0

305

306 A review of the City's legal authority to implement the special conditions bacteria TMDL plan is
307 included in Section 7 of this Plan. As more research becomes available, the City may update this
308 plan in an effort to implement the most effective practices.

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Section 1

Introduction

The City of Richmond (City) developed this local bacteria Total Maximum Daily Load (TMDL) Action Plan (Plan) as required in the Special Conditions of the 2013-2018 General Permit for Discharges of Stormwater from Small (Phase II) Municipal Separate Storm Sewer Systems (MS4s). This plan addresses bacteria TMDLs developed between July 9th, 2008 and July 1st, 2013 within nine watersheds throughout the City. The nine impaired watersheds with bacteria TMDLs identified are; Almond Creek, Falling Creek, Gillies Creek, Goodes Creek, James River (lower), James River (tidal), Powhite Creek, Reedy Creek, and Upham Brook. Specifically, this Plan addresses bacteria loads originating from the MS4 service area within these watersheds. This Plan was developed following the Virginia Department of Environmental Quality (DEQ) draft guidance document (Guidance Document) dated April 2015 and the Phase II MS4 Permit requirements.

The City is located within the James River Basin in central Virginia, and has a total land area of 40,011 acres. It is bordered by Chesterfield and Henrico Counties, and is bisected by the James River. The City is located within the 2000 US Census Urban Cluster named Richmond, Virginia. The City's MS4 is permitted under the General VPDES Permit for Discharges of Stormwater from Small Municipal Separate Storm Sewer Systems permit number VAR040005.

This Plan describes the City MS4 service area, the City's waste load allocations (WLAs) (loading values assigned to point source discharges to a receiving body), and required percent reductions within each bacteria TMDL watershed, and the projects and programs the City plans to implement to meet the reductions. In addition, this Plan includes an evaluation of the legal authority to implement the Plan and Facilities of Concern (FOCs) within the City.

Figure 1.1 depicts the MS4 service area and is provided in Appendix A.

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Section 2

MS4 Service Area and Impaired Watersheds

This plan utilizes a consistent MS4 service area, as previously defined during the development of the Chesapeake Bay TMDL Action Plan. An overview of its development is presented in Section 2.1. Watershed boundary Geographical Information System (GIS) datasets used for this action plan were accessed from Virginia Department of Environmental Quality (DEQ) on July 2015.

There are nine impaired watersheds in the City with bacteria TMDLs approved between July 9th, 2008 and June 29th, 2012. These watersheds include; Almond Creek, Falling Creek, Gillies Creek, Goodes Creek, James River (lower), James River (tidal), Powhite Creek, Reedy Creek, and Upham Brook. In order to develop a strategy to meet the MS4 service area WLAs, the City first evaluated the approved Pollutant of Concern (POC) Load Allocations (LAs) for each watershed. An overview of the Virginia guidelines for designated use standards and impairments is included in Section 2.2. The approved TMDL reports along with the identified POC for each watershed are presented in Section 2.3.

2.1 Definition of MS4 Service Area

The City's MS4 service area utilized in this action plan is the same as previously defined during the first phase of the Chesapeake Bay TMDL Action Plan. The MS4 service area was delineated in Geographic Information System (GIS) using the guidelines set forth in the Chesapeake Bay TMDL Special Condition Guidance Document (DEQ, 2015). A map of the MS4 service area is provided in Figure 1.1 of Appendix A. According to the document, permittees may exclude:

- Lands regulated under any General VPDES permit that addresses industrial stormwater
- Lands regulated under an individual VPDES permit for industrial stormwater discharges
- Forested Lands
- Agricultural Lands
- Wetlands
- Open Waters
- Lands that surface runoff into natural waterbody or another MS4 system

Within the City of Richmond, the Combined Sewer System (CSS) is also removed from the MS4 service area, as stormwater flows are treated at the Wastewater Treatment Plant (WWTP) and included in the WWTP VPDES permit. There are also five individual VPDES permittees located within the City, as shown in Table 2-1.

Table 2-1. Individual VPDES Permittees				
Permit No.	Facility	Address	Permit Type	Facility Type
VA0087734	Dominion - Materials and Metering Services Center	4307 Castlewood Rd	Minor	Industrial
VA0058378	Kinder Morgan Southeast Terminals LLC - Richmond 2	4110 Deepwater Terminal Rd	Minor	Industrial
VA0086151	Kinder Morgan Transmix Company LLC	3302 Deepwater Terminal Rd	Minor	Industrial
VA0063177	Richmond WWTP	1400 Brander St	Major	Municipal
VA0085499	Spruance Genco LLC	5001 Commerce Rd	Minor	Industrial

There are twenty-three general permits that address industrial stormwater within the City, as shown in Table 2-2.

Table 2-2. General VPDES Permittees			
Permit No.	Facility	Address	Permit Type
VAR050554	Spruance Genco LLC	5001 Commerce Rd	Industrial Activity
VAR050563	Smith Iron and Metal Company Inc	3000 Bells Rd	Industrial Activity
VAR050588	SMM Southeast LLC - Richmond	3220 Deepwater Terminal Rd	Industrial Activity
VAR050603	Eubank Trucks Incorporated	3708 N Hopkins Rd	Industrial Activity
VAR050613	Carpenter Company Richmond Division	2400 Jefferson Davis Hwy	Industrial Activity
VAR050657	UPS Freight - Richmond	5401 Midlothian Tpke	Industrial Activity
VAR050910	Upaco Adhesives - Division of Worthen Industries	4105 Castlewood Rd	Industrial Activity
VAR051019	Philip Morris USA Incorporated - Manufacturing Ctr	3601 Commerce Rd	Industrial Activity
VAR051020	Port of Richmond	5000 Deepwater Terminal Rd	Industrial Activity
VAR051027	Liphart Steel Company Incorporated	3308 Rosedale Ave	Industrial Activity
VAR051103	Sonoco Products Company	1850 Commerce Rd	Industrial Activity
VAR051133	Estes Express Lines	1200 Commerce Rd	Industrial Activity
VAR051151	Packaging Corporation of America	2000 Jefferson Davis Hwy	Industrial Activity
VAR051176	International Paper Company - Richmond Plant	2811 Cofer Rd	Industrial Activity
VAR051484	Branscome Richmond - Deepwater Terminal Rd	2106 Deepwater Terminal Rd	Industrial Activity
VAR051549	International Paper - Richmond Recycling Center	1308 Jefferson Davis Hwy	Industrial Activity
VAR051818	Richmond Recycling Company	2500 Decatur St	Industrial Activity
VAR051888	Kenan Transport LLC - 506 E Clopton St	506 E Clopton St	Industrial Activity
VAR052028	Greater Richmond Transit Co - Oper and Maintenance	301 E Belt Blvd	Industrial Activity
VAR052128	Alloy Polymers Incorporated	3310 Deepwater Terminal Rd	Industrial Activity
VAG110308	Hanson Pipe and Precast - Richmond	2900 Terminal Dr	Concrete Products Facility
VAG840078	Luck Stone - South Richmond Plant	2100 Deepwater Terminal Rd	Nonmetallic Mineral Mining
VAG840120	Vulcan Construction Materials LP - Richmond Quarry	1500 Goodes St	Nonmetallic Mineral Mining

There are two other Phase II General MS4 permittees located within the City, as shown in Table 2-3.

Table 2-3. Other Municipal Separate Storm Sewer Systems			
Permit No.	Owner/Operator	Designation	Type
VAR040133	Virginia Department of Transportation	Phase II	State
VAR040074	Hunter Homes McGuire Veteran Affairs Hospital	Phase II	Federal

2.2 Virginia Regulations on Designated Use and Impairments

All Virginia waters are designated for the following uses: recreational uses (e.g., swimming and boating); the propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them; wildlife; and the production of edible and marketable natural resources (e.g., fish and shellfish) (DEQ, n.d.). Waterways may also be considered for primary shellfish harvesting status.

