

October 2018

Annual Stormwater Management Report

VSMP Permit No. 0088595 – FY 2018



Submitted by:
Prince William County
Department of Public Works

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Certification

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



Marc Aveni
Chief, Environmental Services Division

October 1st, 2018

Date

I. Program Implementation

1. MS-4 Program Review and Updates

The Prince William County MS-4 Program plan describes all programs and actions taken by the County to ensure compliance with Virginia Stormwater Management Program (VSMP) MS-4 Permit # VA0088595. Prince William County was issued its latest permit on December 17th, 2014. Prince William County submitted its program plan document to the DEQ Northern Virginia Regional Office (NVRO) on December 17th, 2015 as required in section I.a.6 of its MS-4 Permit. Any changes from the program plan will be reflected in this document.

2. Planning

On December 17th 2015 the County submitted to the Department a cost benefit analysis of pollutant reduction priority projects as part of its Program Plan. These projects are selected from completed watershed studies and are prioritized according to a number of metrics determined by County. This prioritized list will be presented along with information on the number of BMP acres treated, impervious area draining to the BMP, condition of downstream channel, amount of pollutant reduction, feasibility for implementation, unit cost of reductions and other benefits the County determines for the retrofit.

The County's Watershed Management plan as part of its Program plan has been posted on the County's website.

3. MS4 Program Implementation

a. Construction Site Runoff and Post Construction Runoff

BMP 1 – Continue to implement an Erosion and Sediment Control Program

Prince William County continues to implement the erosion and sediment control program consistent with the Virginia Erosion and Sediment Control Law §62.1-44.15:51 of the Code of Virginia and Virginia Erosion and Sediment Control Regulations 9VAC25-840 et seq. During DEQ's audit of Prince William County in November of 2017, the E&S program was thoroughly inspected and found to be in compliance. An E&S permit is required when the land disturbance exceeds 2,500 square feet.

Our stormwater management program is consistent with the Virginia Stormwater Management Act §62.1-44.15:24 of the Code of Virginia and Virginia Stormwater Management Program Regulations 9VAC25-870 et seq. The Virginia Stormwater Management Program (VSMP) regulations became effective on July 1, 2014. These regulations are contained in Section 700 of the County's Design & Construction Standards Manual (DCSM), and Chapter 23.2, Article IV – Storm Water Management in Prince William County Code. The SWM requirements for Development on Prior Developed Lands are consistent with the State regulations. The County's SWM regulations are more stringent than the State regulations only in certain areas as described below:

VSMP regulations allowed the localities to adopt criteria more stringent than VSMP with proper justification based on specific watershed studies. Alternatively, more stringent regulations that pre-existed prior to January 1, 2013 were exempt. Based on this exemption, Prince William County retained more stringent regulations on flood control in critical watersheds to control the 25-year storm to prevent localized flooding events. In addition, the County retained its authority to require the control of the 100-year flood, for proposed developments located upstream of existing residential developments with required minimum lot sizes less than one acre and adjoining special flood hazard areas. These requirements are in addition to the required control of 2- and 10-year frequency storms per state regulations.

Prince William County employs 10 full-time site inspectors. In addition, the County has five full-time engineers to review the land development plans for E&S and SWM requirements. In FY18, Prince William County created and filled a new position as an E&S Program Manager. All our site inspectors and plan reviewers are duly certified for erosion control and SWM. In Prince William County, maintaining these certifications is a condition for the continued employment. Prince William County is committed to providing continuing education and training to its employees on E&S and SWM. For additional information on certifications for plan reviewers and inspectors, please see Appendix A

The land development plan review, inspection and enforcement of E&S and SWM regulations are performed by a single agency in Prince William County. The Environmental Services Division of the Department of Public Works is directly responsible for administering the program. Having a streamlined program under one agency is very helpful in ensuring the consistent interpretation and enforcement of applicable ordinances. The County continues to require the Responsible Land Disturbance (RLD) certifications prior to issuing the land disturbance permits. The County's E&S Administrator conducts periodic joint meetings with the plan reviewers and the site inspectors for the continued improvement of the programs.

Prince William County has developed a mobile application for in E&S and VSMP inspections. This system runs on tablet devices (IPad) provided to each site inspector. Follow up inspections, violation notices, and inspection checklists are all managed through the mobile application. This application has enhanced the inspection efficiency and brought added consistency among all site inspectors.

For the period July 1, 2017 thru June 30, 2018, Prince William County approved a total of 186 land development plans with a cumulative land disturbance of 866.54 acres.

Table 1, presented below, summarizes the number of land disturbing activity inspections conducted and the number and type of each enforcement action taken for Erosion & Sediment Control.

Table 1 – Erosion and Sediment Control Program Summary

Month	Erosion Inspections	Site Inspections	Violations	Notice to Comply	Inspection Notice	Stop Work
17-Jul	1047	600	4	0	5	0
17-Aug	1042	656	3	0	13	0
17-Sep	803	474	2	0	13	0
17-Oct	1141	712	2	1	24	0
17-Nov	784	496	4	0	18	0
17-Dec	655	481	3	1	3	0
18-Jan	635	439	3	0	1	0
18-Feb	692	401	2	0	4	0
18-Mar	830	503	0	0	0	0
18-Apr	940	494	0	0	10	0
18-May	1072	535	1	0	2	0
18-Jun	1022	463	4	0	11	0
Total	10663	6254	28	2	104	0

Our stormwater management program is consistent with the Virginia Stormwater Management Act §62.1-44.15:24 of the Code of Virginia and Virginia Stormwater Management Program Regulations 9VAC25-870 et seq.

Prince William County continues to implement a robust program to address the post-construction discharges from new developments and redevelopments by ensuring the long-term operation and maintenance of these SWM controls. We have a dedicated team for the inspection and maintenance of all county-maintained SWM facilities. All the county-maintained and the county-owned facilities are inspected annually. The County inspects all the privately-maintained SWM facilities once within the 5-year permit cycle. The owners of these facilities receive the County’s inspection reports along with the identification of deficiencies that must be corrected within the specified deadline. Our staff follows-up to ensure maintenance and seek the County Attorney’s assistance as necessary for enforcement.

Prince William County’s strategies to address the stormwater controls that are designed to treat the stormwater runoff solely from individual residential lot are summarized in BMP Table 7-6, included in Appendix A. The Table summarizes the party responsible for the maintenance and the applicable deed restrictions and agreements. For the individual infill lots outside the common plan of development, the County allows the use of the “Agreement in lieu of a SWM Plan”.

b. Retrofitting on Prior Developed Lands

BMP 1 – Implementation of TMDL priority Projects

The County has completed the process of implementing all of its priority projects. A list of these projects can be found in Table 2 below. For a detailed summary, please see Section III.1.

Table 2 – Priority Projects by Completion Year

Number	Project Name	Completion Year
1	SWM Facility No. 99 – Water Quality Retrofit	FY16
2	Hylbrook Park	FY16
3	SWM Facility No. 28 – Water Quality Retrofit	FY17
4	Reach 5 Stream Restoration	FY17
5	Dewey’s Creek Reach 4	FY17
6	East Longview	FY17
7	SWM Facility No. 489	FY18

BMP 2 – Implementation of Non-Priority Projects

During FY18 four additional non-priority restoration or retrofit projects were completed beyond the original seven. See Section III for more information.

c. Roadways

BMP 1 – Maintain Accurate List of Prince William County Owned Roadways

Although the Virginia Department of Transportation (VDOT) maintains a majority of the roadways and right of way areas within Prince William County, the County is responsible for the maintenance of some roadways and parking lots. VDOT operates under its own phase II stormwater permit, and coordination regarding issues with MS-4 physical-interconnectivity is required as part of both permittee’s MS-4 requirements (see section II.m). The County currently operates and maintains parking lots associated with County facilities.

As part of its permit responsibilities PWC has generated a list of all County maintained parking lots, streets, and roadways and the acres treated/not treated by BMPs. This list will be updated during the first year of the next permit cycle. The County has 75 total parcels with impervious parking lots or roads. There are 48 parcels containing County maintained impervious roadways totaling 12.4 miles or 41.9 acres, in addition, there are 69 parcels with impervious parking lots totaling 121.8 acres. Some parcels may contain both sections of impervious roadway and parking lot space.

Table 3 – County Maintained Roadways, Streets, and Parking lots

Street Name	Street Type	Street Class	Street ID	Street Description	Parking Lot	Trail	Load	Load	Load	Sit BM	Parking Lot	Load	Load	Load
	Road	Road		Street Name										
	Road	Road		Street Name										
	Road	Road		Street Name										
	Road	Road		Street Name										
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BMP 2 – Good Housekeeping Practices on County Maintained Roadways

Prince William County contracts out maintenance activities for County maintained parking lots, streets, and roadways. These activities include sweeping, line painting, and asphaltting. No aggregate materials are stored as part of B&G roadway maintenance activities at this time.

Asphalt maintenance to parking lots and roadways are scheduled to be performed cyclically, with the average asphalt lifespan of 17 years. Each lot and roadway is listed for evaluation every fiscal year. Paint maintenance to parking lots is performed every 4 years. Street sweeping to parking lots is scheduled to be performed every 2 years. All maintenance activities are designed to conform to good housekeeping and pollution prevention practices in a manner to minimize the discharge of pollutants.

Buildings and Grounds maintenance vehicles are stored in a manner to reduce the discharge of pollutants. Vehicles are serviced and repaired by PWC Fleet Management Division and are tracked by GPS to provide feedback on fuel usage and routing. This is designed to improve efficiency and minimize pollutant discharge.

Prince William County established a county-wide IDE (Illicit Discharge Elimination) policy to promote good housekeeping practices across all municipal facilities. A full copy of this policy can be found in Appendix I.

BMP 3 – Good Housekeeping Practices for Winter Weather Maintenance

Prince William County Buildings and Grounds and Construction Services are responsible for snow removal at all county facilities maintained by Buildings and Grounds. Snow removal activities are not performed on any other County maintained roads, streets, or parking lots. Salt, sand, and calcium chloride are the specified materials used in snow removal activities. Any materials used for deicing and sanding activities are stored and maintained in a manner to prevent runoff from precipitation.

Prince William County established a county-wide IDE policy to promote good housekeeping practices across all municipal facilities. A full copy of this policy can be found in Appendix I.

d. Pesticide, Herbicide, and Fertilizer Application

Prince William County Public Works will promote and encourage the proper use, application, and disposal of pesticides, herbicides and fertilizers by public, commercial, and private applicators and distributors.

Working with the Virginia Cooperative Extension Service, their staff help support Prince William County applicators and distributors with proper training and coordination with the Virginia Department of Agriculture and Consumer Services (VDACS)

- VDACS provides ongoing communication with all certified applicators and distributors.

- The Virginia Cooperative Extension Service provides training and education on the use, application and disposal of pesticides, herbicides and fertilizers.

There is an annual collection to properly dispose of the materials in the state. It is held in a different region each year. The Cooperative Extension works with our local applicators and distributors to ensure they are aware of the collection.

BMP 1 – Identify Nutrient Applied over County Lands

Prince William County is dedicated to minimizing the effects of pesticides, herbicides, and fertilizer use on the Chesapeake Bay. The County has identified all lands of which nutrients are applied to a contiguous area of more than one acre. The latitude and longitude of these lands will be reported to DEQ as requested. This data will be used to determine where Nutrient Management plans need to be developed. This list is displayed in the following section, along with the current status of implementation for each site.

BMP 2 – Develop and Implement Turf and Landscape Management Plans

The County is in the process of developing and implementing Turf and Landscape nutrient management plans for County lands where nutrients are applied to greater than one contiguous acre. Currently just over 50% of lands owned by the County are covered under nutrient management plans and 75% of lands will be covered by October of 2018. Table 4 below provides a summary of lands of which nutrients are applied to greater than one contiguous acre and the progress of the County’s NMP.

Table 4 – Nutrient Management Plan Implementation

Name	Acres	Longitude (W)	Latitude (N)	Plan acreage	Effective date
H.L. Mooney Plant	4.9	38.6146	77.2684	4.98	9/28/2015
Spittle Building	2.4	38.681184	77.349202	2.48	9/30/2015
Anne Wall	11.318024	77*20'39"	38*36'14"		
Ben Lomond	49.090921	77*29'37"	38*47'51"		
Ben Lomond Community	1.86	77*30'22"	38*47'22"	1.86	7/1/2017
Birchdale Rec	2.983583	77*18'40"	38*37'48"		
Braemar	2.46	77*34'9"	38*44'2"	2.46	9/1/2017
Catharpin	9.03	77*33'56"	38*51'16"	9.03	4/1/2017
Chinn	16.841857	77*19'49"	38*40'14"		
Cloverdale	13.447417	77*19'10"	38*37'20"		
Dale City Rec	7.371609	77*20'42"	38*38'35"		
Fairmont	13.231697	77*29'27"	38*46'54"		

Forest Greens Golf	105.42	77*21'14"	38*32'35"	105.42	11/26/2014
Hellwig	36.84	77*27'0"	38*38'20"	36.84	4/1/2017
Howison	9.82	77*22'57"	38*38'2"	9.82	4/1/2017
Independent Hill Park	3.81	77*25'43"	38*38'10"	3.81	7/1/2017
James Long	17.87	77*38'5"	38*51'13"	17.87	4/1/2017
Lake Ridge Golf	21.29	77*19'15"	38*41'31"	21.29	5/4/2016
Leitch	2.798762	77*22'16"	38*39'26"		
Leitch/VEPCO	16.210986	77*22'6"	38*39'13"		
Locust Shade	7.008583	77*21'4"	38*32'0"		
Mayhew	6.95	77*29'29"	38*48'24"	6.95	10/1/2017
Nokesville	42.943161	77*34'39"	38*41'8"		
Prince William Golf	114.33	77*37'50"	38*44'51"	114.33	2/5/2016
Stadium	22.775254	77*21'5"	38*41'1"		
Turley	2.467387	77*18'34"	38*37'40"		
Valley View	69.882351	77*32'22"	38*42'4"		
VEPCO	3.908403	77*21'49"	38*38'53"		
Veterans	48.584245	77*14'59"	38*38'32"		
Barg Homeless	5.07	77*16'32"	38*37'36"	5.07	10/15/2017
Boys Home /Winter Shelter	1.92	77*17'43"	38*37'50"	1.92	10/30/2015
Bull Run Library	1.56	77*31'14"	38*47'12"	1.56	10/30/2015
Central Library	1.48	77*27'19"	38*46'7"	1.48	4/11/2016
Dawson Beach	4.08	77*14'42"	38*38'53"	4.08	2/1/2016
Fire 20	1.59	77*18'23"	38*38'51"	1.59	5/17/2017
Fire 4	1.53	77*37'10"	38*48'14"	1.53	10/30/2016
Garfield Ferlazzo	5.9	77*17'40"	38*36'29"	5.9	5/16/2017
Manassas Court	8.1	77*28'44"	38*45'9"	8.1	6/18/2018
McCoart	13.97	77*21'8"	38*40'49"	13.97	3/15/2015
PWC Safety Training Center	4.95	77*35'7"	38*39'52"	4.95	6/25/2018
Western PD	7.27	77*31'2"	38*45'45"	7.27	4/1/2015
Total	725.26424		Total to Date	389.49	53%
			48 Month Goal		75%

Staff certified in nutrient management planning develop turf and landscape management plans. These certifications are summarized in Table 5.