The state of Virginia has adopted numerical regulations for bacteria for each designated use. A waterway is listed as impaired for bacteria if it exceeds the maximum bacteria levels defined for its listed uses. In saltwater and transitional waters, recreational uses are considered impaired when Enterococci counts exceed a monthly geometric mean of 35 Colony Forming Units (CFU)/100 ml. In cases where there are insufficient data to calculate a geometric mean, violation occurs when 10% of the Enterococci samples exceed 104 CFU/100 ml. In freshwaters, recreational uses are considered impaired when *E. coli* counts exceed a monthly geometric mean of 126 CFU/100 ml. In cases where there are insufficient data to calculate a geometric mean, an impairment is determined when 10% of the total samples exceed 235 CFU/100 ml. In shellfish waters, impairment occurs when the geometric mean fecal coliform concentration exceeds a Most Probable Number (MPN) or Membrane Filter (MF) of 14 per 100 ml. These bacteria regulations for E. *coli,* Enterococci, and Fecal Coliform were adopted in 2003 and are the governing water quality standards for all data presented in this report.

2.3 Approved TMDLs within the City of Richmond

There are two approved TMDL documents describing requirements for watersheds within the City and revised requirements in an Implementation Plan (IP). The documents are:

1. *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond* prepared by MapTech, Inc., dated November 2010.
2. *Total Maximum Daily Load Development for the Upham Brook Watershed* prepared by MapTech, Inc., dated March 2008.
3. *Bacterial Implementation Plan Development for the James River and Tributaries – City of Richmond Technical Report* prepared by MapTech, Inc., dated December 2011.

Table 2-4 lists impairments for each watershed by report.

Table 2-4. Watershed TMDL Overview

Report	Watershed	Impairment Listing[1]	Pollutant of Concern[1]
MapTech (2010)	Almond Creek	Primary Contact	E. coli
	Falling Creek	Primary Contact	E. coli
	Gillies Creek	Primary Contact	E. coli
	Goodes Creek	Primary Contact	E. coli
	James River (tidal)	Primary Contact	E. coli
	James River (lower)	Primary Contact	E. coli
	Powhite Creek	Primary Contact[2]	E. coli[2]
	Reedy Creek	Primary Contact	E. coli
MapTech (2008)	Upham Brook	Primary Contact	E. coli

[1]Information was sourced from DEQ Draft 2014 Water Quality Assessment Any Use Map Service

[2]Based on DEQ Draft 2014 Water Quality Assessment Data, Powhite Creek is expected to be delisted for Bacteria Impairments

There are several significant differences between the City's current MS4 service area definition, described in Section 2.1, and the MS4 service area as defined in the MapTech, 2008 and MapTech, 2010 TMDL reports. The MS4 service area definition in the TMDL reports includes all impervious lands within the City boundary and the impaired watershed. This method tends to overstate the impervious lands within the MS4 service area because the CSS areas, Virginia Department of Transportation (VDOT) rights-of-way, other permit holders, or surface runoff were not removed from the calculation. This definition of the MS4 service area also excludes pervious land areas. Discussions with DEQ staff indicated that bacteria loads from pervious lands will need to be addressed within the TMDL action plan.

Since the City's MS4 area definition is consistent, and developed in accordance with the Chesapeake Bay TMDL guidelines, the MS4 service area used in the WLA calculations is the same as previously developed for the Chesapeake Bay TMDL Action Plan.

The MS4 service area within each impaired watershed was delineated by spatially intersecting the watersheds which contain a bacteria TMDL requirement and the Citywide MS4 service area in GIS. The TMDL watershed GIS file was downloaded from the DEQ website in July 2015. The resulting areas were utilized to evaluate the bacteria load allocation and percent required reductions within each watershed.

Section 3

Bacteria Waste Load Allocations

The WLAs in the TMDL reports were developed by assigning bacteria loading rates to each land cover type. The aggregate load from the combined land area for each MS4 was then designated as the WLA for the municipality. Since the TMDL reports calculated the WLAs for the City using only impervious area within the MS4, the WLAs presented in the reports are not representative of the actual load from the City's current MS4 service area. The revised bacteria WLAs for the City's MS4 service area within each watershed were calculated for this Plan based upon the bacteria loading and percent required reductions developed by DEQ, as documented in the TMDL reports, and using the MS4 service area definition as developed in the Chesapeake Bay TMDL Action Plan.

The TMDL reports do not document the specific land use loading rates applied within each watershed used to calculate the WLAs or percent required reductions within the City's MS4. DEQ was contacted with a request for additional details regarding the methodology used to develop the land-based loading values, and DEQ in turn contacted the authors of the reports. At the time of development of this TMDL Action Plan, no information detailing a complete methodology was received. Because no further details were available, the City's WLAs and percent required reductions were formulated using the limited information documented within the reports, and by making certain assumptions that are documented in this section.

Section 3.1 defines the land cover classification used for the MS4 service area. Sections 3.2 and 3.3 define the methodologies used to develop the WLAs and percent reductions required by the City's MS4 service area within each watershed.

3.1 Land Cover Classification

Land cover data attributed to the MS4 service area was obtained from the 2001 National Land Cover Database (NLCD).

Although the 2001 NLCD land cover data was used to delineate the watershed area in the MapTech, 2008 and MapTech, 2010 documents, the reports did not use the same classification labels presented within the NLCD metadata. Table 3-1 includes the land cover classifications contained within the City MS4 derived from the NLCD legend. Tables 3-2 and 3-3 include the land cover classification groups that correspond with the land cover groups provided within each TMDL report.

452

Table 3-1. 2001 NLCD Legend		
Class/Value	Class Number	Classification
Water	11	Open Water
	12	Perennial Ice/Snow
Developed	21	Developed, Open Space
	22	Developed, Low Intensity
	23	Developed, Medium Intensity
	24	Developed, High Intensity
Barren	31	Barren Land
Forest	41	Deciduous Forest
	42	Evergreen Forest
	43	Mixed Forest
Shrubland	52	Shrub/Scrub
Herbaceous	71	Grassland/Herbaceous
Planted/Cultivated	81	Pasture/Hay
	82	Cultivated Crops
Wetlands	90	Woody Wetlands
	95	Emergent Herbaceous Wetlands

453 MapTech (2010) grouped the 2001 land cover classifications as shown in Table 3-2. The forest
454 category encompasses all of the forest types from the NLCD data. Since the agricultural land was
455 removed from the MS4 service area, it assumed there was no livestock access to streams within the
456 MS4 service area. Low to Medium Intensity Residential (LMIR), as defined within the TMDL report,
457 included both low and medium intensity developed land cover classifications and commercial land
458 cover included high intensity developed lands such as high intensity residential.
459 Grassland/herbaceous land was combined with pasture to account for possible livestock utilization.

Table 3-2. Land Cover Classifications from The James River and Tributaries Report	
TMDL Land Cover Category	NLCD Class Number
Water	11
Open Space	21
LMIR[1]	22, 23
Commercial	24
Barren	31
Forest	41, 42, 43, 52
Pasture Hay	81,71
Crop	82
Wetlands	90, 95
Livestock Access	81 (near streams)

460 [1]LMIR=Low to Medium Intensity Residential

461

462 MapTech (2008) grouped the 2001 land cover classifications as shown in Table 3-3. The forest
463 category encompasses all of the forest types from the NLCD data. Since the agriculture land was

removed from the MS4 service area, it assumed there was no livestock access to streams. MapTech (2008) did not include a separate open space land cover. Instead, open space developed lands were grouped with residential areas. This group also included low and medium intensity developed land covers. Commercial land included high intensity developed lands, such as high intensity residential. Grassland/herbaceous land were combined with pasture to account for possible livestock utilization.

Table 3-3. Land Cover Classifications Used In The Upham Brook Report

TMDL Land Cover Category	NLCD Class Number
Water	11
Residential	21, 22, 23
Commercial	24
Barren	31
Forest	41, 42, 43, 52
Pasture	81,71
Cropland	82
Wetlands	90, 95
Livestock Access	81 (near streams)

In order to produce the MS4 service area defined by each land cover type, the following steps were taken:

- The 2001 NLCD land cover dataset was applied to the GIS map which included the City's MS4 service area and bacteria TMDL watersheds.
- The NLCD land cover layer was clipped to the extents of the MS4 service area which produced the MS4 service area defined by land cover type.
- The combined MS4/NLCD layer was separated by TMDL watershed.
- The MS4 service area acreage, by land cover type, was calculated per TMDL watershed.

Although land covers such as wetlands, forested lands, and agricultural lands are excluded from the City's current MS4 service area, the land cover delineations described above includes small areas of these land cover types. This may occur due to the different scales utilized for the land cover delineations. It may also occur because the wetlands, forested lands, and agricultural lands delineations were developed with different datasets, so land cover boundaries may have slight differences.

3.2 James River and Tributaries

The report, *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond* (MapTech, Inc., 2010), identified the WLAs for the City in the following watersheds: Almond Creek, Falling Creek, Gillies Creek, Goodes Creek, James River (lower), James River (tidal), Powhite Creek, and Reedy Creek. The TMDL WLAs in the report were calculated using a land use-based approach. The report defines the MS4 service area as all the impervious area within the City in each watershed. However, the City's current MS4 service area used in this analysis, as defined in Section 2.1, includes pervious and impervious surfaces within the permit area. The WLAs developed in this section accounts for bacteria loading from both land covers. .

The impaired watershed layer, as sourced from DEQ, had overlapping watershed areas. The James River (tidal) watershed overlaps every other watershed contained within the TMDL report. The

loading calculations for the James River (tidal) watershed include only MS4 service area not already included in the other overlapped watersheds. The James River (lower) watershed overlaps both the Powhite Creek and Reedy Creek watersheds. The loading calculations for the James River (lower) watershed include only MS4 service area not already included in Powhite Creek and Reedy Creek.

The existing loads, WLAs, and percent required reductions were determined by taking the ratio of the MS4 service area to the total watershed area by land cover group and multiplying it by the land cover loads as provided in the report. All loads from the MS4 service area were assumed to be from non-point source land-based loadings. Tables 3-4 to 3-11 show the existing loads, WLA, and percent reduction required from the City's MS4 service area by watershed.

As shown in Table 3-4, the required reduction for bacteria loads in the City's MS4 service area within the Almond Creek watershed is 83 percent. This reduction is primarily due to the large reduction required from the LMIR land cover area. Almond Creek watershed contains portions of the City's CSS area, which is excluded from the City's MS4 and associated WLA.

Table 3-4. Almond Creek MS4 Service Area WLA and Required Reduction

Land Cover	Total Existing Load[1] (cfu/yr)	Total Allocated Load[1] (cfu/yr)	Total Area in Watershed[1] (ac)	City of Richmond MS4 Service Area[2] (ac)	MS4 Service Area Existing Loads[2] (cfu/yr)	MS4 Service Area WLA[2] (cfu/yr)	Percent Reduction Required[2]
Water	0.00E+00	0.00E+00	23	0	0.00E+00	0.00E+00	0%
Open Space	4.00E+11	4.00E+11	689	40	2.35E+10	2.35E+10	0%
LMIR	1.53E+13	2.29E+12	796	45	8.64E+11	1.29E+11	85%
Commercial	3.56E+10	3.56E+10	61	0	1.95E+08	1.95E+08	0%
Barren	2.02E+10	2.02E+10	56	0	0.00E+00	0.00E+00	0%
Forest	3.06E+10	3.06E+10	807	27	1.02E+09	1.02E+09	0%
Pasture Hay	2.19E+11	2.19E+11	688	0	0.00E+00	0.00E+00	0%
Crop	5.33E+09	5.33E+09	150	0	0.00E+00	0.00E+00	0%
Wetlands	1.33E+09	1.30E+09	72	1	1.33E+07	1.30E+07	2%
Livestock Access	0.00E+00	0.00E+00	0	0	0.00E+00	0.00E+00	0%
Total	**1.60E+13**	**3.00E+12**	**3,342**	**113**	**8.88E+11**	**1.54E+11**	**83%**

[1]Data was sourced from the TMDL report *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond (2010)*

[2]Values were calculated utilizing data developed in GIS

As shown in Table 3-5, the required reduction for bacteria loads in the City's MS4 service area within the Falling Creek watershed is 12 percent. This total reduction is primarily due to the reduction required LMIR land cover area.

516

Table 3-5. Falling Creek MS4 Service Area WLA and Required Reduction							
Land Cover	Total Existing Load[1] (cfu/yr)	Total Allocated Load[1] (cfu/yr)	Total Area in Watershed[1] (ac)	City of Richmond MS4 Service Area[2] (ac)	MS4 Service Area Existing Loads[2] (cfu/yr)	MS4 Service Area WLA[2] (cfu/yr)	Percent Reduction Required[2]
Water	0.00E+00	0.00E+00	295	1	0.00E+00	0.00E+00	0%
Open Space	8.64E+12	8.64E+12	15,192	1591	9.05E+11	9.05E+11	0%
LMIR	7.47E+13	6.50E+13	8204	1302	1.19E+13	1.03E+13	13%
Commercial	5.97E+10	5.97E+10	633	112	1.06E+10	1.06E+10	0%
Barren	1.55E+09	1.55E+09	55	0	0.00E+00	0.00E+00	0%
Forest	3.41E+12	3.41E+12	12,099	688	1.94E+11	1.94E+11	0%
Pasture Hay	2.08E+11	2.08E+11	1,164	10	1.83E+09	1.83E+09	0%
Crop	7.37E+08	7.37E+08	323	0	0.00E+00	0.00E+00	0%
Wetlands	7.19E+09	7.19E+09	963	34	2.55E+08	2.55E+08	0%
Livestock Access	2.73E+08	2.73E+08	15	0	0.00E+00	0.00E+00	0%
Total	**8.70E+13**	**7.73E+13**	**38,943**	**3,738**	**1.30E+13**	**1.14E+13**	**12%**

517 [1]Data was sourced from the TMDL report *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond (2010)*
518 [2]Values were calculated utilizing data developed in GIS

519

520 As shown in Table 3-6, the required reduction for bacteria loads in the City's MS4 service area within
521 the Gillies Creek watershed is 90 percent. This total reduction is primarily due to the large reduction
522 required in the LMIR land cover area. Gillies Creek watershed contains portions of the City's CSS
523 area which is excluded from the City's MS4 and associated WLA.
524

Table 3-6. Gillies Creek MS4 Service Area WLA and Required Reduction							
Land Cover	Total Existing Load[1] (cfu/yr)	Total Allocated Load[1] (cfu/yr)	Total Area in Watershed[1] (ac)	City of Richmond MS4 Service Area[2] (ac)	MS4 Service Area Existing Loads[2] (cfu/yr)	MS4 Service Area WLA[2] (cfu/yr)	Percent Reduction Required[2]
Water	0.00E+00	0.00E+00	21	0	0.00E+00	0.00E+00	0%
Open Space	8.98E+11	8.98E+11	3,226	278	7.75E+10	7.75E+10	0%
LMIR	3.35E+13	2.01E+12	3,744	307	2.74E+12	1.65E+11	94%
Commercial	3.57E+10	3.57E+10	424	9	7.22E+08	7.22E+08	0%
Barren	1.26E+10	1.26E+10	96	0	0.00E+00	0.00E+00	0%
Forest	7.78E+10	7.78E+10	2,597	939	2.81E+10	2.81E+10	0%
Pasture Hay	2.39E+11	2.39E+11	721	45	1.48E+10	1.48E+10	0%
Crop	5.11E+09	5.11E+09	257	0	0.00E+00	0.00E+00	0%
Wetlands	1.45E+09	1.45E+09	146	7	7.36E+07	7.36E+07	0%
Livestock Access	0.00E+00	0.00E+00	2	0	0.00E+00	0.00E+00	0%
Total	**3.48E+13**	**3.28E+12**	**11,234**	**1,585**	**2.86E+12**	**2.86E+11**	**90%**

525 [1]Data was sourced from the TMDL report *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond (2010)*
526 [2]Values were calculated utilizing data developed in GIS
527

528 As shown in Table 3-7, the required reduction for bacteria loads in the City's MS4 service area within
529 the Goodes Creek watershed is 93 percent. This total reduction is primarily due to the large

reduction required in the LMIR land cover area. Goodes Creek watershed contains portions of the City's CSS area which is excluded from the City's MS4 and associated WLA.