Table 5 – Name, certificate number, and expiration date of all nutrient management planners for Prince William County

Plan Writer	Certificate number	Expiration date
Julie Flanagan	#772	2/2020
Clay Morris	#757	8/2019
Paige Thacker	#759	8/2019
Nancy Berlin	#801	8/2020
Thomas Bolles	#732	2/2019
Kevin Flickinger	#842	8/2019

BMP 3 – Develop and Employ Good Housekeeping Practices for storage transport and disposal of pesticides, herbicides, and fertilizers.

The County works with its Mosquito Forest Pest Management, Buildings and Grounds, and Parks and Recreation departments to ensure good housekeeping practices are followed. This includes the storage, transport, and disposal of pesticides, herbicides, and fertilizers. All County staff working with pesticides, herbicides, insecticides, and fertilizers are trained and maintain required certifications. Good housekeeping practices are further defined in the Illicit Discharge Elimination (IDE) policy. The County evaluated each of these departments for compliance with this policy through IDE compliance reports. These reports and the policy can be found in Appendix I. They are also described further in SOPs found in Appendix D.

In addition, the County works with various volunteer organizations to ensure the proper use and storage of pesticides, herbicides, and fertilizers. For instance, the Environment and Natural Resources program of Virginia Cooperative Extension Service (VCE) provides research based information to help citizens improve their lawns and landscapes without negatively impacting the environment. Services include:

- Horticulture Help Line and Plant Clinics at local Garden Centers and farmer’s market to answer questions about insect, disease or gardening problems
- BEST Lawns is a lawn education program that provides lime and fertilizer recommendations based on a soil test and lawn measurements, as well as best practices for lawn care
- Free lectures to the public
- Education for businesses and non-profit organizations in the management of storm water runoff
- Training for interested citizens who wish to become Master Gardener volunteers
- Low maintenance gardening techniques demonstrated at the Teaching Garden
- Plant a Row for the Hungry collections at local Farmer’s Markets
- Cooperative Extension agent is on the board of the Prince William Soil & Water Conservation District
- Emergency management assistance to local agricultural producers
- Pesticide Safety training and best management educational workshops for the Green Industry

VCE conducts a post survey gauging awareness and behavior changes made through educational programming. It tracks program effectiveness and reach by evaluating the number of people educated and the number of people that implement the practices they learn.

The County will continue to define and promote good housekeeping practices for storage transport and disposal of pesticides, herbicides, and fertilizers.

BMP 4 – Develop and Employ Integrated Pest Management Plans

The County will track and employ Integrated Pest Management Plans where applicable. Currently the county maintains all lands under IPM with the mission of the program to survey, reduce, and control populations when possible, of mosquitoes and forest pests. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment. The data gathered in the process is analyzed and used to track population trends, determine appropriate control measures and evaluate effectiveness of the control efforts. Reduction and response consists of implementing IPM pest control measures to suppress populations of mosquitoes, gypsy moths and fall cankerworms. Selective application of environmentally-compatible, EPA-registered products are utilized to control these pests. Several factors from our surveillance program and other environmental factors help in determining treatment options.

During the reporting period, the County applied larvicide to a total of 42.44 acres including 14.85 acres of stormwater management facilities and 27.59 acres of lands not designated as stormwater management facilities. In addition, the Mosquito and Forest Pest Management Branch applied adulticide to a total of 17,179.54 acres, bringing the total County lands treated by IPM to 17,221.98 acres.

e. Illicit Discharge and Improper Disposal

BMP 1 – Elimination of Illicit Discharges and Improper Disposal

The Prince William County's Illicit Discharge Detection and Elimination (IDDE) Program consists of elements designed to identify, mitigate, and prevent the release of non-stormwater discharges into its storm sewer system, and thus into State and Federal waters. Through development of County Fire Protection, Zoning, Building Development, and Stormwater Management Ordinances; Prince William County has prohibited the discharge of any non-stormwater element determined to be contributing significant amounts of pollutants to its storm sewer system. This includes the dumping or improper disposal of motor vehicle fluids, household hazardous wastes, sanitary sewage, grass clippings, leaf litter, and animal wastes. The County defines all discharges categorized as non-stormwater discharges, as well as those discharges not addressed as illicit discharges in accordance with part I.A.1.b) in permit #VA0088595 in Article II sec. 23.2-4.1 of Prince William County's Code of Ordinances. By issuance of a Notice of

Violation, illicit discharges are required to be eliminated within 30 days of discovery, unless removal is not possible within that timeframe. In these instances, reasonable and prudent measures to minimize discharge will be taken and an action plan for mitigation/removal will be required.

Table 6 below summarizes the results of the Illicit Discharge Program. The program is broken into 2 elements; Dry weather outfall inspections (see section II.1 for more details); and reported and observed discharges.

Table 6 – Illicit Discharge Program Overview

Type	No.	Percentage	
Dry Weather Outfall Inspections	Non-flowing	710	84.52%
	Flowing	130	15.48%
	Groundwater	44	33.85%
	Upstream Open Channel	44	33.85%
	Discharge of Upstream BMP's	33	25.38%
	Other	13	6.92%
	Illicit Discharges	17	2.02%
Total:		840	
Reported and Observed Discharges	Nonfounded/minor	37	71%
	Illicit Discharges	15	29%
	Total:		52
Total illicit Discharges	Closed Cases	27	84%
	Active Cases	5	17%
	Total:		32

During the reporting period, Prince William County responded to 52 complaints of illicit discharge, a slight increase from the 49 reported discharges from the previous reporting period. All from this fiscal year have been resolved. See Table 7 below for more detail on reported Illicit Discharge cases handled by the County in FY18.

Table 7 – Reported Illicit Discharges for FY18

Reported Discharges for FY18									
Citizen/County Staff	Date	Discharge Description	Discharge Location	Type	Date of initial inspection	NOV Issued	Date of last Inspection	Comments/Notes	Status
Citizen	7/11/2017	Car leakage	4221 Holiday Ct.	oil discharge	7/12/2017	No	7/12/2017	Upon arrival, dry oil stains observed on street and oil was not flowing into storm sewer system. Unable to identify violator.	Closed
County Staff	7/11/2017	Oil spill	10824 Monocacy Way	oil discharge	NA	Yes, FMO	NA	Based on fire marshal officer's (FMO) investigation, there was a small spill. NOV was issued by FMO to run clean up work. Case will follow up by FMO.	Closed
County Staff	7/17/2017	Oil and waste food fluid	8356 Sudley Rd	an illicit discharge	7/17/2017	Yes, 11-2017	8/30/2017	Waste food debris, grease and waste cooking oil found to be stained on the pavement and flowing mark observed towards drain. Follow-up inspection made [08/30]. Dumpster replaced with new ones and debris were cleaned up.	Closed
County Staff	7/19/2017	Oil and waste food fluid	2700 Potomac Mills Circle	an illicit discharge	7/19/2017	Yes, 12-2017	Periodic 8/10/2017; 8/21/2017	Ac water was mixing with waste food fluid leaking from compactor; grease and cooking oil being spread out on pavement during collection and haulage. Follow up inspection made [8/21]. Deficiencies mentioned in an NOV found to be corrected to resolve the problems.	Closed
Citizen	7/19/2017	Asphalt Tar	2700 Potomac Mills Circle	Petroleum	7/19/2017	Yes, FMO	7/24/2017	The bituminous emulsion was spilled over the road through tar tanker due to leakage during road maintenance. The emulsion ultimately reached into downstream creek through storm sewer system. NOV was issued by the department of fire and rescue (DFR). The case was resolved by the contractor employing certified cleaning contractor "ATLAS".	Closed

County Staff	8/4/2017	Suspected Illicit discharge	7407 Bull Run Rd	Algae Growth	7/4/2017	NA	8/4/2017	Upon arrival, the lid of storm water structure, located at the property 7411 Bull Run Road was found to be displaced from its original position after clogged out downstream storm sewer. PWC drainage staff were already working on drainage problem. The algae could develop due to bacteria with corroded corrugated metal pipe at the outfall. It is a natural phenomenon.	Closed
Citizen	8/8/2017	Oil spill on street	1405 Colchester Rd.	Oil spill	8/8/2017	NA	8/10/2017	Upon arrival, oil and grease stain observed at drive way and adjoining street of 1405 Colchester Rd. Mr Mathew Peters said, the incident happened unintentionally and took the responsibility for spill. He agreed to mitigate deficiency as soon as possible. The case was resolved before followup inspection.	Closed
Citizen	8/15/2017	Oil & Paint Spill	11858 Livingston Rd.	Oil & Paint Spill	8/15/2017	NA	8/15/2017	After making conversation with complainant, site identified multiple spills; spill-1, spill-2 and spill-3 in three different locations. First and second sites found with petroleum stains having colorful surface and 3rd one was dumping paint on pavement directed toward storm sewer system in dry condition. Petroleum spill observed colorful and spread out due to rainwater. All spills were small and particular violator could not identify due to lack of evidences, notice of violation not issued.	Closed
Citizen	8/25/2017	Release automotive fluid	14208 Jefferson Davis Hwy	NA	8/25/2017	NA	8/25/2017	PWC, IDDE Staff received a complainet regarding automotive fluid from American Auto Salvage Company into storm sewer system located at downstream property of Koons. The facility is a VPDES permitted facility. On site, nothing found to be released as complained.	Closed

Citizen	9/5/2017	Swimming pool discharge	12658 Dara Dr	Swimming pool water	9/5/2017	NA	9/5/2017	A citizen reported a pool being drained out into stormwater system. Interaction made with the Ground Manager of Condo but he did not accept the incident. Educational materials were hand over to make them aware about unlawful activities.	Closed
Citizen	9/8/2017	Blowing yard debris/clippings	5071 Kapp Lane	Clippings discharge	9/11/2017	NA	9/11/2017	Site inspected. There was no bottles and trash into storm sewer system except minor grass clippings. Interaction made with owner Mr. Cung Quinh and education materials were hand over. Mr Quinh agreed to control grass clippings onsite rather than blowing into storm sewer system.	Closed
Citizen	9/12/2017	Oil spill potential for being washed away	13808 Dawson Beach Road	Oil spill	9/14/2017	NA	9/14/2017	Oil found to be spilled with in the property 13804 Dawson Beach Road where as property 13808 found to be used to store automotive and other junk scraps. There was no storm sewer system nearby spill spots. The case has been forwarded to NSD for further actions.	Closed
DEQ Staff	9/20/2017	Dumping fertilizer on the ground slopped towards stormsewer system	13720 Smoketown Rd	Dumping Fertilizer	9/21/2017	NA	Periodic; 10/4/2017 10/18/2017	The fertilizer found to be dumped over the ground behind the Lowe's store. The grass found to be dead with some residual fertilizer. NOV 13/2017 was issued onsite. Follow up inspection made [10/4]; The mitigation work was not perfect so that second follow up inspection made[10/18]; salt removed and denuded spots stabilized.	Closed
Citizen	9/25/2017	Dumping residual paint into drop inlet grattings	13967 Gullane Drive	Dumping residual paint/ cleaning painting tools	9/25/2017	NA	9/25/2017	Upon arrival, citizen complaint found but the amount of dumping was insignificant inside the drop inlet. Painting crew said, it had happened mistakenly without having knowledge about unlawful discharge. Phone call made to the contractor's company. The owner of Campos Construction LLC immediately arrived and completed cleaning work.	Closed

Citizen	9/27/2017	Cooking oil with bottles (glass) being dumped	2926 stockholm way	Dumping cooking oil with bottles	9/28/2017	NA	Periodic; 9/28/2017 10/18/2017	The incident of dumping cooking oil bottles (glass) into storm sewer system was repeatedly received on 3/27/17; 9/27/17 into storm water inlet across street 2926 Stockholm Way. Black stains were covered with fresh oil. Pieces of bottles were seemed to be spread out and few bottle-neck were observed with cap after breaking on flat surface of inlet structure. The case forwarded to PWC Police to continue investigation with available video footage.	Closed
Citizen	10/17/2017	Dumping Grass Clippings	12124 Paper Birch Ln	Dumping clippings	10/17/2017	Yes, 14-2017	Periodic: 11/15/2017 , 2/7/2018	Miss Keila Navarro on 10/17/2017, the administrative staff of Property Management Company sequoiamanagement.com, forwarded a citizen complaint regarding clippings dumped into storm sewer system. Upon arrival, grass clippings found to be dumped after mowing the yard of 12124 Paper Birch Lane. The volume of clippings was enough to block the drain. NOV#14-2017 was issued to Wells Fargo Bank. Deficiencies have found to be corrected.	Closed
County Staff	10/21/2017	Floataing colorful film on creek water	15455 Silvan Glen Dr.	Flowing colorful substance on creek	10/17/2017	NA	11/21/2017	Mr Cook of PWC Hezmat Team did inspection on 10/17/2017 and inform IDDE staff about no abnormal signs and testing results found. Followup inspection made on 11/21/2017. Floatables did not observe.	Closed
County Staff	11/17/2017	Discharge of chemicals and detergents from carwash	2141 Opize Blvd	Discharge of detergent and chemicals	11/17/2017	Yes, 16-2017	Periodic; 11/21/2017 11/27/2017 1/29/2018	Nature of flow was stagnant with suds and noticeable detergent odor. Discharge tracked; Firefighting Trucks were found washing and cleaning with water and chemicals at the complex of Atlantic Emergency Solutions. Notice of Violation issued and handovered to the business owner to stop further discharge on 11/2/2017. Deficiencies found to be corrected.	Closed

Citizen	11/21/2017	Dumping Waste Food	7170 Gary Rd	Dumping waste	11/22/2017	NA	11/22/2017	PWC, Environment Services Received a complain regarding dumping waste food by the crews of Mo Honey mobile food truck into storm sewer at 7170 Gary Road. Upon arrival, there was no evidence of dumping food into storm sewer system.	Closed
County Staff	11/21/2017	Dumping Fat and Waste Cooking Oil	1920 Daniel Stuart Square	Discharge fat and cooking oil	11/21/2017	Yes, 17-2017	12/20/2017	Upon arrival, pond located at 2141 Opitz Blvd found contaminated. There are various restaurants at the catchment drainage areas. Among them, spill of fat and cooking oil observed around grease collection container of Checkers Restaurant and was flowing towards storm sewer system. NOV was issued. Case closed after corrected deficiencies.	Closed
County Staff	12/7/2017	Yard Clippings	9301 Byron St. Manassas	Dumping into SW system	12/8/2017	NA	12/11/2017	Upon arrival, dead leaf clippings found dumped into road curb and gutter located in front of house 9301 Byron Street. Both inlet and outlet pipes covered with clippings at the manhole. The road structures belongs to VDOT, so the case has forward to VDOT for resolution.	Closed
County Staff	12/7/2017	White Substance	SWMP 884	Flowing through outfall 57896	12/8/2017	NA	Periodic; 12/8/2017 1/3/2018	Upon arrival, white stain observed at the bottom concave of outfall 57896. The white stain was wet and impossible to collect sample for laboratory test. Disperse white stain was observed on Riprap placed around outfall; Tracked upstream sewer; could not find the evidence of spill; decided to continue followup inspections. White stain didn't exist any more.	Closed
Citizen	12/12/2017	Yard Clippings	16109 Olmstead Ln	Dumping into SW system	12/12/2017	NA	12/19/2017	Upon arrival, grass clippings found dumped into storm sewer system through curb and gutter inlets, located nearby 16109 Olmstead Ln. Met the landscaper Mr. George at his house located at 16100 Kennedy Street. Notice of violation (NOV) did not issue since the violator has accepted his fault and ready to mitigate deficiencies with no more repetition. Case closed after corrected deficiencies.	Closed

PWALERT	12/19/2017	Gas spill	7001 Dale Blvd	Spill on the pavement	12/19/2017	NA	12/19/2017	The hazmat spill site was visited after receiving notice from PWALERT. The site was 7-Eleven with gas station. Upon arrival, the site observed cordoned and Kitty Litter was spread out on spilled surface. Spill did not reach up to the drain system. The case found to be handled prudently by PWC Hazmat team.	Closed
PWALERT	1/12/2018	Propane Gas Leakage	16927 Old Stage Rd	Spread out smell	1/12/2018	NA	1/12/2018	Upon arrival, the case was already resolved by DFR team. Building construction contractor has temporarily installed propane gas tank for heating purpose in an inclement weather. According to one of the construction supervisors, the tank was re-filled more than 95% in a freezing temperature. After raising temperature, the volume of propane gas had expanded and slightly released out through valve and became foggy for a minute.	Closed
County Staff	1/16/2018	Uncovered Salt Pile	6450 Trading Square	Concentrated salt solution flowing into stormwater	1/16/2017	Yes, 1-2018	1/29/2018	Upon arrival, salt pile observed uncovered/non-confined on parking lot and white salt stain directed towards storm sewer system. NOV#1-2018 was issued to correct deficiencies. Follow up inspection made on 1/29/2018. Case closed after corrected the deficiencies.	Closed
Citizen	1/18/2018	Commercial vehical wash water	11900 Livingston Rd, Suite 122	Vehicle wash water with sediments	1/22/2018	Yes, 3-2018	Periodic: 2/22/2018; 3/2/2018	Prince William County Watershed Staff got a complaint from Wet Weather Monitoring Vendor on 01/18/2018 regarding pollutant discharge through outfall (ID: 40621) into the pond. The crew of Hutchison Hydroseeding Company was cleaning their vehicles and discharging sediments with pollutants into stormwater system. The notice of violation NOV issued to Hutchison Hydroseeding, Inc. to stop further unlawful discharge into storm sewer system. The case closed after corrected deficiencies.	Closed

Citizen	1/19/2018	Commercial vehical wash water	11900 Livingston Rd, Suite 131	Vehicle wash water with sediments	1/19/2018	Yes, 4-2018	Periodic: 2/22/2018; 3/2/2018	Prince William County Watershed Staff got a complaint from Wet Weather Monitoring Vendor on 01/18/2018 regarding pollutant discharge through outfall (ID: 40621) into the pond. The crew of Crigger Contracting Inc.(CCI) was cleaning their vehicles and discharging sediments with pollutants into stormwater system. The notice of violation NOV issued to CCI to stop further unlawful discharge into storm sewer system. The case closed after corrected deficiencies.	Closed
Citizen	1/20/2018	Dumping salt on storm water flow path	11900 Livingston Rd, Suite 113	Salt debris exposed to storm water	1/19/2018	Yes, 5-2018	Periodic: 1/22/2018; 2/22/2018; 3/2/2018	Prince William County Watershed Staff got a complaint from Wet Weather Monitoring Vendor on 01/18/2018 regarding pollutant discharge through outfall (ID: 40621) into the pond. Salt was dumping at the gate of Hawkeye Exteriors, Inc. which was exposed, and washed into stormwater systems. Notice of violation NOV was issued to stop further unlawful discharge into storm sewer system. The case closed after corrected deficiencies.	Closed
Citizen	1/21/2018	Discharge debris and sediments	11900 Livingston Rd, Suite 147	Discharge of industrial process water with sediments and debris	1/19/2018	Yes, 6-2018	Periodic: 2/22/2018; 3/2/2018	Prince William County Watershed Staff got a complaint from Wet Weather Monitoring Vendor on 01/18/2018 regarding pollutant discharge through outfall (ID: 40621) into the pond. The crew of Northern Virginia Cast Stone was discharging Industrial process water with debris into stormwater system during inspection. The notice of violation NOV issued to Northern Virginia Cast Stone to stop pollutant discharge into storm sewer system. The case closed after corrected deficiencies.	Closed
Citizen	2/2/2018	Asphalt Tar Spill	2157 Armitage Ct.	Discharge of Asphalt Tar into stormwater system	2/5/2018	NA	2/6/2018	Upon arrival, dry oil stains observed on parking lot and did not flow into storm sewer system. There was no sign of dumping Asphalt Tar into Stormwater Curbs and Gutter inlet. Storm sewer tracked up to outfall. Illicit discharge did not observe at outfall.	Closed.

County Staff	2/8/2018	Dumping rocks and debris	10125 Crashing Thunder Pl	Dumping into SW system	2/9/2018	NA	2/12/2018	The excavated stone pables were collected over gratings of drop inlet. Digout soil pile, confined with woden board was made nearby drop inlet. Follow up inspection made on 2/12/2018. Stone was removed from drop inlet gratings and soil removed.	Closed
County Staff	2/14/2018	Releasing Automotive fluide	13885 Hedgewood Drive	Changing oil over drop inlet by releasing existing oil into drop Inlet	2/14/2018	NA		Hazmat team received a complaint regarding oil chainge over drop inlet by releasing used oil directly into storm sewer system. Upon arrival, Lt. Hinson and his team was onsite collecting evidence and witness of incident. Oil stains observed into drop inlet. Tracking made to successive down stream storm sewer. Following successive manhole was dry. The case was handled by DFR team.	Closed
PWALERT	2/15/2018	Diisocyanate exposed with bags on road	I66 East near Prince William Pkwy	Approx. 42,000 pounds of Diisocyanate exposed with bags	2/15/2018	NA	NA	Following informations received from PWALERT. Units on scene of an Overturned Truck Traylor, driver is being ground transported to FFX. Believe the trailer was hauling approx. 42,000 pounds of Diisocyanate. Our staff Mr. Clay Morris observed the case while being routed to the office and said, the case was undertaken by emergency respond team.	Closed
County Staff	2/15/2018	Petrolium Spill	11007 Nokesville Rd	Overflow of gas due to defective pump at Gas Station	2/15/2018	Yes, FMO	2/15/2018	Upon arrival, The petroleum spill had been seized by PWC (Hazmat) emergency respond team with kitty litter and hydrocarbon absorbent booms. The case was undertaken by a company "HIPACO" for environmental remediation and abatement works. The company was working until mitigate the deficiencies.	Closed

Citizen	2/20/2018	Dumping Salt	9401 Liberia Ave	Dumping Salt on Parking Lot	2/21/2018	NA	2/22/2018	Upon arrival, salt found to dump at two different places on 2/21/2018. One pile was almost used for snow melt leaving salt debris at the location and another left uncovered. Following inspection, meeting made with Co-Manager Mr. Richard. The pile was small and Mr. Richard agreed to remove salt immediately, NOV did not issue. Follow up continued next day. The case closed after corrected deficiencies.	Closed
County Staff	2/21/2018	Dumping Salt	14609 Potomac Mills Rd	Dumping Salt on Parking Lot	2/21/2018	NA	2/22/2018	Upon arrival, one salt pile and another sand pile observed side by side on parking lot near Chinese King Buffet. The pile was uncovered. Contact made with Property Manager Mrs. Susan Winchell. She agreed to employ their snow removal vendor immediately to remove salt pile. Follow up inspection made on 02/22/2018. Salt pile and salt stains were found to be removed.	Closed
Citizen	3/2/2018	Overturing Portable Toilet	15717 Cranberry Ct	Sewage flowing	3/5/2018	NA	3/13/2018	Upon arrival, portable toilet observed overturning at site. Incident happened in last week due to hurricane. Follow up inspection made on 3/5 and 3/13. The vendor John Rentals employed to clean up the ground contaminated with fluid releasing from overturning toilets.	Closed
County Staff	3/6/2018	Dumping Mulch	9509 Allegro Drive	Dumping mulch over storm drain	3/6/2018	NA	3/6/2018	Upon arrival, there was a pile of mulch besides storm water curb and gutter inlet. Contact made with Mr Brougham Geoffrey, the owner of 9509 Allegro Drive. He immediately removed the mulch to his property.	closed
County Staff	3/21/2018	putting his leaves in our drains	15261 Dyers Lane	putting his leaves in our drains	3/22/2018	NA	3/22/2018	Upon arrival, two drop inlets located at the end of Dyers Ln was opened and maintained free flow of water generated by melting snow. Interaction made with Mr. Mccorkindale Scott about the issues. Education materials were handover for making him aware about an illicit discharge.	Closed

County Staff	3/28/2018	Fish die in the creek at cloverdale	3756 Wertz Dr Woodbridge , VA 22193	TBD	3/28/2018	NA	3/29/2018	PWC Park and Recreation Staff Mr. D'Elia Tom noticed dead fish in Neabsco creek at cloverdale. The case was Forwarded by Mr. Kevin Flickinger, the Manager of Park and Recreation to the Environmental Services on 03/28/2017. After investigation, the sanitary sewage found to intermingle with storm sewer at Calexico Ln, nearby the house 15107. The case was notified to VA American Water. The incident happened unintentionally and fixed as quick as possible during repair leakage in water main. The case found to be corrected.	Closed
County Staff	3/16/2018	Salt Dumping	9401 Liberia Ave	Salt Dumping	4/6/2018	Yes, 7-2018	Periodic: 04/09/2018 04/13/2018	Upon arrival, the grass at landscape beside parking lot of Walmart was found dead due to concentrated salt and salt residue was still remained at the ground. Following inspection, interaction made with the Asistant Manager Mr. Mohamad who was on duty. NOV issued to the owner and CC handovered to the Manager Mr Adams at the store on 4/9/2018 . Follow up inspection made on 4/13/18. Deficiencies found to be corrected by removing salt and establishing turf on denuded spots.	Closed
Citizen	4/2/2018	Dumping Clippings	1518 colchester rd	Dumping Yard Waste to the County Water	4/5/2018	NA	4/5/2018	Upon arrival, dumping of yard waste in flow line did not observe. Education materials left at the door since there was no owner at home at that moment. Immediately received a call from Mrs. Hoffmann Mary, the owner complaining about on arrival to the office. She said, yard clippings used to dump at the ground near by creek. She mentioned, decomposable materials dumping on ground is better than collecting in a bags and sending to landfill site. After conversation, she agreed to collect and dispose yard waste properly rather than dumping on the ground to endorse the issue of complainant.	Closed