Table 3-7. Goodes Creek MS4 Service Area WLA and Required Reduction

Land Cover	Total Existing Load1 (cfu/yr)	Total Allocated Load1 (cfu/yr)	Total Area in Watershed1 (ac)	City of Richmond MS4 Service Area2 (ac)	MS4 Service Area Existing Loads2 (cfu/yr)	MS4 Service Area WLA2 (cfu/yr)	Percent Reduction Required2
Water	0.00E+00	0.00E+00	3	0	0.00E+00	0.00E+00	0%
Open Space	1.90E+12	1.90E+12	1253	936	1.42E+12	1.42E+12	0%
LMIR	6.98E+13	2.79E+12	1913	1476	5.38E+13	2.15E+12	96%
Commercial	4.23E+11	4.23E+11	399	388	4.12E+11	4.12E+11	0%
Barren	8.99E+09	8.99E+09	15	16	9.46E+09	9.46E+09	0%
Forest	1.70E+11	1.70E+11	541	161	5.07E+10	5.07E+10	0%
Pasture Hay	0.00E+00	0.00E+00	0	13	0.00E+00	0.00E+00	0%
Crop	0.00E+00	0.00E+00	0	0	0.00E+00	0.00E+00	0%
Wetlands	2.70E+09	2.70E+09	13	24	5.03E+09	5.03E+09	0%
Livestock Access	0.00E+00	0.00E+00	0	0	0.00E+00	0.00E+00	0%
Total	**7.23E+13**	**5.29E+12**	**4,137**	**3,015**	**5.57E+13**	**4.05E+12**	**93%**

[1]Data was sourced from the TMDL report *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond (2010)*

[2]Values were calculated utilizing data developed in GIS

As shown in Table 3-8, the required reduction for bacteria loads in the City's MS4 service area within the James River (lower) watershed is 98 percent. This total reduction is due to the large reductions required in most of the land cover types. The James River (lower) watershed contains portions of the City's CSS area which is excluded from the City's MS4 and associated WLA.

Table 3-8. James River (lower)[1] MS4 Service Area WLA and Required Reduction

Land Cover	Total Existing Load[2] (cfu/yr)	Total Allocated Load[2] (cfu/yr)	Total Area in Watershed[2] (ac)	City of Richmond MS4 Service Area[3] (ac)	MS4 Service Area Existing Loads[3] (cfu/yr)	MS4 Service Area WLA[3] (cfu/yr)	Percent Reduction Required[3]
Water	0.00E+00	0.00E+00	3,817	64	0.00E+00	0.00E+00	0%
Open Space	1.24E+15	4.57E+14	10,748	2487	2.87E+14	1.06E+14	63%
LMIR	2.38E+17	2.38E+15	27,298	962	8.39E+15	8.39E+13	99%
Commercial	2.60E+14	9.61E+13	2,467	119	1.25E+13	4.64E+12	63%
Barren	1.41E+12	5.22E+11	733	0	1.94E+08	7.20E+07	63%
Forest	1.19E+15	4.40E+14	64,514	1228	2.26E+13	8.37E+12	63%
Pasture Hay	3.35E+15	3.35E+13	19,144	48	8.47E+12	8.47E+10	99%
Crop	1.64E+14	1.64E+12	3,661	0	0.00E+00	0.00E+00	0%
Wetlands	2.58E+13	9.54E+12	4,199	96	5.90E+11	2.18E+11	63%
Livestock Access	2.37E+12	2.37E+10	529	0	0.00E+00	0.00E+00	0%
Total	**2.44E+17**	**3.42E+15**	**137,110**	**5,003**	**8.72E+15**	**2.03E+14**	**98%**

[1]Land use areas based only on the acreage within the Lower James watershed not already accounted for by other overlapping watersheds.

[2]Data was sourced from the TMDL report *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond (2010)*

[3]Values were calculated utilizing data developed in GIS

As shown in Table 3-9, the required reduction for bacteria loads in the City's MS4 service area within the James River (tidal) watershed is zero percent. The tidal portion of the James River requires a 100 percent reduction of direct human sources only. Direct human sources refer to uncontrolled discharges, namely from straight pipes, that flow directly to surface water. These sources do not discharge from an MS4 outfall. The James River (tidal) watershed contains portions of the City's CSS area which is excluded from the City's MS4 and associated WLA.

Table 3-9. James River (tidal)[1] MS4 Service Area WLA and Required Reduction

Land Cover	Total Existing Load[2] (cfu/yr)	Total Allocated Load[2] (cfu/yr)	Total Area in Watershed[2] (ac)	City of Richmond MS4 Service Area[3] (ac)	MS4 Service Area Existing Loads[3] (cfu/yr)	MS4 Service Area WLA[3] (cfu/yr)	Percent Reduction Required[3]
Water	0.00E+00	0.00E+00	11,250	3	0.00E+00	0.00E+00	0%
Open Space	2.61E+12	2.61E+12	40,455	235	1.76E+11	1.76E+11	0%
LMIR	8.30E+13	8.30E+13	49,678	453	2.36E+12	2.36E+12	0%
Commercial	1.82E+11	1.82E+11	4,973	158	1.01E+10	1.01E+10	0%
Barren	2.01E+11	2.01E+11	1,923	0	0.00E+00	0.00E+00	0%
Forest	1.73E+13	1.73E+13	119,905	103	1.92E+11	1.92E+11	0%
Pasture Hay	4.94E+13	4.94E+13	37,214	30	1.04E+11	1.04E+11	0%
Crop	9.82E+12	9.82E+12	11,451	0	0.00E+00	0.00E+00	0%
Wetlands	5.11E+12	5.11E+12	11,944	27	5.27E+10	5.27E+10	0%
Livestock Access	1.37E+12	1.37E+12	677	0	0.00E+00	0.00E+00	0%
Total	**1.69E+14**	**1.69E+14**	**289,470**	**1,009**	**2.90E+12**	**2.90E+12**	**0%**

[1]Land use areas based only on the acreage within the Tidal James watershed not already accounted for by other overlapping watersheds.
[2]Data was sourced from the TMDL report *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond (2010)*
[3]Values were calculated utilizing data developed in GIS

As shown in Table 3-10, the required reduction for bacteria loads in the City's MS4 service area within the Powhite Creek watershed is 79 percent. This total reduction is primarily due to the large reduction required in the LMIR land cover area. Based on DEQ Draft 2014 Water Quality Assessment Data, Powhite Creek is expected to be delisted for bacteria impairments.

Table 3-10. Powhite Creek MS4 Service Area WLA and Required Reduction

Land Cover	Total Existing Load[1] (cfu/yr)	Total Allocated Load[1] (cfu/yr)	Total Area in Watershed[1] (ac)	City of Richmond MS4 Service Area[2] (ac)	MS4 Service Area Existing Loads[2] (cfu/yr)	MS4 Service Area WLA[2] (cfu/yr)	Percent Reduction Required[2]
Water	0.00E+00	0.00E+00	0	0	0.00E+00	0.00E+00	0%
Open Space	1.82E+14	1.80E+14	3,146	637	3.68E+13	3.64E+13	1%
LMIR	1.02E+15	1.42E+14	1,536	589	3.91E+14	5.45E+13	86%
Commercial	1.21E+10	1.21E+10	84	44	6.34E+09	6.34E+09	0%
Barren	2.15E+09	2.15E+09	42	0	0.00E+00	0.00E+00	0%
Forest	5.95E+12	5.95E+12	2,267	300	7.87E+11	7.87E+11	0%
Pasture Hay	4.96E+10	4.96E+10	108	7	3.42E+09	3.42E+09	0%
Crop	1.51E+06	1.51E+06	23	4	2.36E+05	2.36E+05	0%
Wetlands	1.21E+10	1.21E+10	180	18	1.19E+09	1.19E+09	0%
Livestock Access	0.00E+00	0.00E+00	1	0	0.00E+00	0.00E+00	0%
Total	**1.21E+15**	**3.28E+14**	**7,387**	**1,599**	**4.29E+14**	**9.17E+13**	**79%**

[1]Data was sourced from the TMDL report *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond (2010)*
[2]Values were calculated utilizing data developed in GIS

The Reedy Creek watershed was reevaluated after the TMDL report, *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond,* was submitted and accepted by EPA in November of 2010. Bacteria concentration data collected in Reedy Creek during and after TMDL development were overall higher values than the data used to originally calibrate the model (MapTech, 2011). The updated model outputs, with required reductions, are shown in Table 3-11. Detailed loading values, per land cover type, were not included in the implementation plan. Cropland, pasture, and livestock access land cover types were not included because there are no livestock or agricultural land uses in the watershed. The Reedy Creek watershed requires a 100 percent reduction of direct human sources. Direct human sources refer to uncontrolled discharges, namely from straight pipes, that flow directly to the surface water. These sources do not discharge from an MS4 outfall. Reedy Creek watershed contains portions of the City's CSS area which is excluded from the City's MS4 and associated WLA.

Table 3-11. Reedy Creek MS4 Service Area Required Reductions From Land-Based Sources

Land Cover	Total Area in Watershed[2] (ac)	City of Richmond MS4 Service Area[3] (ac)	Percent Reduction Required[1]
Barren[4]	10	0	97%
Commercial[4]	248	160	
Forest[4]	614	265	
Open Space[4]	1,014	852	
Wetland[4]	20	20	
Low-Medium Intensity Residential[5] (LMIR)	1,202	1,159	100%

[1]Reduction Data was sourced from the TMDL Implementation Plan *Bacterial Implementation Plan Development for the James River and Tributaries – City of Richmond Technical Report*
[2]Data was sourced from the TMDL report *Bacterial Total Maximum Daily Load Development for the James River and Tributaries – City of Richmond (2010)*
[3]Values were calculated utilizing data developed in GIS
[4]Loading from these land cover types were categorized as wildlife land based loads
[5]Loading from LMIR land cover was categorized as human and pet land based

3.3 Upham Brook

The report, *Total Maximum Daily Load Development for the Upham Brook Watershed* (MapTech, Inc., 2008), identified the WLAs for the City's MS4 service area within the Upham Brook watershed. The TMDL load allocations in the report were determined using a land use-based approach. The report defined the MS4 service area as all the impervious area in the watershed. The MS4 service area used in this TMDL action plan, as defined in section 2.1, includes pervious and impervious surfaces within the permit area. The WLA and required reduction developed in this section account for loading rates from both pervious and impervious lands. Section 3.1 describes the classification of land cover data from the TDML reports.

The existing loads, WLA, and percent required reductions were determined by taking the ratio of the MS4 service area to the total watershed area and multiplying it by the loads as calculated by the report. All loads from the MS4 service area were assumed to be from non-point source land-based loadings. Table 3-11 show the existing loads, WLAs, and percent reduction required from the City in the watershed.

As shown in Table 3-12, the required reduction in the Upham Brook watershed is 99 percent. This is primarily due to the large reductions required in the residential and commercial land cover areas. Upham Brook watershed contains portions of the City's CSS area which is excluded from the City's MS4 and associated WLA.

Table 3-12. Upham Brook MS4 Service Area WLA and Required Reduction

Land Cover	Total Existing Load[1] (cfu/yr)	Total Allocated Load[1] (cfu/yr)	Total Area in Watershed[1] (ac)	City of Richmond MS4 Service Area[2] (ac)	MS4 Service Area Existing Loads[2] (cfu/yr)	MS4 Service Area WLA[2] (cfu/yr)	Percent Reduction Required[2]
Water	0.00E+00	0.00E+00	159	0	0.00E+00	0.00E+00	0%
Residential	1.55E+11	1.55E+09	15,213	2554	2.60E+10	2.60E+08	99%
Commercial	3.55E+13	3.55E+11	1,471	174	4.19E+12	4.19E+10	99%
Forest	1.71E+12	2.40E+11	6,205	251	6.91E+10	9.69E+09	86%
Barren	2.95E+10	4.13E+09	75	0	0.00E+00	0.00E+00	0%
Pasture	1.86E+12	1.86E+10	1,346	5	6.24E+09	6.24E+07	99%
Cropland	1.09E+11	1.09E+09	514	0	0.00E+00	0.00E+00	0%
Wetlands	7.55E+11	1.06E+11	482	1	1.25E+09	1.76E+08	86%
Livestock Access	1.23E+11	1.23E+09	29	0	0.00E+00	0.00E+00	0%
Total	**4.02E+13**	**7.28E+11**	**25,494**	**2,983**	**4.29E+12**	**5.21E+10**	**99%**

[1]Data was sourced from the TMDL report *Total Maximum Daily Load Development for the Upham Brook Watershed (2008)*

[2]Values were calculated utilizing data developed in GIS

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603 Section 4

604 Strategies to Reduce Pollutants of 605 Concern

606 Projects, programs, and structural BMPs reduce bacteria levels in runoff and are part of the City's
607 plan to help reach its reduction goals. The implemented projects, programs, and structural BMPs will
608 be evaluated, based on their measurable goals, on an annual basis as part of the City's assessment
609 plan.

610 Unlike the Chesapeake Bay TMDL action plan guidance, there is no prescribed methodology for
611 calculating bacteria load reductions for projects and programs. Current available research does not
612 support a purely quantitative approach to bacteria reduction due to unknown factors and limited
613 research into bacteria reduction capabilities. According to the document, *Pathogens in Urban*
614 *Stormwater Systems*:

615 > "There are significant limitations associated with use of currently available models to
616 > accurately predict FIB loading and reductions associated with various management
617 > measures. These limitations are due to multiple factors such as limited understanding of fate
618 > and transport mechanisms in the natural environment, scale-related issues, limited data sets
619 > for model calibration and verification, and variable performance of stormwater control
620 > practices."

621 Because of these limitations, a semi-quantitative approach to bacteria reduction tracking and
622 reporting is presented. The quantitative elements primarily relate to the degree of implementation of
623 various practices, rather than the bacteria load reduced. Each project or program is discussed in
624 terms of its potential for bacteria reduction and measurable metrics indicating the level of
625 implementation within the City.

626 The Phase II MS4 Permit does not currently require a schedule to meet the final WLA, but rather
627 focuses on actions during the remaining years of the current permit term. The following sections
628 outline the City's projects and programs which work to reduce bacteria sources within its MS4
629 service area.

630 4.1 Types of Projects and Programs

631 Source controls for Fecal Indicator Bacteria (FIB) are the first strategies that should be pursued when
632 FIB impairments are identified (Pathogens in Urban Stormwater Systems, 2014). Examples of source
633 controls are:

634 - Implement pet waste control programs
635 - Implement Illicit Discharge Detection and Elimination (IDDE) programs
636 - Investigate and identify leaking/aging sewer infrastructure
637 - Implement a reporting hotline for illegal dumping and educate the public on applicable laws
638 - Implement maintenance schedules for stormwater BMPs and stormwater conveyance
639 system
640 - Encourage site designs that minimize directly connected impervious areas

- Implement public education programs to reduce dry weather flow from storm sewers related to irrigation practices, car washing, power washing, etc.

Public education and outreach to citizens and businesses is an overarching source control practice necessary for other types of source controls to be effective. Education and outreach activities may include brochures, posters, websites, event attendance, utility bill inserts, television advertisements, articles in homeowner association newsletters, and other approaches that effectively reach citizens and promote behavioral changes (Pathogens in Urban Stormwater Systems, 2014).

4.2 Structural BMPs

An inventory of the City's public and private structural BMPs constructed between January 2007 and August 2014 is included in Table 4-1. Efficiency data for fecal bacteria removal ability was not included because the current data pool is limited and statistical conclusions cannot be drawn based on the available data. Significantly more studies and representative data are needed for all BMP types in order to increase the confidence of performance estimates with regard to fecal indicator bacteria (Pathogens in Urban Stormwater, 2014).

Although definitive FIB removal data is not available at this time, based on the treatment processes provided in detention ponds, media filters, and bioretention (UV light exposure, predation, sedimentation of solids, etc.), FIB reductions would be expected and, generally, current data seems to support the theory (Pathogens in Urban Stormwater Systems, 2014). The above list is not exhaustive of all BMPs which may have bacteria removal abilities and only represents a few that indicate an ability to reduce bacteria based on limited research.