County Staff	4/10/2018	Dumping cutdown trees	13347 Delaney Road	Dumping Woods and Debris at Creek	4/10/2018	NA	4/10/2018	Mr. Melvin Pittman, the resident of 13317 Kurtz Road (Contact: 571-259-1743) reported a complaint regarding dumping woods and debris at creek located at 13347 Delaney Rd at NSD which was forwarded to IDDE staff. The statement was "The occupants at 4810 and 4808 Kirkdale Drive are cutting brush and throwing it into the creek which is damming the creek located on the parcel addressed 13347 Delaney Road". Since the developer still owned the property on which the debris were dumped, developer agreed to remove it.	closed
County Staff	5/1/2018	White Substance at Creek	14980 Farm Creek Drive	Paint associated discharge	5/1/2018	NA	5/1/2018	Upon arrival, milky water observed at road culvert of Farm Creek Drive located nearby 14980. During inspection, painting tools cleaning discharge and residual paint found to dump into drop manhole located at 14980 Farm Creek Drive. The crews working for renovation agreed to take an action to correct deficiencies instantly. The impact of discharge is an insignificant and discharge holding in drop inlet was immediately disposed over graveled ground. Paint residue was cleaned and captured. The case has been closed.	Closed
DEQ Staff	5/2/2018	Salt Dumping	2700 Potomac Mills Circle nearby the intersection of Nazarene Way and Potomac Mills Circle	Flow of salt leachet into storm sewer system	5/3/2015	yes, 8- 2018	5/15/2018	Prince William County Watershed Staff received a complaint from DEQ staff regarding salt dumping and leaching into storm sewer system at parking lot located nearby the intersection of Nazarene Way and Potomac Mills Circle. Upon arrival, salt pile was non-confined and leaching out on parking lot. NOV issued to the property owner. The deficiency found to be corrected.	Closed

Citizen	5/22/2018	Car Burnt out Debris	1020 Express Drive	Burnt out debris potential for wasaway into SWMS	5/23/2018	NA	5/23/2018	PWC Watershed staff got a citizen complaint regarding unattended burnt out debris and residue at parking lot of 1020 Express Drive. After inspection, contact made with VRE Property Manager Mr. Eric Johnson; situation explained; he agreed to remove as soon as possible. Removal of debris was notified on 5/25/2018. Case resolved.	Closed
Citizen	5/25/2018	Oil Spill	13550 Heathcote Blvd	Aprox. 4 Gallon Transfermer oil spill during refill	5/25/2018	NA	5/25/2018	The transfermer oil spill was found to be immediately captured by hiring Vendor "HIPACO" after getting spill around transfermer. Spill did not reach into storm water management system. Case resolved prudently.	Closed
County Staff	5/30/2018	Oil Spill	14101 Jefferson Davis Hwy	Approx. 50 gallons oil spill on road easement	5/30/2018	NA	5/30/2018	Upon arrival, electric power pole was broken down by 18 wheels truck. Approximately 50 gallons gas released on the ground. Kitty litter and hydrocarbon absorbent booms were used to capture spill. Incident happened in VDOT easement. VDOT, PWC Hazmat team and cleaning company worked together to resolve the case.	Closed
Citizen	6/4/2018	Household trash	13211 Fitzwater Drive	Dumping Asbestos sheets in drainage ditch	6/4/2018	NA	6/4/2018	PWC, Watershed staff received a complaint regarding dumping asbestos sheets from nearby shed into a drainage ditch in front of their house. Upon arrival, asbestos sheets were found in ditch. Following inspection, case notified to the homeowner. Homeowner immediately removed all sheets. Education materials were handover to the homeowner to make them aware about illicit discharge.	Closed
Citizen	6/13/2018	Pool Water	4527 Hazelton Drive	Pool water discharge into stormsewer system	6/13/2018	NA	6/13/2018	Upon arrival, retained pool water found to be already discharge into storm sewer system. Pool water seemed to be retained more than a year without use in a forecloser house. Contractor employed to renovate the facility including pool. Volume of pool water was small with no chemicals. Case closed.	Closed

Citizen	6/27/2018	Oil Sheen	9565 Sunnyslope	Oil sheen was the result of bacteria growth at marsh landscape	6/28/2018	NA	6/27/2018	Watershed staff got a complaint regarding oil sheen on his property. Interaction made with homeowner Mr. Chuck Sisler onsite. Oil sheen was observed at landscape slope towards road culvert. Source of oil sheen suspected bacteria growth in marshy land instead of oil spill. Mr. Sisler asked me some drainage improvement work from County through his property. The case is forwarded to Mr. Khalid to address his drainage maintenance concern.	Closed
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Reports for the Illicit Discharge cases above are presented in Appendix E. The County expects reported discharges to continue to increase over the next fiscal year. An increase in reported discharges are expected due to a combination of an updated IDDE program, increased citizen awareness of illicit discharge issues through public outreach initiatives, and County Employee training.

BMP 2 – Sanitary Sewer Exfiltration Abatement Program

Prince William County contains a mix of sanitary sewer systems and septic fields within its jurisdiction. The sanitary sewer system is maintained, and operated by the Prince William County Sanitary Sewer Service Authority (PWCSA) and Virginia American Water (formally Dale Services Corporation), both which operate under their own VPDES permit. Prince William County is not responsible for the inspection and maintenance of the sanitary sewer system; however, PWC works closely with the PWCSA to identify and correct deficiencies within the sanitary sewer network. Prince William County Service Authority has an ongoing program, the infiltration and inflow check program, for identifying and correcting defects in the County’s sanitary sewer systems, such as:

- Performing detailed engineering studies to locate defects in the gravity sewer system and recommend corrective action.
- Preparing construction documents for repair of the identified defects.
- Constructing necessary improvements.

The identification and correction of deficiencies is aided by Prince William County through its Dry Weather Monitoring, Stormsewer Maintenance, General Stormwater Discharge, and Stream Restoration Programs. Cross connections, leaks, and other maintenance issues are discovered as non-stormwater discharges within the storm sewer network through the County’s Dry Weather Monitoring and Stormsewer Maintenance Programs. Citizens can report leaks and cross connections discovered discharging through the storm sewer system through the County’s General Discharge program. Sanitary sewer infrastructure exposed to potential damage as a result of degrading streams and waterways are protected through projects associated with the County’s Stream Restoration Program. Prince William County continues to identify and report concerns to the PWCSA when sanitary sewer system maintenance and repairs are needed. The PWCSA oversees all new construction on sanitary sewer system components and is responsible for the proper installation and operation of the system.

Prince William County is actively working on establishing working relationships with Virginia American Water with regards to their Infiltration and Inflow Program as well as with all Phase II MS-4 systems within the County’s Jurisdictional area.

The Prince William Health District is responsible for the oversight and regulation of certain sewage and water environmental health issues within Prince William County. The Health department oversees the permitting and inspection of septic systems. The Health District inspects

and permits septic systems and requires onsite sewage disposal systems not requiring a Virginia Pollution Discharge Elimination System (VPDES) permit shall have pump-out accomplished at least once every five years. The Heath District also provides valuable public outreach to septic system owners, including information on septic system maintenance.

BMP 3 – Reduce the Discharge of Floatables

The Adopt-A-Spot program is a litter cleanup and recycling program sponsored by the Virginia Department of Waste Management. The Prince William County Soil & Water Conservation District (SWCD) undertakes stream cleanups under their Adopt-A-Stream program. Some stream clean-ups are done on an individual occasion basis rather than an on-going project, and these sites are often done for specific programs or purposes (Alice Ferguson Foundation, Earth Day, etc.). Adoptable areas under this program include parks, schools, vacant land and neglected public areas. Stream sites are located in the various sub-watersheds in Prince William County and some of cleaned up more than once per year.

The locations selected for the Adopt-A-Stream (AAS) clean-ups are selected from mainly public or park riparian properties, which have experienced historical problems with trash accumulation or have had specific problems in the past. Some private sites are also found in the areas. A list of potential sites is also maintained for future clean-up sites. This program not only identifies locations where floatables and trash are a concern in the County. It follows that assessment with a volunteer cleanup, which temporarily removes the trash and debris. The County's Litter Control and landfill personnel also provide assistance with picking and weighing of the trash after a cleanup to document the amount of trash removed from the site. If the cleanup is included in the AAS program, periodic clean-ups on a biannual or annual basis are conducted, thereby revisiting sites to see if the floatables condition has improved over time.

PWSWCD also administers the County's Floatables Monitoring Program. This program is designed to assess refuse loading to 5 selected stream sites throughout the County. More information on this program can be found in section II.3.

Prince William County, in coordination with the Keep Prince William Beautiful (KPWB) Organization, developed a program dedicated to the labeling of storm drains throughout the County. These labels identify a storm drain as discharging to the Chesapeake Bay, as well as remind citizens not to dump items, fluids, etc., down the storm drain. Included in this program will be public outreach initiatives focused on eliminating illicit discharge and litter. KPWB partners with local volunteers to complete program objectives, involving local citizens and providing educational services. KPWB partnered with volunteers to label 970 storm drains in FY18, and reached 4,028 citizens through public outreach events.

Public Works has established a Litter Control Crew to pick up highly traveled roadways of the county, handle cleanups of illegal dumpsites and haul material from community clean up events. In FY18, the Litter Control Crew picked up over 125.44 tons of trash and debris along 1,504 miles of roadway. They also collected 12,253 roadside signs. Public Works also provides funding to Prince William Soil and Water Conservation District and Keep Prince William Beautiful to lead volunteers in cleaning up litter at designated locations and along streams.

- Residents
 - Encourage residents to use litter bags and dispose of waste properly through messages on web site, local government channel and through partner agencies
 - Offer community “dumpster days” where residents can drop off unwanted items from their home
 - Recruit residents to adopt a stream through the Prince William Soil and Water Conservation District (in FY18, volunteers cleaned 35,493 pounds of trash from 57.5 miles of stream. There were 1,425 volunteers in FY18. They conducted 50 clean up events for a total of 5,007.58 hours of service. They collected 1,939 bags of trash and 364 bags of recyclable material.)
 - Recruit residents to participate in floatables monitoring conducted by the Prince William Soil and Water Conservation District (14 volunteers monitored five sites each quarter)
 - The Soil & Water Conservation District implemented two Virginia Conservation Assistance Program (VCAP) projects – a rain garden and conversion of turf to native meadow. They plan additional projects in the future. They provided education events to 440 citizens.
 - Recruit residents to adopt a spot or participate in an organized cleanup event sponsored by Keep Prince William Beautiful (volunteers participated in 302 community cleanups)
 - Conduct litter survey four times a year
 - Conduct cleanups for 1,237 volunteers to clean 34 miles of roadway and provide 5,493.5 hours of service to the community
 - Enforce anti-littering laws
 - Ask community to report illegal dump sites so we can send Litter Control Crew out to clean them up
 - Pick up litter along highly traveled roadways on a regular annual schedule
 - Pick up trash and debris from community volunteer cleanups at a designated location after the event
 - Enforce property code requirements to eliminate dump heaps, overgrown grass and unkempt structures on residential properties

- Businesses and Industries
 - Encourage businesses and industries to provide volunteers to clean up community
 - Enforce property code requirements to eliminate dump heaps, overgrown grass and unkempt structures on commercial properties
 - Reduced nutrients on local farms including 17,096 pounds of nitrogen and 1,001 pounds of phosphorus through BMPs and planning. The Soil & Water Conservation District has over 1,400 acres of conservation plans approved and 4,200 acres of BMPs in place. The district created 71 new or revised plans in FY18. They provided technical assistance to 149 citizens.

BMP 4 – Proper Disposal of Wastes

Working with our partners, Prince William County Public Works will promote, publicize and facilitate the proper management and disposal of used oil and household hazardous waste.

Public Works has created and maintains a robust management program for the collection and disposal of household hazardous waste and collection and recycling of used oil

- Residents
 - Offer twice a week collection of household hazardous waste and electronics year-round at the County Landfill and once a month at the Balls Ford Road Compost Facility (in FY18, 25,287 citizens delivered 112.11 tons of household hazardous waste and electronics to our County Landfill and Balls Ford Road Compost Facility)
 - Maintain a safe building for residents to drop off household hazardous waste and electronics with proper storage as needed
 - Offer daily collection of used motor oil, antifreeze and car batteries
 - Provide useful signs to direct residents on how to properly dispose of these materials when they arrive at the landfill and compost facility
 - Provide clear and complete information about managing, storing and bring household hazardous waste to the County landfill and compost facility through brochures and instruction sheets, web pages, public service announcements and newsletters
 - Host an annual special event at the County landfill for Prince William Recycles Day to share information on handling household hazardous waste and recycling used oil (775 participants in October 2017)

Future efforts: Continue to build an online system for residents that captures the typical products and materials used by residents and how to properly dispose of them

- Businesses and Industries
 - Do not accept hazardous waste or oils from commercial businesses
 - Offer a list of companies they can contact for assistance when they call or visit the County website

Future efforts: The online system created for residents will also be a useful reference for business and industry managers

- County Government
 - Provide extensive training on the proper handling and disposal of chemicals and potentially hazardous materials
 - Reviewing current chemicals used and seeking safer alternatives

- Provide extensive training on how to respond and report a chemical spill
- Established an effective program for handling motor oil, antifreeze and other vehicle fluids at the Fleet Maintenance Shop
- Conducted an inventory of chemicals in use by County agencies and arranged a collection of no longer used products with a licensed handler
- Piloting a program to collect chemicals from agencies and work with County contractor to accept them at designated intervals throughout the year
- Produced a preferred chemical list to reduce the use of potentially hazardous and harsh products

The following summarizes the County’s solid waste, household hazardous waste, and recycling programs for FY18:

FY18	OTHER REFUSE						TOTAL REFUSE TO LANDFILL TONS	TIRES		TOTAL MONTHLY REVENUE
	KEEP PW B'FUL TONS	"Overs" B.F. TONS	INCIN. ASH TONS	CONTAM. SOIL TONS	REFUSE FROM B.F. TONS	COUNTY ROAD CL-UP TONS		TONS	REVENUE	
Jul-17	-	971.89	191.82	-	651.18	-	43,719.37	124.27	\$ 14,006.10	\$ 177,460.53
Aug-17	-	307.86	-	-	568.35	-	44,619.04	290.76	\$ 20,977.00	\$ 206,695.68
Sep-17	1.17	227.36	181.76	-	572.52	-	41,576.51	163.48	\$ 24,935.80	\$ 213,980.63
Oct-17	11.77	565.38	-	-	531.00	-	40,551.21	160.45	\$ 20,950.95	\$ 199,521.20
Nov-17	5.78	256.35	72.25	-	455.51	-	41,579.22	168.37	\$ 22,737.45	\$ 185,145.23
Dec-17	-	608.98	222.27	-	413.07	-	36,724.46	261.88	\$ 27,821.60	\$ 174,813.98
Jan-18	7.16	126.60	-	-	386.13	-	29,489.23	159.29	\$ 16,510.10	\$ 160,571.15
Feb-18	4.67	278.78	132.74	-	359.03	-	25,565.37	145.84	\$ 21,355.70	\$ 156,377.35
Mar-18	-	245.69	278.17	-	588.25	-	29,757.76	187.18	\$ 20,404.00	\$ 194,493.40
Apr-18	38.11	734.53	136.06	-	659.99	-	33,938.14	246.74	\$ 24,021.00	\$ 220,876.75
May-18	28.20	457.45	12.97	-	746.15	-	40,954.93	336.59	\$ 30,355.00	\$ 228,614.84
Jun-18	40.68	481.18	211.21	-	682.84	-	36,179.23	313.73	\$ 33,484.00	\$ 247,501.45
TOTAL	137.54	5,262.05	1,439.25	-	6,614.02	-	444,654.47	2,558.58	\$ 277,558.70	\$ 2,366,052.19

Figure 1 – PWC Landfill Refuse Reduction Statistics for FY18

FY18	SCRAP METAL		ELECTRONICS		TEXTILES OUT	DONATION PLACE OUT	USED OIL			CAR BATTERIES			ANTIFREEZE	
	OUT TONS	REVENUE	LANDFILL OUT TONS	BALLS FORD OUT TONS			L.F. OUT GALLONS	B.F. OUT GALLONS	REVENUE	L.F. OUT NO.	B.F. OUT NO.	REVENUE	L.F. OUT GALLONS	B.F. OUT GALLONS
Jul-17	274.67	\$ 40,037.63	43.42	6.14	0.72	21.75	4,562	1,077	\$ (1,533.50)	165	64	\$ 1,421.70	698	37
Aug-17	359.66	\$ 60,901.33	43.78	7.64	0.97	25.62	6,776	1,267	\$ (1,805.28)	245	41	\$ 1,262.60	-	95
Sep-17	329.38	\$ 56,138.99	39.60	7.74	0.90	23.57	3,799	1,120	\$ (1,360.68)	161	32	\$ 1,637.80	562	62
Oct-17	243.04	\$ 38,614.47	39.53	8.10	0.72	16.00	3,822	985	\$ (1,169.94)	198	41	\$ 1,148.40	138	56
Nov-17	366.42	\$ 55,447.24	39.31	7.06	0.69	20.83	4,359	1,092	\$ (1,501.60)	101	48	\$ 1,160.90	444	122
Dec-17	269.97	\$ 44,970.17	37.49	6.77	0.83	17.26	3,371	564	\$ (861.02)	101	25	\$ 1,125.50	63	58
Jan-18	253.21	\$ 43,750.88	39.14	6.83	1.07	22.68	1,620	640	\$ (844.00)	114	36	\$ 614.30	490	84
Feb-18	183.99	\$ 34,003.24	36.52	7.23	0.36	14.42	3,679	643	\$ (871.64)	101	19	\$ 892.50	55	27
Mar-18	221.74	\$ 43,204.81	37.74	5.44	0.39	21.17	4,677	1,070	\$ (1,454.36)	144	34	\$ 707.10	311	84
Apr-18	255.06	\$ 51,565.02	37.50	6.98	0.69	23.88	4,611	1,074	\$ (1,712.10)	241	30	\$ 963.30	513	112
May-18	359.20	\$ 71,424.86	44.27	5.07	0.93	24.18	5,691	1,214	\$ (1,748.04)	255	51	\$ 1,496.90	480	117
Jun-18	367.52	\$ 69,578.54	44.31	4.59	0.62	18.90	3,169	1,117	\$ (1,006.08)	272	40	\$ 1,804.60	169	71
TOTAL	3,483.85	\$ 609,637.18	482.61	79.59	8.89	250.26	50,136	11,863	\$ (15,868.24)	###	461	\$ 14,235.60	3,923	925

Figure 2 – PWC Landfill Recycling Statistics for FY18

FY18	MONTHLY REVENUES		NEWS-PAPER TO Republic & American	CARD-BOARD TO Republic & American	MIXED PAPER TO Republic & American	CO-MINGLED TO Republic & American	TOTAL TONS	DATE & SIGNATURE
	COMPOST FACILITY	RECYCLABLE PROCESSING						
	REVENUE	REVENUE	TONS	TONS	TONS	TONS		
MONTH	REVENUE	REVENUE	TONS	TONS	TONS	TONS	TONS	
Jul-17	\$ 73,787.31	\$ 39,925.83	3.99	53.76	30.76	68.68	157.19	
Aug-17	\$ 86,736.95	\$ 60,358.65	1.85	52.68	29.56	63.04	147.13	
Sep-17	\$ 82,537.71	\$ 56,416.11	3.22	41.24	20.33	56.75	121.54	
Oct-17	\$ 67,183.06	\$ 38,592.93	3.28	41.87	24.00	65.33	134.48	* 15.48 tons
Nov-17	\$ 66,016.30	\$ 55,106.54	1.49	41.30	23.22	76.22	142.23	
Dec-17	\$ 97,422.55	\$ 45,234.65	-	42.92	19.34	57.11	119.37	
Jan-18	\$ 124,043.24	\$ 43,521.18	-	51.40	18.94	84.13	154.47	
Feb-18	\$ 18,313.87	\$ 34,024.10	-	34.59	17.79	53.77	106.15	
Mar-18	\$ 78,105.99	\$ 42,457.55	0.98	40.50	25.52	65.23	132.23	
Apr-18	\$ 66,303.72	\$ 50,816.22	-	43.55	19.60	64.68	127.83	
May-18	\$ 100,930.07	\$ 71,173.72	-	55.79	21.99	80.74	158.52	* 12.2 tons
Jun-18	\$ 88,758.87	\$ 70,377.06	-	48.61	16.53	72.13	137.27	
TOTAL	\$ 950,139.64	\$ 608,004.54	14.81	548.21	267.58	807.81	1,638.41	
							*tons of mixed paper collected at shred events but not sent to any of these destinations	

Figure 3 – PWC Recycling Statistics for FY18 (cont.)

BMP 5 - Discharge Elimination Programs

Prince William County hosts several programs under its Illicit Discharge Detection and Elimination (IDDE) program dedicated to the detection, identification, and elimination of unauthorized discharges to its MS-4 system. These programs include the Dry Weather Monitoring, General Discharge, Wet Weather Monitoring, Service Authority’s Inflow and Infiltration program, and Industrial and High Risk Monitoring Programs. For more information on these programs, including program background and reporting, see section II.3.1 water quality screening programs.

f. Spill Prevention and Response

BMP 1 – Coordination with FMO

The County’s Department of Fire and Rescue is the lead County agency responsible for all aspects of spill response. Accordingly, the County has designated a full-time Hazardous Materials Officer. Prince William County participates in the Commonwealth Department of Emergency Management Services’ regional Hazardous Materials response programs and maintains a National Incident Management System Type 1 HAZMAT Team for emergency response.

The County’s Department of Fire & Rescue (DFR) responds to all complaints of hazardous spills and hazardous illicit discharge. If the complaints relate to sewage, the appropriate agency, such as, Prince William County Service Authority or the Virginia American Water will be contacted. The complaints on the malfunctioning septic systems and drain fields are referred to the County’s Health Department. The County staff makes every effort to direct complaints to the appropriate agency as expeditiously as possible.

For this reporting period there were 67 instances of discharges impacting the MS-4 that were responded to by Prince William County's Department of Fire and Rescue. Discharge Reports for these incidents will be included in Appendix F.

g. Industrial and High Risk Runoff

BMP 1 – Identify all Industrial and High Risk Dischargers

The monitoring of VPDES permitted areas of Prince William County is accomplished as part of the County's IDDE program. On a semi-annual basis, PWC examines lists provided by DEQ to assess new permitted facilities discharging to the County's stormsewer system along with their permit, and registration form. These facilities are then added to a GIS layer, and their outfalls identified for use in monitoring efforts. Outfalls are identified using a combination of facility registration statements, DMR reports, and GIS desktop analysis. Having identified its MS-4 service area, a GIS desktop analysis was completed and Permittees that discharge into the County's MS-4 service area were identified. Maps of these facilities can be seen in Appendix G.

Individual VPDES permitted facilities that may be considered high risk include municipal landfills; other treatment, storage, or disposal facilities for municipal waste; hazardous waste treatment, storage, disposal and recovery facilities; facilities that are subject to EPCRA Title III, Section 313. There are three of these facilities that discharge to the County's MS-4:

- Virginia Concrete Company Inc. – Gainesville

High Risk and Industrial VPDES permitted facilities are found to be contributing significant pollutants to the stormsewer system will be referred to DEQ for compliance review. Table 8 below shows the VPDES facilities discharging into the County's MS-4 area.

In FY16, the County performed used GIS to analyze and generate a list of potential High Risk outfalls according to a probability of pollutant discharge. This probability takes in account an assumed potential for a discharge to occur, possible pollutant discharge effect according to the type of facility and its operations, and the potential for environmental damage according to the facilities proximity to environmentally sensitive areas. From this analysis, 518 outfalls were deemed as potentially High Risk. Over the next fiscal year, the County will finish inspecting each of these outfalls to produce a field-verified list. In addition, any outfalls found to be contributing a significant source of pollutants during routine Dry Weather Monitoring inspections will be added to this list and updated yearly.

Table 8 – VPDES Permitted Facilities that Discharge into the County’s MS-4

	Permit No	Facility	Location Address 1	Type	Location City	Location Zip5	County Name	DMRs
1	VAR052243	234 Auto and Truck Salvage Limited Liability Co.	14843 Dumfries Rd	SWGP	Manassas	20112	Prince William County	TBD
2	VAR051949	Chemung Contracting Corporation - Gainesville	7201 Rail Line Ct	SWGP	Gainesville	22013	Prince William County	Semi-Annual
3	VAR052372	Swift Auto Recycling and Salvage, Inc	14832 Dumfries Rd	SWGP	Manassas	20112	Prince William County	TBD
4	VAR051477	First Transit Incorporated	14700 Potomac Mills Rd	SWGP	Woodbridge	22192	Prince William County	Semi-Annual
5	VAR052115	Penny's Used Auto Parts	13059 Minnieville Rd	SWGP	Woodbridge	22192	Prince William County	TBD
6	VAR051639	Potomac Disposal Services of Virginia, LLC	9650 Hawkins Dr	SWGP	Manassas	20109	Prince William County	Semi-Annual
7	VAG110100	Virginia Concrete Company Inc - Gainesville	7300 Rail Line Ct	Concrete	Gainesville	20156	Prince William County	TBD

BMP 2 – Develop Prioritized Schedule for Monitoring VPDES and High Risk Outfalls

Outfalls identified as VPDES and High Risk non-VPDES as described above are inspected according to specific protocols outlined in the Prince William County’s IDDE Program. Outfall prioritization follows an iterative process that incorporates in-field observations. As outfalls are monitored under the County’s Dry Weather Monitoring Program, those which are determined to have a high potential for pollutant discharge are identified as High Risk and added to the prioritized schedule the next time it is updated.

BMP 3 – Develop Program to Monitor VPDES and High Risk Outfalls

VPDES and High Risk outfalls are scheduled for inspection according to the methods described in BMP 2. Outfalls are monitored in accordance with the County’s Dry Weather Monitoring Protocols. Facilities whose outfalls are found to discharge significant pollutant flows within 3 consecutive inspections (follow-up inspections are scheduled according to IDDE protocols) are referred to DEQ for compliance review (see BMP 6). Outfalls of VPDES permitted facilities are inspected once a year, while High Risk outfalls are inspected once a permit cycle (due to high volume).

During the reporting period PWC continued VPDES and high risk outfall inspections. No deficiencies were found as a result of these inspections. The County expects a renewed emphasis on these inspections in the upcoming fiscal year and expects to complete inspections on all VPDES and High Risk outfalls during the next reporting period. Outfalls associated with VPDES facilities are identified as below:

Table 9 – VPDES Outfalls

Number	Outfall ID	Facility
1	49124	Chemung Contracting Corporation
2	49117	Chemung Contracting Corporation
3	49119	Chemung Contracting Corporation
4	49121	Chemung Contracting Corporation
5	53541	Chemung Contracting Corporation
6	47233	First Transit Inc
7	47271	First Transit Inc
8	35905	Potomac Disposal Services
9	35901	Potomac Disposal Services
10	35896	Potomac Disposal Services

In addition the County inspected 117 non-VPDES permitted high risk facility outfalls. This number is expected to increase over the next reporting period. All identified non-VPDES high risk facilities are expected to have associated outfalls inspected during the Permit Cycle.

BMP 4 – Obtain DMR Reports from VPDES Permitted Facilities

PWC receives Discharge Monitoring Reports (DMRs) from applicable (non-exempt) VPDES permitted facilities that discharge into the County's MS-4. Prince William County may conduct additional monitoring, or may require the facility to conduct additional monitoring, of any stormwater discharges it believes may be a source of significant pollutant loadings. Facilities that discharge in to the County's MS-4 and do not provide the DMR's will be directed to DEQ for compliance review (BMP 6).