Table 4-1 lists the BMPs within the City that went online after 2006. The year 2006 was used as a cutoff point since that was the final year used in the TMDL reports for bacteria monitoring data. All BMPs that existed prior to 2007 were in place during the bacteria testing period and the baseline bacteria load calculations account for their presence. Since 2006, the City added stormwater treatment for over 400 acres within the MS4 service area.

Table 4-1. Total BMPs and Acres Treated by BMPs per Watershed

Watershed	Number of BMPs		Total MS4 Area in Watershed (ac)	Total Area Treated by BMPs[1] (ac)		Percent of Total MS4 Area Treated
	Public	Private		Public	Private	
Almond Creek	0	0	113	0	0	0%
Falling Creek	1	3	3,738	0	2	0%
Gillies Creek	1	1	1,585	0	0	0%
Goodes Creek	7	3	3,015	6	7	0%
James River (lower)[2]	1	18	5,003	1	362	7%
James River (tidal)[3]	0	3	1,009	0	0	0%
Powhite Creek	6	1	1,599	17	4	1%
Reedy Creek	0	5	2,478	0	3	0%
Upham Brook	1	3	2,983	1	2	0%
Total	**54**		**21,523**	**405**		**2%**

[1]Acres treated are from BMPs constructed 2007 to present

[2]BMPs in the James River (lower) are BMPs in the MS4 service area not already accounted by the other overlapped watersheds

[3]BMPs in the James River (tidal) are BMPs in the MS4 service area not already accounted by the other overlapped watersheds

BMP Maintenance Agreements

The City has a process to ensure that development plans cannot be finalized without an easement and maintenance agreement (EMA) for all post-construction stormwater control measures/BMPs. Water Resources plan reviewers review the agreements and ensure the information is correct. The information is forwarded to the City attorney's office for signature and recordation. The EMA is then entered into the City's database.

The City requires that new developments follow the requirements outlined in the Virginia Stormwater Management Handbook which promotes impervious cover disconnection.

At a minimum, the City requires inspections once every 5 years for private BMPs and annually for City-owned BMPs.

BMPs Implemented as Part of the Chesapeake Bay TMDL Action Plan

In addition to the structural BMPs presented in Table 4-1, the City also identified five stream restoration projects to be implemented as part of the Chesapeake Bay Plan. The five stream restoration projects are:

- Reedy Creek Stream Restoration in the Reedy Creek watershed. The restoration drainage area is 2,310 acres.
- Rattlesnake Creek Stream Restoration in the James River (lower) watershed. The restoration drainage area is 840 acres.
- Albro (Goode's) Creek Stream Restoration in the Goodes Creek watershed. The restoration drainage area is 35 acres.
- Pocosham Creek Stream Restoration in the Falling Creek watershed. The restoration drainage area is 3,625 acres.
- Maury Cemetery Stream Restoration in the Goodes Creek watershed. The restoration drainage area is 177 acres.

A map of the BMPs within the City's MS4 is included in Figure 4.2 in Appendix A.

4.3 DPU Outfall Inventory and IDDE Program

To meet MS4 Phase II permit requirements, the City developed a Standard Operating Procedure (SOP) to inventory of stormwater outfalls in priority waterways. The SOP includes instructions on how to select a waterway based on a tier system. There are three tiers outlined in the SOP and they are:

- Tier 1: Primary Importance-This waterway is considered to be of primary importance, based on its classification as impaired by DEQ.
- Tier 2: Secondary Importance-This waterway is considered of secondary importance, based on its location in a highly urbanized, commercialized/industrial area, or has a previous history of illicit discharges, dumping, or illegal connections.
- Tier 3: Low Importance-This waterway is considered low importance, based on its location in a highly suburban or undeveloped area.

The City utilizes a 'worst first' selection criteria which results in waterway outfall inventories occurring in the order of tier one through tier three.

The City currently uses an Outfall Reconnaissance Inventory (ORI) sheet to document stormwater outfall conditions. In addition, City staff document any dry weather flows from the stormwater system

and track these illicit discharges to their upstream source. City staff also looks for any possible illicit connections and straight pipes. These activities can be an important step in reducing direct human sources of bacteria to surface waters.

This activity will be measured with several metrics:

- Percentage of total watersheds inventoried annually
- Number of illicit discharges at outfalls detected and resolved
- Number of outfalls inspected annually

4.4 DPU Sewer CCTV Program

The City currently implements a sewer system Closed Circuit Television (CCTV) program. Sewer segments are selected from the Collection System Master Plan (CSMP), which includes a prioritized list of sanitary sewer sheds. A Sanitary Sewer Evaluation Study (SSES) is performed, which includes 50% manhole (MH) checks, 50% MH inspections, and 25-40% CCTV. The sewer sheds are broken into sub-sheds and further prioritized based on the field data. Segments are selected for rehabilitation, point repairs, replacement (MH to MH) or any combination of the three. In some cases, additional CCTV is required for segments not previously looked at during field data gathering. These segments then go through a similar process to determine what method of rehabilitation, if any is required. CCTV programs help to identify sewer segments that need repair or cleaning and can help to prevent future Sanitary Sewer Overflows (SSOs).

The City will track and document the length of sewer CCTV'd.

4.5 Pet Waste Program

The City is currently implementing a pet waste program that includes distributing pet waste bags to citizens and placing posters with information about picking up pet waste throughout the City. The posters can also be sourced from DPUs website and printed out for use. This activity is part of the City's public participation and outreach program designed to educate citizens about stormwater impacts on the environment. Educating the public on the importance of cleaning up pet waste increases awareness of pet waste impacts on the bacteria levels in urban stormwater runoff.

A metric that the City is currently tracking is the number of pet waste bags distributed and the number of posters distributed throughout the City. The goal from the FY2015 MS4 program plan was to distribute 35,000 pet waste bags.

4.6 Distribute FOG Brochures

The City currently implements a Fats, Oils, and Grease (FOG) education program which informs citizens of the dangers of putting these materials in the sewer systems. The Illicit Discharge/pre-treatment group goes door to door educating local area restaurants and businesses about the effects of FOG in storm sewer pipes. FOG door hangers are distributed to those areas where there is a history of sewer overflows caused by grease in the system. Providing public outreach on this subject and enacting public behavioral changes is an important step in reducing the number of SSOs that occur. Reducing SSOs will help contribute to bacteria reduction in surface waters.

A metric that the City currently measures is the number of brochures distributed. The goal from the FY2015 MS4 program plan was to distribute 200 FOG brochures.

4.7 Television Commercials

The City currently airs television commercials which contain information about the importance of pollution prevention and illicit discharge awareness. Preventing pollution and illicit discharges may help to reduce bacteria in surface waters by reducing nutrients and organic matter in surface waters.

A metric that the City currently measures is the number of views. The goal from the FY2015 MS4 program plan was to reach 20 million views.

4.8 Articles for Newsletters

The City currently writes articles for newsletters about stormwater education and pollution prevention and illicit discharge awareness. Educating the public on important stormwater issues is an important step in enacting behavior changes which may help to reduce bacteria in surface waters.

Metrics that the City currently measures are the number of articles written and the number of people reached. The goal from the FY2015 MS4 program plan was to write three articles and reach 6,000 readers.

4.9 School Outreach

The City currently implements several programs to reach out to school age children and teach them about topics such as pollution prevention, illicit discharges, and stormwater. Some examples of programs involving school children are educating 5th and 8th graders about pollution prevention and illicit discharge awareness, hosting a rain barrel decorating contest for middle school children, and presenting stormwater topics to 4th and 5th graders. Reaching out to children can be an effective way to enact public behavior changes because children's behavior may also influence their parents' behavior.

A metric that the City currently measures is the number of school children reached annually. The goal from the FY2015 MS4 program plan was to reach 2,800 people.

4.10 Civic Association Meetings

The City currently attends a number of Civic Association meetings annually to educate the public on the importance of pollution prevention and illicit discharge awareness. Examples of Civic Associations are neighborhood groups, community garden groups, and parks groups. Attending meetings with civic groups helps to spread public awareness of important pollution issues and may help to alter public behavior.

Measurable goals for this activity are the number people in attendance and the number of meetings attended annually, both of which the City is currently tracking.

4.11 Employee Training

The City currently implements training programs for new employees that address pollution prevention and illicit discharge awareness. Training new employees helps to ensure environmental protocols are followed by each employee. The program may be expanded to include regular refresher courses for existing employees.

A metric that the City is currently tracking is the number of new employees who receive this training. The goal from the FY2015 MS4 program plan was to train 100 new employees.

Additionally, City staff developed a required training program, with a biennial training schedule for stormwater awareness for all City employees and for those employees involved in areas likely to

have an effect on the MS4. The program covers spill prevention, vehicle maintenance, bulk material storage, road and parking lot maintenance, and facility maintenance.

A metric that the City is currently tracking is the number of employees who receive this training.

During fiscal year 2015, MS4 training sessions were held for the Department of Public Utilities (DPU), the Department of Public Works (DPW), and the Department of Parks, Recreation, and Community Facilities (DPRCF). A total of 8 sessions were scheduled for DPU, 5 sessions for DPW, and 4 sessions for DPRCF. The number of employees who attended the sessions was 85 from DPU, 42 from DPW, and 57 from DPRCF.

Section 5

Facilities of Concern

Facilities of concern are defined as any area with a higher-than-normal bacterial load for its land use and is owned and/or operated by the municipality. Some examples of facilities of concern are dog parks, equine facilities, and sewer pump stations.

Table 5-1 contains a list of the identified facilities of concern within the City's MS4 Service area that are located in a bacteria TMDL watershed. An evaluation of the City's GIS data indicated that municipal-owned pump stations and dog parks are located within the MS4 service area. Figure 5.1 in Appendix A shows the location of each facility.

Table 5-1. City of Richmond Facilities of Concern within MS4 Service Area and TMDL Watershed

Facility	Watershed
Barker Field Dog Park	James River (lower)
Church Hill Dog Park	Gillies Creek
Sanitary Sewer Pump Station	James River (lower)
Sanitary Sewer Pump Station	Reedy Creek

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Section 6

Methods of Assessment and Schedule of Milestones

As part of the Phase II MS4 permit special conditions, the City must develop and implement methods to assess the TMDL action plan for its effectiveness in reducing the pollutants of concern, as described in Section 2.3, and include an assessment of the FOCs, as described in Section 5.

6.1 Evaluating Programmatic Measures

The City will assess the effectiveness of its programmatic BMPs, as described in Sections 4.3 to 4.12, by tracking measurable goals for each activity. Table 6-1 shows a list of the City's programmatic measures and their associated measurable goals.

Table 6-1. Programmatic BMPs and Measurable Goals

BMP	Measurable Goal(s)
DPU Outfall Inventory and IDDE Program	• Percentage of total watersheds inventoried annually • Number of illicit discharges at outfalls detected and resolved • Number of outfalls inspected annually
DPU Sewer CCTV Program	• Length of sewer CCTV'd annually
Pet Waste Program	• Number of bags distributed annually • Number of posters distributed annually
Host Household Hazardous Waste Pick Up	• Number of citizens reached annually
Distribute Fog Brochures	• Number of brochures distributed annually
Television Commercials	• Number of commercial views annually
Articles for Newsletters	• Number of articles written and the number of people reached annually
School Outreach	• Number of schoolchildren reached annually
Employee Training	• Number of employees who receive training annually
Civic Association Meetings	• Number of people in attendance and the number of meetings attended annually

6.2 Monitoring

For the purpose of assessing the effectiveness of the TMDL action plan, the City has developed an Integrated Monitoring Plan (IM Plan) to evaluate water quality within the City. Since the City currently conducts regular monitoring of the Combined Sewer System (CSS), the IM Plan focuses on the surface water quality of watersheds. The primary goals for the IM Plan are ensuring regulatory

compliance; establishing the surface water quality baseline within the City's watersheds; and identifying long term trends.

The IM plan suggests the installation of seven long term ambient monitoring stations. Six of these stations are within the MS4 service area and an impaired watershed, specifically:

- In the Upham Brook TMDL watershed on Upham Brook within Henrico County
- In the Goodes Creek TMDL watershed at the confluence of Broad Rock Creek and Goodes Creek
- In the Reedy Creek TMDL watershed on Reedy Creek
- In the Powhite Creek TMDL watershed on Powhite Creek
- In the Gillies Creek TMDL watershed on Gillies Creek near the boundary between the City and Henrico County
- In the Gillies Creek TMDL watershed at the confluence of Gilles Creek and the James River

In addition, six sites were identified for future exploratory monitoring which the City may use to assess the bacteria conditions within additional watersheds in the MS4 service area. The locations are:

- On Pittaway Creek in the Lower James TMDL watershed
- On Cherokee Creek in the Lower James TMDL watershed
- On Rattlesnake Creek in the Lower James TMDL watershed
- On Broad Rock Creek in the Goodes Creek TMDL watershed
- On Grindall Creek in the Falling Creek TMDL watershed
- On Pocosham Creek in the Falling Creek watershed near the boundary between the City and Chesterfield County

Additionally, the City will utilize the long-term monitoring station results from DEQ and citizen monitoring stations. The current DEQ and citizen monitoring stations that test for bacteria within the City are shown by watershed in Table C-1 in Appendix C. The data was provided by DEQ staff and was sourced from the draft 2014 data. A summary of the number of stations per watershed is shown in Table 6-2. There are a total of 61 DEQ and citizen stations within the City.

Table 6-2. DEQ and Citizen Monitoring Stations within the City

Watershed	Number of Stations
James River-Almond Creek	38
James River-Little Westham Creek	19
Upham Brook	4

6.3 Assessment of Facilities of Concern

The FOCs identified in Section 5 are two dog parks and two pump stations. Pump station maintenance procedures follow the Sewage Collection and Treatment (SCAT) Regulations as defined by VDH. The SCAT Regulations govern most municipal and large flow systems. The regulations contain requirements for system design, operation, and maintenance not contained in Sewage Handling and Disposal Regulations.

Dog parks are maintained by the Department of Parks, Recreation, and Community Facilities. Regular maintenance includes emptying the trash receptacles 1-3 times weekly.

6.4 Schedule of Milestones

As a requirement of the Phase II MS4 permit special conditions, the City has developed a schedule of milestones for activities to be implemented during the remaining years of the permit term. At a minimum, the City will ensure funding for projects and programs which are part of the schedule of milestones. Table 6-3 includes the year four and year five goals for each project and program.

Table 6-3. Programmatic BMPs and Year 4 and 5 Goals

BMP	Year 4 Goals	Year 5 Goals
DPU Outfall Inventory and IDDE Program	• Identify the percentage of total watersheds inventoried • Identify the number of illicit discharges detected and resolved • Identify the number of outfalls inspected	• Identify the percentage of total watersheds inventoried • Identify the number of illicit discharges detected and resolved • Identify the number of outfalls inspected
DPU Sewer CCTV Program	• Identify the length of sewer CCTV'd	• Identify the length of sewer CCTV'd
Pet Waste Program	• Identify the number of bags distributed with a goal of 56,000 • Identify the number of posters distributed	• Identify the number of bags distributed with a goal of 56,000 • Identify the number of posters distributed
Host Household Hazardous Waste Pick Up	• Identify the number of citizens reached with a goal of 500	• Identify the number of citizens reached with a goal of 500
Distribute Fog Brochures	• Identify the number of brochures distributed with a goal of 200	• Identify the number of brochures distributed with a goal of 200
Television Commercials	• Identify the number of views with a goal of 200,000 people with 10 views each	• Identify the number of views with a goal of 200,000 people with 10 views each
Articles for Newsletters	• Identify the number of articles written with a goal of 3 and the number of people reached with a goal of 6,000	• Identify the number of articles written with a goal of 3 and the number of people reached with a goal of 6,000
School Outreach	• Identify the number of school children reached annually	• Identify the number of school children reached annually
Employee Training	• Identify the number of employees who receive training with a goal of 100	• Identify the number of employees who receive training with a goal of 100
Civic Association Meetings	• Identify the number people in attendance with a goal of 1,200 people and the number of meetings attended	• Identify the number people in attendance with a goal of 1,200 people and the number of meetings attended

Tracking programmatic measures will help the City identify the degree of success for each measure. By tracking measurable goals, the City can modify programs which may not be performing as projected and continue to implement programs which appear to be successful.