BMP 5 – Identify High Risk Dischargers Not Covered Under VPDES Program

As outfalls for facilities determined to have a high risk for pollutant discharge are inspected, those which do not fall under VPDES permitting requirements or Virginia State Water Control Law are identified. These facilities are included under the County's non-VPDES High Risk Designation.

Potential Non-VPDES High Risk facilities are identified, along with associated outfalls, through GIS desktop analysis. Using County land-use information land-uses that are identified to have a high potential for the discharge of pollutants are isolated. As with VPDES permitted facilities, a buffer is placed around a high risk parcel and the containing outfalls are identified. These outfalls are considered to be potentially High Risk outfalls. During Dry Weather Monitoring activities, outfalls determined to potentially contribute a significant source of pollutants to the stormsewer system are identified and added to the list of high risk discharges. These outfalls are then added to the High Risk outfall prioritization (BMP 2) list the next time it is updated. As with VPDES permitted facilities, as the County's GIS based stormsewer layer is updated, the analysis of outfalls associated with High Risk facilities will be updated. The list of high risk facilities can be found in Appendix G.

Outfalls from these facilities are included in the prioritized outfall inspection schedule described in BMP 2. Any facility found to be discharging significant pollutants to the stormsewer system will be required to adopt control measures to prevent these discharges from entering the County's MS-4 under appropriate regulatory ordinance, since they cannot be referred to DEQ for VPDES compliance review. If access to facilities that fall under these conditions cannot be obtained by watershed staff, assistance from the PWC Fire Marshal's office will be requested.

BMP 6 – Refer Facilities in Noncompliance to DEQ for Review

PWC is required to refer the following facilities to the Department of Environmental Quality, Northern Regional Office, for DEQ compliance review under the Virginia State Water Control Law:

- Facilities and operations having non-stormwater discharges that do not have coverage under an existing VPDES permit;
- Facilities and operations identified pursuant to 40 CFR Part 122.26(b)(14) with manufacturing, processing, or raw materials storage outside that do not have coverage under an existing VPDES industrial stormwater permit.
- Any VPDES industrial stormwater permit facility where there is evidence of significant pollutant loadings to the MS4.
- Facilities that do not submit signed copies of DMRs to the permittee as required under a VPDES industrial stormwater permit.

During the reporting period no facilities were deemed necessary to report to DEQ for compliance review.

h. Storm Sewer Infrastructure Management

BMP 1 – Identify MS-4 Service Area and Regulated Outfalls

An integral part of developing the County’s Chesapeake Bay TMDL action plan is determining the MS-4 regulated area. Prince William County maintains a comprehensive GIS database of SWM facilities and its stormsewer system. Included in this system are approximately 619 miles of storm drainage easements, approximately 9,142 stormwater outfalls, and 2,036 private and publically maintained SWM facilities; however, not all these facilities are served by MS-4 regulated areas.

In June of 2016 the County established its MS4 service area. This included the Regulated Outfalls and their associated drainage area. Information for each outfall included the individual ID number, local watershed, HUC and receiving water, and latitude/longitude for each MS-4 structure. The number of pervious and impervious acres served by the MS-4 and treated by MS-4 controls were also identified and reported. Prince William County has a total regulated MS-4 area of 36,365 acres, with 9,087 acres of impervious and 27,278 acres of pervious area. DEQ has copies of the County’s MS-4 Service area. Prince William County will be updating its MS-4 service area in 2019.

BMP 2 – Continue Inspection of Publicly Maintained SWM Facilities

Prince William County continues a program for the inspection and maintenance of SWM facilities maintained by the County. Publicly maintained facilities include those owned by HOA’s and residential communities or by the County Board of Supervisors, and where basic maintenance responsibilities are performed by County staff. As of June 30, 2018 the County is responsible for the maintenance of approximately 969 facilities, most of which are dry ponds, wet ponds, infiltration trenches, or sand filter facilities. The County maintains a number of Bioretention and proprietary BMP facilities.

County Maintained SWM/BMP facilities are typically inspected under two scenarios; under the general inspection program which occurs once a year, or, as requested by an impacted property owner. Maintenance is prioritized by the severity of maintenance needs for the facility. Maintenance on publically maintained SWM facilities is performed by Prince William County Construction Services as necessary. All applicable permitting requirements will be met during maintenance activities.

During the reporting period, the County staff conducted 938 routine inspections and 32 re-inspections of publically maintained facilities. A list of these facilities and their inspection date are included in Appendix H.

BMP 3 – Continue Inspection of Privately Maintained SWM Facilities

The County has a program in place to inspect more than 20 percent of the privately maintained facilities annually and to pursue enforcement actions in instances where maintenance is needed. All privately maintained facilities will be inspected within the five year permit cycle. As of June 30, 2018 Prince William County encompasses approximately 1,067 privately maintained facilities. These facilities are comprised of dry ponds, wet ponds, constructed wetlands, bioretention facilities, proprietary stormwater inlet BMP facilities, underground storage facilities, infiltration trenches, and many more.

Facilities in compliance with maintenance requirements are scheduled for re-inspection during the following permit cycle. For facilities with deficiencies, the owner is provided with a detailed report outlining those deficiencies. If the deficiencies are not corrected within the time period allotted a second notice is given, and additional time is provided for repairs. If the facility is still not repaired, Prince William County Construction Services conducts maintenance on the facility and the facility owner is required to reimburse the County for expenses. Follow up inspections are performed to ensure maintenance requirements are followed. Facility owners are urged to self-report maintenance activities to the County in the form of a detailed engineering report.

Before a privately maintained facility can be removed from bond, maintenance agreement must be recorded to ensure the proper upkeep of the facility. A majority of the privately-maintained SWM facilities have duly-recorded Maintenance Agreements that requires the owner to perform the inspection and maintenance at a frequency identified in the Agreement. For those facilities that do not have Maintenance Agreements, our County Attorney has determined that the maintenance note on the plan is still enforceable.

During the reporting period a total of 251 routine inspections and 71 re-inspections were conducted. Of those, 41 were found to be in compliance of the 144 that were in need of maintenance and are within the 60 or 30 day compliance periods. All facilities are expected to be brought into compliance. Table describing inspection, maintenance, and enforcement of privately maintained facilities for the reporting period along with a future inspection schedule can be found in Appendix H.

BMP 4 – Continue Inspection of MS-4 Stormsewer System

Prince William County conducts routine inspection of its storm drainage system, inspecting 20% of the MS-4 annually. Stormsewer is inspected using visual inspection techniques, as well as using CCTV. The County continues to implement a program to inspect all new drainage systems (eligible for County maintenance) using video cameras, prior to accepting the systems into the County's maintenance program.

During the reporting period, the County conducted routine inspections on 239 miles of stormsewer during the reporting period.

BMP 5 – BMP/SWM Inventory

Prince William County maintains an inventory of all SWM/BMP facilities installed in the County. This list is updated as new facilities come on line, and old facilities are removed or retrofitted. This

list includes the facility number, type, total acres treated, impervious acres treated, HUC code, State FIPS, and latitude/longitude and is included in an electronic form submitted with this document.

In addition, 75 facilities were added to the County’s inventory during the reporting period. These facilities are listed below.

Table 10 – BMPs added to County Inventory in FY18

FAC ID	FAC TYPE	FAC DESC	DATE INVEN	MAINT	COMMENTS	SWM AGREE	VAHUC6	VAHUC12 NAME
789	SWMP/BMP	D	7/6/2017	P	3.2"x3.2" BMP ORIFICE AT RISER	N	PL51	Powells Creek
790	SWMP/BMP	D	7/20/2017	P	1.80" BMP ORIFICE AT EW	N	PL34	Broad Run-Rocky Branch
791	SWMP/BMP	D	7/20/2017	P	108"x75" RISER, 4" BMP ORIFICE AT EW	N	PL34	Broad Run-Rocky Branch
792	SWMP/BMP	D	7/19/2017	P	8'x4' RISER, 1" BMP ORIFICE AT EW	N	PL46	Lower Bull Run
793	SWMP/BMP	D	8/17/2017	P	1.13" BMP ORIFICE AT EW	N	PL51	Powells Creek
794	SWMP/BMP	D	9/18/2017	P	2.5" BMP ORIFICE AT EW	N	PL49	Neabsco Creek
795	SWMP/BMP	D	9/20/2017	P	0.75" BMP ORIFICE AT RISER	N	PL52	Quantico Creek
796	SWMP/BMP	W	9/29/2017	P	PWSE=242.35', 17.3'x5.9' RISER	N	PL41	Occoquan River-Lake Jackson
797	SWMP/BMP	W	10/24/2017	P	NO DATA, REG POND	N	PL47	Occoquan River-Occoquan Reservoir
798	SWMP/BMP	D	1/25/2018	P	7'x12' RISER; 3" BMP ORIFICE; REG POND	N	PL32	Broad Run-Catletts Branch
799	SWMP/BMP	D	1/25/2018	P	2" BMP ORIFICE AT EW	N	PL34	Broad Run-Rocky Branch
964	BMP	T	10/19/2017	P	BMP MICRO-MEASURE W/ MONITORING WELL	N	PL32	Broad Run-Catletts Branch
965	BMP	T	10/19/2017	P	BMP MICRO-MEASURE W/ MONITORING WELL	N	PL32	Broad Run-Catletts Branch
966	SWMP/BMP	D	1/26/2018	P	8'x8' RISER, 2.5" BMP ORIFICE AT RISER	N	PL34	Broad Run-Rocky Branch

967	SWMP/BMP	W	2/20/2018	P	PWSE=277.39', 6" DRAWDOWN PIPE	N	PL46	Lower Bull Run
968	SWMP/BMP	D	2/20/2018	P	1.75" BMP ORIFICE AT RISER	N	PL46	Lower Bull Run
969	BMP	B	2/20/2018	P	BIORETENTION AREA	N	PL46	Lower Bull Run
970	SWMP/BMP	W	2/23/2018	P	PWSE=279.05', 8'x8' RISER W/ SLUICE GATE	N	PL51	Powells Creek
971	SWMP/BMP	W	3/5/2018	P	PWSE=293.72', 6'x6' RISER W/ SLUICE GATE	N	PL51	Powells Creek
972	SWMP/BMP	D	3/14/2018	P	PWSE=311.90', SHALLOW MARSH/MICROPOOL	N	PL51	Powells Creek
973	SWMP/BMP	D	3/19/2018	P	2.4" BMP ORIFICE AT EW	N	PL51	Powells Creek
974	SWMP/BMP	D	3/19/2018	P	2" BMP ORIFICE AT EW	N	PL51	Powells Creek
975	SWMP/BMP	D	3/23/2018	P	4'x4' RISER, 1.38" BMP ORIFICE AT EW	N	PL51	Powells Creek
6039	CSWMP/BMP	W	8/14/2017	C	PWSE=26.69', 8'x8' RISER W/ SLUICE GATE	Y	PL13	Neabsco Creek
6040	CBMP	U	7/28/2017	C	STORMCEPTOR (STC 3600)	Y	PL34	Broad Run-Rocky Branch
6041	CBMP	U	9/25/2017	C	6'x12' FILTERRA	N	PL52	Quantico Creek
6042	CBMP	U	9/25/2017	C	6'x4' FILTERRA	N	PL52	Quantico Creek
6043	CBMP	U	9/25/2017	C	8'x6' FILTERRA	N	PL52	Quantico Creek
6044	CSWMP/BMP	U	9/25/2017	C	STORMTECH SC-740 W/ 2 ISOLATOR CHAMBERS	N	PL52	Quantico Creek
6045	CSWMP	U	10/30/2017	C	90" CMP W/ 3 YI, APR PLAN DATA	N	PL49	Neabsco Creek
6046	CSWMP	D	11/6/2017	C	TWIN 30" CMP OUTFALL PIPES, APR PLAN DATA	N	PL52	Quantico Creek
6047	CBMP	B	12/15/2017	C	BIORETENTION AREA, RISER W/ YI TOP	Y	PL34	Broad Run-Rocky Branch
6048	CBMP	U	12/15/2017	C	8'x11' STORMFILTER W/ WEIR WALL	Y	PL34	Broad Run-Rocky Branch
6049	CBMP	U	12/15/2017	C	8'x14' STORMFILTER W/ WEIR WALL	Y	PL34	Broad Run-Rocky Branch

6050	CBMP	U	12/15/2017	C	4.5'x8' STORMFILTER W/ WEIR WALL	Y	PL34	Broad Run- Rocky Branch
6051	CBMP	U	12/15/2017	C	CONTECH CDS2015-4- C	Y	PL34	Broad Run- Rocky Branch
6052	CBMP	U	12/15/2017	C	CONTECH CDS2015-4- C	Y	PL34	Broad Run- Rocky Branch
6053	CBMP	U	12/15/2017	C	CONTECH CDS2015-4- C	Y	PL34	Broad Run- Rocky Branch
6054	CBMP	B	1/9/2018	C	BIORETENTION AREA	Y	PL47	Occoquan River- Occoquan Reservoir
6055	CBMP	B	1/9/2018	C	BIORETENTION AREA	Y	PL47	Occoquan River- Occoquan Reservoir
6056	CBMP	B	1/9/2018	C	BIORETENTION AREA	Y	PL47	Occoquan River- Occoquan Reservoir
6057	CBMP	B	1/9/2018	C	BIORETENTION AREA	Y	PL47	Occoquan River- Occoquan Reservoir
6058	CBMP	B	1/9/2018	C	BIORETENTION AREA	Y	PL47	Occoquan River- Occoquan Reservoir
6059	CSWMP/BMP	U	1/17/2018	C	STORMTECH SC-740 W/ ISOLATOR CHAMBER	N	PL50	Potomac River- Occoquan Bay
6060	CBMP	B	1/17/2018	C	BIORETENTION AREA	N	PL50	Potomac River- Occoquan Bay
6061	CBMP	B	1/17/2018	C	BIORETENTION AREA	N	PL50	Potomac River- Occoquan Bay
6062	CSWMP/BMP	D	2/5/2018	C	2" BMP ORIFICE AT RISER	N	PL40	Cedar Run- Slate Run
6063	CSWMP/BMP	D	2/5/2018	C	2" BMP ORIFICE AT RISER	N	PL40	Cedar Run- Slate Run
6064	CSWMP/BMP	D	2/5/2018	C	2" BMP ORIFICE AT RISER	N	PL40	Cedar Run- Slate Run

6065	CBMP	U	2/5/2018	C	6'x4' FILTERRA	N	PL40	Cedar Run-Slate Run
6066	CBMP	U	2/5/2018	C	8'x4' FILTERRA	N	PL40	Cedar Run-Slate Run
6067	CBMP	U	2/5/2018	C	6'x4' FILTERRA, CBMP IN VDOT ROW	N	PL40	Cedar Run-Slate Run
6068	CBMP	U	2/5/2018	C	6'x4' FILTERRA	N	PL40	Cedar Run-Slate Run
6069	CBMP	U	2/5/2018	C	10'x6' FILTERRA	N	PL40	Cedar Run-Slate Run
6070	CBMP	U	2/5/2018	C	8'x6' FILTERRA	N	PL40	Cedar Run-Slate Run
6071	CBMP	U	2/5/2018	C	6'x4' FILTERRA	N	PL40	Cedar Run-Slate Run
6072	CBMP	U	2/5/2018	C	8'x4' FILTERRA	N	PL40	Cedar Run-Slate Run
6073	CBMP	U	2/5/2018	C	8'x6' FILTERRA	N	PL40	Cedar Run-Slate Run
6074	CBMP	U	3/7/2018	C	6'x6' FILTERRA	Y	PL44	Middle Bull Run
6075	CBMP	U	3/7/2018	C	6'x4' FILTERRA	Y	PL44	Middle Bull Run
6076	CSWMP/BMP	U	3/7/2018	C	STORMTECH SC-740 W/ 2 ISOLATOR CHAMBERS	Y	PL44	Middle Bull Run
6077	CBMP	U	3/7/2018	C	ADS NYLOPLAST STORM-PURE FILTER INSERT	Y	PL44	Middle Bull Run
6078	CBMP	U	3/28/2018	C	8'x6' FILTERRA	Y	PL49	Neabsco Creek
6079	CSWMP/BMP	D	3/28/2018	C	1.5" BMP ORIFICE AT RISER	Y	PL49	Neabsco Creek
6080	CSWMP/BMP	U	4/2/2018	C	CMP CHAMBER W/ JB	Y	PL47	Occoquan River-Occoquan Reservoir
6081	CBMP	U	4/2/2018	C	CURB INLET STORMFILTER	Y	PL47	Occoquan River-Occoquan Reservoir
6082	CBMP	U	4/2/2018	C	STORMFILTER W/ STORMGATE & HIGH FLOW BYPASS	Y	PL47	Occoquan River-Occoquan Reservoir
6083	CSWMP/BMP	U	4/2/2018	C	2 CMP CHAMBERS W/ JB	Y	PL47	Occoquan River-Occoquan Reservoir

6084	CSWMP/BMP	D	4/24/2018	C	2.75" BMP ORIFICE AT EW	Y	PL34	Broad Run-Rocky Branch
6085	CSWMP/BMP	D	4/24/2018	C	1.75" BMP ORIFICE AT EW	Y	PL34	Broad Run-Rocky Branch
6086	CSWMP/BMP	U	4/27/2018	C	STORMTECH SC-740 W/ ISOLATOR CHAMBER	N	PL44	Middle Bull Run
6087	CSWMP/BMP	U	5/1/2018	C	STORMTECH SC-740 W/ ISOLATOR CHAMBER	N	PL44	Middle Bull Run
6088	CSWMP/BMP	D	5/29/2018	C	2" BMP ORIFICE AT EW	Y	PL51	Powells Creek
6089	CBMP	U	6/7/2018	C	STORMCEPTOR (STC 450i)	N	PL46	Lower Bull Run
6090	CSWMP/BMP	U	6/27/2018	C	HDP CHAMBER	Y	PL49	Neabsco Creek
9036	CBMP	U	12/21/2017	C	STORMCEPTOR (CDS2015-4); NO ESMT	N	PL43	Little Bull Run
9037	CBMP	U	12/21/2017	C	6'x10' FILTERRA, NO ESMT	N	PL43	Little Bull Run
9038	CBMP	T	5/9/2018	C	INFILTRATION TRENCH, NO ESMT	N	PL49	Neabsco Creek
9039	CBMP	U	5/9/2018	C	PERMEABLE PAVEMENT	N	PL49	Neabsco Creek

i. County Facilities

BMP 1 – Promote Good Housekeeping Practices for Municipal Facility Operations

Prince William County promotes good housekeeping practices throughout all its municipal facilities through its Environmental Management System (EMS) program and other methods. PWC Watershed Management in partnership with PWC Risk Management enforces good housekeeping at County municipal facilities. The EMS program promotes consistency and accountability in the method for addressing environmental concerns through the allocation of resources, assignment of responsibility and ongoing evaluation of practices, procedures, and processes. This program emphasizes objectives such as the identification and prevention of spills, hazardous material storage and removal, storage tank inspection and maintenance, waste disposal and recycling, proper equipment and material storage, and many other environmental good housekeeping practices.

The following list shows some of the public buildings or facilities that have the Extraordinary Environmental Enterprise (E-2/E-3/E-4) certification:

E4 – PWC Solid Waste Sanitary Landfill and PWC Balls Ford Road Recycling & Composting Facility

- E3 – PWC Fleet Management Facility
- E3 – PWC Environmental Services Construction Services
- E3 – PWC Buildings & Grounds
- E3 – Mosquito & Forest Pest Management
- E3 – Historic Preservation
- E3 – PWC Fire & Rescue
- E2 – PWC Police
- E2 – PWC Libraries
- E2 – PWC Parks & Recreation

In addition to the EMS program, Prince William County promotes good housekeeping activities for parks and rec facilities. These facilities are inspected biennially, to ensure good housekeeping practices are being followed. This includes properly managing yard waste and grass clippings. Police and fire vehicles are required to be washed in an environmentally safe manner, allowing no wash water to enter stormdrain systems. Most vehicles are washed in commercial car washing facilities. PWC Fleet Management has worked closely with Risk Management and Watershed Management to set up a system to prevent the leaking or spilling of vehicles on site waiting for maintenance.

Inn FY18, Public Works hosted its first Annual Good Housekeeping Event for all employees to inspect, identify and correct potential safety issues in their office, as well as eliminate potential hazards.

Prince William County’s storm drain labeling program targets high priority municipal facilities to maintain markings on storm drain inlets. This program not only labels inlets at high priority municipal facilities, but in multiple areas of the county including high-risk shopping centers and residential neighborhoods.

BMP 2 – Identify High Priority Municipal Facilities

The County operates many municipal facilities. Some, like the PWC landfill facility, are covered under their own VPDES permit for stormwater discharges. During FY17, the County assessed all municipal facilities within it’s MS4 service area, and evaluated their need for a SWPPP. High risk facilities included composting facilities, equipment storage and maintenance facilities, materials storage yards, pesticide storage facilities, public works yards, recycling facilities, salt storage facilities, solid waste handling and transfer facilities, and vehicle storage and maintenance yards. The following four facilities have been identified as being high risk, and are currently maintaining a SWPPP:

Table 11 – High Priority Municipal Facilities

Facility Name	SWPPP Needed	SWPPP Developed
Fleet Administration	Yes	Developed
Ben Lomund Maintenance Building	Yes	Developed
Hellweg Maintenance Building	Yes	Developed
PWC Stadium Maintenance Building	Yes	Developed

BMP 3 – Develop SWPPPs for Selected High Priority Municipal Facilities

SWPPPs will include a site description that includes site map showing all outfalls, direction of flows, existing source controls, and receiving water bodies; a checklist of potential pollutants and pollutant sources; all potential non-stormwater discharges; a maintenance schedule for all source controls; policies and procedures implemented at the facility for source reduction; an inspection schedule to ensure source reduction controls are implemented and maintained properly; training schedules for facility employees; procedures for annual evaluations of the facility; dry weather monitoring procedures; and all modifications made as a result of a spill or release of pollutant. The status of SWPPP development at High Priority Municipal Facilities is presented in Table 12 located in the above section.

j. Public Education and Participation

Prince William County strives to share relevant and useful information with our community to help protect our local waterways and natural environment. We undertake a number of projects and special events to provide citizens with the opportunity to help in these goals. Public Works also partners with residents, businesses, other government agencies and organizations to advance our goals to protect and preserve natural resources.

BMP 1 – Promote Public Reporting and Recognition of Illicit Discharges

Prince William County Public Works offers information to define an illicit discharge, possible sources of pollutants that can enter our stormwater systems, how to prevent runoff and how to report incidents of improper dumping.

- Residents
 - Maintain several references on our website at various pages including Citizen Action, Storm Water Management, Illicit Discharge and Illegal Dumping and Participation in Clean Water Programs
 - Placed articles in newsletter to HOAs and neighborhood leaders about cleaning up after pets, native plants, and proper disposal of wastes
 - Established a hotline and email address to report illegal dumping into storm drains (Staff received, inspected and took action on 52 complaints through the hotline and email in FY18)
 - Placed 970 informational markers at selected stormwater drains throughout the community and hand out information door hangers explaining the concerns with placing materials in the storm drain
 - Continue to air a public service announcement video about preventing pollution that appears on the local government channel and the website at <http://www.pwcgov.org/government/dept/publicworks/environment/pages/default.aspx>

- Host displays for community at Prince William Recycles Day, Earth Day and Compost Awareness events

Future efforts: Create an online reporting system for illegal dumping, work on public participation events to learn more about plastic pollution prevention.

- Businesses and Industries
 - Maintain a web page for businesses on ways to prevent pollution with pages targeted at specific industries
 - Share informational materials when visiting sites in the field
 - Send educational materials with warning and violation letters

Future efforts: Send letters and create pages for other targeted businesses and industries, create a special sign for industries that practice best management practices for them to display and seek opportunities to present information at industry meetings and educational events

- County Government
 - Created online training about illicit discharge and pollution prevention for employees (required for some and encouraged for others)
 - Establish a SWPPP at four facilities identified as high risk including park sites and Fleet
 - Established protocol for outdoor storage of equipment, materials and chemical
 - Expanded program for proper collection and disposal of batteries, universal waste, printer cartridges, electronic accessories, chemicals and hazardous waste generated by County employees
 - Worked with an independent vendor to inspect and make repairs to all above-ground fuel storage tanks located at PWC facilities

Future efforts: Adopt a County policy on Illicit Discharge Detection and establish SWPPPS at identified high risk facilities

BMP 2 - Continue to Promote Involvement in Local Water Quality Improvement Projects

Prince William County Public Works will continue to promote individual and group involvement in local water quality improvement initiatives including the promotion of local restoration and clean-up projects, programs groups, meetings and other opportunities for public involvement.

Public Works takes the lead on water quality improvement initiatives by facilitating projects and educational events, as well as providing funds to partner agencies in the community to support public involvement and awareness.

- Residents

- Sponsor an annual Youth Conference on the Environment and Parent Symposium on a variety of Environmental Topics (we have hosted the event for 17 years and average 100 participants and 30 high school student leaders each year)
- Sponsor Six Weeks to Make a Difference Conservation Projects for Families to participate in a weekly project from April through mid-May including projects to pick up litter, reforest areas and help along streams (we have undertaken projects for the past 10 years with an average of 20 volunteers at each of the six events)
- Recognize volunteers, individuals and groups, with an annual Green Community Award (since 2014, we have recognized 41 individuals and 23 groups, as well as the family volunteers at the conservation projects)
- Create and maintain educational web pages on sound practices around the home to prevent pollution and runoff, protecting streams, rivers and wetlands, planting native species, safeguarding trees, and managing waterfront property
<http://www.pwcgov.org/government/dept/publicworks/environment/pages/default.aspx>
- Create and maintain informational web pages on opportunities to help families volunteer, take steps to go green and reduce their impact on the environment, get outdoors and learn about conservation agencies in the community
<http://www.pwcgov.org/government/dept/publicworks/gogreen/pages/gogreen.aspx>
- Provide residents with the opportunity to drop off household hazardous waste and electronics twice a week year-round at no charge to reduce inclination to pour down the storm drain for convenience and cost savings (61,999 gallons of used oil, 4,848 gallons of anti freeze and 2,559 car batteries)
- Provide residents with the opportunity to drop off motor oil, anti-freeze and car batteries at no charge every day to reduce inclination to pour down the storm drain for convenience and cost savings (provide amount)
- Provide funding to the Prince William Soil and Water Conservation District to run an Adopt-a-Stream program (in FY18, 1,425 volunteers donated 5,007.58 hours of time to clean 35,493 pounds of trash from 57.5 miles of stream)
- Provide funding to the Prince William Soil and Water Conservation District to monitor floatables in the community (volunteers monitored five sites each quarter)