6.5 Annual Reporting Requirements

Under Section 5 of the Phase II MS4 Permit special conditions, the City is required to submit on an annual basis:

- TMDL Action Plans with the appropriate annual report and in accordance with the associated schedule identified in the state permit
- A report on the implementation of the TMDL Action Plans and associated evaluation, including the results of any monitoring conducted as part of the evaluation

Additionally, the City will evaluate the effectiveness of its TMDL action plan using the IM Plan results and measurable goals from the implemented programmatic measures.

Section 7

Legal Authority for TMDL Implementation

The Phase II MS4 Permit requires that the Plan document the current program and legal authority, new or modified legal authority, and the means and methods to address discharges from the new sources.

7.1 Current Program and Existing Legal Authority

Richmond has reviewed its current MS4 Program Plan and has determined that the authority as stated in the current MS4 Program Plan is sufficient for compliance with this special condition. Specific City codes include the following:

Chapter 46.1 Richmond City code: Fire Protection and Protection

(Includes spill abatement)

https://www.municode.com/library/va/richmond/codes/code_of_ordinances?nodeId=CH46.1FIPRPR

Chapter 50 Richmond City code: Floodplain Management, Erosion and Sediment Control, and Drainage Generally

(Includes Floodplain management, Erosion and Sediment Control, Chesapeake Bay Preservation Areas, and Richmond Stormwater Management Program)

https://www.municode.com/library/va/richmond/codes/code_of_ordinances?nodeId=CH50FLMAERSECODRGE

Chapter 90 Richmond City Code: Streets, Sidewalks and Public Ways

https://www.municode.com/library/va/richmond/codes/code_of_ordinances?nodeId=CH90STSIPUWA

Chapter 106 Richmond City code: Utilities

(Includes Wastewater Sewers and Collection System, Stormwater)

https://www.municode.com/library/va/richmond/codes/code_of_ordinances?nodeId=CH106UT_ARTVIIIST

7.2 New or Modified Legal Authority

As described in Section 2.1, existing authority is sufficient for compliance with this special condition. Therefore, no new or modified legal authority is considered necessary to meet the requirements of this special condition.

7.3 Means and Methods to Address Discharges from New Sources

Richmond will adhere to the VSMP regulations for the implementation of post-development stormwater management facilities.

Section 8

Conclusion

The City of Richmond has developed this TMDL Action Plan as required in the Phase II MS4 Permit. The WLAs developed under this action plan were formulated using TMDL report documents sourced from DEQ and reproducing the methodology provided within to the maximum extent practicable.

It is understood that the TMDL values calculated for the City may not represent the City's actual bacteria contribution to surface waters. The interconnectivity of surface waters to multiple MS4s and other land uses outside of the MS4, coupled with the lack of definitive removal rates for individual BMPs, makes it nearly impossible to predict whether the actions of the City will reduce FIB concentrations in the stream to use standard levels. Additionally, current research points to the fact that the majority of conventional stormwater controls in ASCE's BMP Database (i.e. stormwater wetlands, wet ponds, bioretention) do not appear to be able to reduce FIB concentrations to primary contact stream standards (Pathogens in Urban Stormwater, 2014).

Per permit requirements, the City will continue to implement BMPs in an effort to reduce FIB loading to surface waters. The City is required to provide an estimated date of TMDL compliance at the end of the current Phase II MS4 permit term in 2018. As more research becomes available, the City may update this plan in an effort to implement the most effective practices. Modifications to this plan will be documented in Appendix B.

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937 ## Section 9

938 # Limitations

939 This document was prepared solely for the City of Richmond in accordance with professional
940 standards at the time the services were performed and in accordance with the contract between the
941 City of Richmond and Brown and Caldwell dated July 1, 2015. This document is governed by the
942 specific scope of work authorized by the City of Richmond; it is not intended to be relied upon by any
943 other party except for regulatory authorities contemplated by the scope of work. We have relied on
944 information or instructions provided by the City of Richmond and other parties and, unless otherwise
945 expressly indicated, have made no independent investigation as to the validity, completeness, or
946 accuracy of such information.

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Section 10

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Appendix A: Maps

Figure 1.1: MS4 Service Area and Bacteria TMDL Watersheds

Figure 4.2: BMPs

Figure 5.1: Facilities of Concern

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978 # Appendix B: Plan Updates

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980 # Appendix C: DEQ and Citizen Monitoring Stations

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Table C-1. DEQ and Citizen Monitoring Stations Within Richmond	
DEQ Monitoring Station ID	Watershed
2-GIL000.42	James River-Almond Creek
2-JMS109.38	James River-Almond Creek
2-JMS109.39	James River-Almond Creek
2-JMS109.40	James River-Almond Creek
2-JMS109.41	James River-Almond Creek
2-JMS109.42	James River-Almond Creek
2-JMS109.45	James River-Almond Creek
2-JMS109.47	James River-Almond Creek
2-JMS108.74	James River-Almond Creek
2-JMS104.16	James River-Almond Creek
2-JMS104.58	James River-Almond Creek
2-JMS107.32	James River-Almond Creek
2-JMS108.93	James River-Almond Creek
2-JMS108.94	James River-Almond Creek
2-JMS108.95	James River-Almond Creek
2-JMS108.96	James River-Almond Creek
2-JMS108.97	James River-Almond Creek
2-JMS108.99	James River-Almond Creek
2-JMS109.02	James River-Almond Creek
2-JMS109.04	James River-Almond Creek
2-JMS109.05	James River-Almond Creek
2-JMS109.06	James River-Almond Creek
2-JMS109.07	James River-Almond Creek
2-JMS109.08	James River-Almond Creek
2-JMS109.09	James River-Almond Creek
2-JMS109.10	James River-Almond Creek
2-JMS109.11	James River-Almond Creek
2-GIL001.77	James River-Almond Creek
2-GOD000.77	James River-Almond Creek
2-JMS109.12	James River-Almond Creek
2-JMS109.13	James River-Almond Creek
2-JMS109.14	James River-Almond Creek
2-JMS109.15	James River-Almond Creek
2-JMS109.16	James River-Almond Creek
2-JMS109.17	James River-Almond Creek

Table C-1. DEQ and Citizen Monitoring Stations Within Richmond	
DEQ Monitoring Station ID	Watershed
2-JMS109.18	James River-Almond Creek
2-JMS109.19	James River-Almond Creek
2-JMS109.20	James River-Almond Creek
2-JMS110.30	James River-Little Westham Creek
2-JMS110.34	James River-Little Westham Creek
2-JMS110.44	James River-Little Westham Creek
2-JMS111.17	James River-Little Westham Creek
2-JMS111.47	James River-Little Westham Creek
2-JMS112.33	James River-Little Westham Creek
2-JMS115.29	James River-Little Westham Creek
2-JMS112.79	James River-Little Westham Creek
2-JMS113.20	James River-Little Westham Creek
2JMS-35-ALL[1]	James River-Little Westham Creek
2-MAN000.19	James River-Little Westham Creek
2-PWT000.57	James River-Little Westham Creek
2-RDD001.57	James River-Little Westham Creek
2-RDD-RC3-ACB[1]	James River-Little Westham Creek
2-RDD-RC4-ACB[1]	James River-Little Westham Creek
2-RDD000.76	James River-Little Westham Creek
2-RDD-RC1-ACB[1]	James River-Little Westham Creek
2-RTL000.04	James River-Little Westham Creek
2-CKD-CB1-ACB[1]	James River-Little Westham Creek
2CXBC-1-VMN[1]	Upham Brook
2-XXQ-3-VMN[1]	Upham Brook
2-UPM-2-VMN[1]	Upham Brook
2-UPM-4-VMN[1]	Upham Brook

[1]Citizen Monitoring Station