- Provide funding to the Prince William Soil and Water Conservation District to monitor water quality at 15 active sites and four sites to monitor E.coli (232 volunteers donated 816 hours. They also offered monitoring events and outreach events to reach 830 residents)
- Provided funding to Keep Prince William Beautiful to work with volunteers to apply 970 adhesive markers to storm drains that remind residents that the drain leads to local waters and eventually the Chesapeake Bay
- Provide funding to Keep Prince William Beautiful to organize litter clean-ups throughout the community (27 organized community cleanups)
- Provide funding to the Virginia Tech Cooperative Extension Office to provide training for residents on a variety of environmental topics including horticulture, best lawn practices, natural resources and other lawn care recommendations (residents participated in the program with them adopting recommended water quality practices)
- Provide funding to the Virginia Tech Cooperative Extension office to offer assistance to homeowners, businesses and houses of faith to adopt an urban nutrient management plan (53.32 acres are under a plan. In FY18, 244 plans were written covering 83.32 acres. There are a total of 826 active plans covering 222.41 acres under nutrient management)

Future efforts: Provide tips for inclusion in newsletters distributed by the Board of County Supervisors, and attend local festivals and farmer markets to distribute materials about illicit discharge and protecting water quality

- Businesses and Industry
 - Created a web page with tips on reducing the impact from businesses on local water quality and implementing best management practices
 - Work with local businesses to properly maintain their stormwater management ponds
 - Work with local businesses to recruit volunteers to help with cleanup projects, particularly near their business or when companies have a corporate philosophy to volunteer in the community
 - Recognize volunteers, individuals and groups, with an annual Green Community Award
 - Provide funding to Keep Prince William Beautiful to conduct quarterly litter surveys in the community to identify problem areas then report back to nearby businesses to seek assistance in cleanups and managing potential sources of litter or runoff
 - Provide funding to Keep Prince William Beautiful to conduct shopping center surveys and provide feedback to property manager to help them better maintain their center (99 shopping centers currently participate)

Future efforts: Provide sign for businesses to post that indicate they help protect local water quality

- County Government
 - Created online training for compliance with Resource Conservation and Recovery Act, Spill Prevention, Control and Countermeasure plans and Illicit Discharge Detection and Elimination
 - Increased overall rate of environmental training of all County personnel by over 50%
 - Host an annual Good Housekeeping Event to ensure environmental compliance as well as safety in Public Works facilities
 - Enforce the County’s Environmental Policy Statement
 - Continue a robust Environmental Management System that includes facilities awarded E2, E3, E4 and SP status by DEQ and an EMS Council that manages and expands the environmental compliance program
 - Host an annual Earth Day Festival for County Employees
 - Provide spill kits for all fuel tanks and generators at County facilities and train staff how to respond
 - Maintain compliant Spill Prevention, Control and Countermeasure plans for facilities when required and maintain training requirements for the program
 - Continue to improve housekeeping practices that will help protect water quality

Future efforts: Provide additional training and increase awareness about actions we can take as county employees to improve local water quality by implementing additional good housekeeping practices

BMP 3 – Promote Integrated Management Practice (IMP) Plans for Public and Private Golf courses

Prince William County Public Works will reach out to public and private golf courses located within the county that discharge to the permittee’s MS4 that would encourage implementation of integrated management practice (IMP) plans and techniques to reduce runoff of fertilizers and pesticides.

Public Works has established a relationship with local golf course managers, particularly the public courses, to ensure they have the tools and knowledge to reduce the impact of their operations.

- Required all golf courses to have a current nutrient management plan
- Required all golf course managers to ensure staff is properly trained in IPM plans
- Required all golf course managers to ensure staff is trained in application techniques to reduce run off

Future efforts: Establish stronger working relationship with private golf course managers and send an annual letter to golf course managers regarding requirements for illicit discharge, pollution prevention and available resources to ensure they are within compliance of these initiatives

BMP 4 - Continue to Promote Public Good Housekeeping Practices

Prince William County Public Works will promote and publicize good housekeeping practices including the proper disposal of pet waste, household yard waste and washing vehicles to minimize water quality impacts.

- Residents
 - Provide information online about picking up after your pets
 - Provide a pamphlet about picking up after your pets
 - County-owned compost facility accepts yard waste from residents for composting and mulching (product available for purchase from private vendor that operates the compost)
 - Provide tips and steps for grasscycling and composting at home
 - Host an annual event to highlight the benefits of composting and provide information to the community
 - Provided local vets to post a poster and offer pamphlets on picking up after pets

Future efforts: Expand composting and collection of yard waste from residents. Continue to work on program to compost food wastes

- Businesses and Industries
 - Lawn care and landscaping companies can pay to dispose of yard waste from residential and commercial projects
 - Lawn care and landscaping companies can pay to purchase mulch and compost

Future efforts: Plans are underway to add a food waste processing system at the compost facility

- Residents
 - Created a page on the website which encourages the use of commercial car washes, but provide details on how to wash the car at home
 - Provided tips on how to manage any spills or leaks of oil and auto fluids

Future efforts: Work with local organizations that hold car washes as a fundraiser with tips to reduce soap entering storm drains at the various commercial locations used for the events

- County Government
 - Require all standard vehicles be washed at commercial facilities
 - Established protocol for properly washing non-standard vehicles and equipment in such a way as to prevent runoff

BMP 5 - Encourage Private Property Owners to Implement Voluntary Stormwater Management Techniques and/or Retrofits

Prince William County will continue to develop programs to encourage private property owners to implement voluntary stormwater management retrofits. Currently, the County partners with the Prince William County Soil and Water Conservation District to encourage private property owners to implement voluntary stormwater management retrofits through the Virginia Conservation Assistance Program. This program promotes cost share incentives for private property owners looking to implement BMPs. As part of this partnership PWCSWCD looks to install at a minimum two voluntary retrofit projects per year. Two VCAP projects have been completed in FY18. For FY19, we have one permeable pavement project under construction. There are several more approved projects, but awaiting funding.

Prince William County helps private property owners implement voluntary stormwater management techniques and/or retrofits with strategies including protecting sensitive areas, reducing run off and saving trees.

- Residents
 - Created brochures and web pages for owners with waterfront property
 - Hosted a conference with information for owners with waterfront property
 - Created a brochure about the Chesapeake Bay Resource Protection Areas for distribution at events and site visits
 - Created a pamphlet on the benefits of rain gardens
 - Offer funding through the Virginia Conservation Assistance Program for non-agricultural lands to support best management practices to protect local water quality
 - Encourage residents to reduce turf on property and replace with native species and forested areas
- Businesses and Industries
 - Encourage businesses and industries to replace turf areas with native species and forested areas to reduce use of herbicides and fertilizers, as well as reduce mowing costs
 - Offer funding through the Virginia Conservation Assistance Program for non-agricultural lands to support best management practices to protect local water quality

- County Government
 - Establish a reforestation practice for all new County construction to leave as many mature trees as feasible, save soil for planting projects and replace disturbed areas with trees and native plants to save mowing costs and reduce use of fertilizers and herbicides
 - Establish meadows and gardens at County historic sites and public facilities
 - Undertake stream restoration projects
 - Retrofit existing stormwater management structures with improved structures and strategies during retrofits, repairs or maintenance

Future efforts: Increase efforts to identify opportunities to use VCAP for residential, commercial or county projects if state continues grants

BMP 6 - Continue to Promote Commercial, institutional and Industrial Good Housekeeping Practices

Prince William County Public Works will share specific information and strategies with local groups of commercial, industrial, and institutional entities likely to have significant stormwater impacts, including illicit discharge and illegal dumping concerns.

- Businesses and Industries
 - Focused on providing information to Carpet Cleaning and to Lawn and Landscaping Services with a letter to owners and a web page
 - Offer an education program on Fats, Oils and Grease from food service establishments through the Prince William County Service Authority

Future efforts: Identifying industries for future education and awareness campaign

- County Government
 - Inspect facilities and areas at high risk for runoff to ensure best management practices in place
 - Improve best management practices by continuous review and upgrades as needed
 - Place spill kits and provide training for staff to use spill kits at all vulnerable locations
 - Conduct regular inspections of our above ground tanks to ensure there are no leaks or spills
 - Enforce and promote protocol for staff and volunteers for safety when they find tanks, suspicious bottles/jars and oil/fluid spills during inspections and cleanups

Future efforts: Increase awareness of all staff to recognize potential spill hazards and report any spills or runoff to the proper staff

Prince William County Public Works posts a copy of this state permit on its web page no later than 30 days after the effective date of this state permit and continue to retain a copy of the permit online for the duration of this state permit.

- Public Works has posted a copy of the state permit on its Public Works web site within the County Government pwcgov.org website. It resides on our Environmental Services pages and has its own direct link from our navigational bar at: <http://www.pwcgov.org/government/dept/publicworks/environment/pages/ms-4-permit.aspx>
- A printed copy of the state permit is kept in our offices for any citizen to review upon request at our service counter.

k. Training

BMP 1 – Continue to Train Staff in the Recognition of Illicit Discharges and Good Housekeeping Practices

Prince William County Staff are trained in the recognition and reporting of Illicit Discharges as well as implementation of good housekeeping practices. Currently, appropriate staff are trained on basic good housekeeping, spill prevention, and illicit discharge prevention practices through EMS training. This training is conducted biennially and is required for all staff including full time parks and rec staff.

To increase training opportunities for personnel with varying shifts and schedules, an effort was made during FY18 to offer more online environmental compliance courses. These custom courses with voice-over narration were developed internally and featured pertinent photos from County facilities to demonstrate information and relay County specific procedures for compliance and response. A test at the end of these courses ensured users remained engaged and attentive. Training records are maintained using the online SkillSoft platform that is customized for the County and named “PWC University”, and attendance reports are generated by that system. Risk Management maintains a copy of sign-in sheets and course content. Overall, the addition of online courses increased participation, with just under 1,500 employees being trained on environmental compliance topics in FY18.

Table 12 – Training Provided During FY18

Title	Course #	# Attended	Content
Chemical & Custodial Safety	EHS 411	218	Quarterly discussion with custodial staff, each with 3 focus topic: safety, wellness, and environmental compliance. Environmental topics include indoor and outdoor spill recognition and response, proper waste disposal procedures

			(regulated and non-regulated waste) and green chemical evaluation and use.
Universal Waste Refresher	EHS 417 (classroom) EHS 456 (online)	68	30-Minute course outlining the requirements for fluorescent bulb, battery, and electronic waste labeling, storage, transportation, and recycling
EMS Annual Training	EHS 441 (classroom) EHS 402 (manager workshop)	81	60-minute course provides a refresher to VEEP participants on the various components of their Environmental Management System, including: training requirements, environmental impacts, regulatory compliance review, communication plans, and operational controls. New managers receive a 4-hour, hands-on workshop as an introduction to the program.
Environmental Regulatory Overview	EHS 450 Blackboard for Fire & Rescue Personnel	684	This 90-minute course is intended for personnel who manage or perform activities involving chemicals, fluorescent light bulbs, mechanical equipment, storage tanks and/or garbage and recycling. Background information will be provided and participants will learn how to ensure their facility meets applicable regulatory requirements. This course covers SPCC, RCRA, Chemical Disposal and Discharge, Watershed Protection, and an overview of the Environmental Management System.
RCRA Waste for Generators	EHS 146 (classroom) EHS 462 (online)	195	This course reviews the requirements on management of hazardous waste by generators. Subjects include waste identification, collecting wastes, storing wastes, required paperwork, waste shipments, and emergency planning relating to EPA hazardous wastes.
Spill Prevention and Response	EHS 401	21	Overview of methods for preventing spills through regular tank and equipment checks; containing spills through the use of booms, absorbents, and storm drain barriers; reporting spills internally and to regulatory bodies, when necessary.
OSHA Level II Chemical Spill Response Training	EHS 402	27	This 8-hour course educates employees at facilities that store or handle oils, petroleum, and other regulated materials that pollute surface waters. The purpose of this training is to illustrate proper methods for preventing and responding to spills
Spill Prevention, Control & Countermeasure Plan	EHS 435 (classroom) EHS 461 (online)	117	This 60-minute class reviews regulatory requirements for writing, maintaining and complying with a written SPCC plan for facilities that have over 1,320-gallons of fuel on their site.
Watershed Protection / Illicit Discharge Prevention	EHS 451 (Classroom) EHS 460 (online)	81	Introduction to the importance and function of watersheds, regulations that protect them, and complying with local, state, and federal laws that prohibit illicit discharges

BMP 2 – Continue to ensure pesticide and Herbicide Application Occurs in Accordance With Pesticide Control Board Regulations

All County staff and County contractors receive appropriate training in pesticide and herbicide application. These include staff of Parks and Recreation, as well as Environmental Services Mosquito and Forest Pest Management staff. All staff are required to stay current in applicable trainings and certifications.

BMP 3 – Continue to ensure County Staff are Trained and Certified in DEQ Stormwater, E&S, and Plan Review Courses

All our engineering staff who review E&S, SWM and VSMP plans are have...certifications. All our site inspectors and stormwater management facility inspectors have erosion and sediment control inspector and stormwater management inspector certifications .

BMP 4 – Continue to ensure Emergency Response Staff are Trained in Spill Response

All uniform personnel are trained to the hazmat first responder operations level. This training teaches spill control as a defensive manner. This training is regulated by 29 CFR 1910.120(q) and NFPA 472. The 109 HAZMAT technicians or specialists and 725 career personnel are required to be current in this training, including annual refresher training. Approximately 1,000 volunteers are trained to this level as well. During the reporting period, all required personnel were current in Emergency Spill Response training.

I. Water Quality Screening Programs

BMP 1 – Develop and Maintain a Dry Weather Monitoring Program

During the reporting period, Prince William County conducted 840 Dry weather Monitoring inspections. Of the 970 outfalls monitored, 130 (15.5%) outfalls were found to be flowing; 44 (33.8%) of the flowing outfalls were found to have groundwater as a source, 77 (59.2%) were found to have surface water as a source (piped streams), 13 (6.9%) of those were found to have other sources (Lawful discharges such as landscape irrigation, sump pump discharges, AC condensate, etc.), and 17 were found to be Illicit in nature. Two resulted in the issuance of an Notice of Violation. Descriptions of these discharges and of follow-up can be found below. Discharge reports for each instance can be found in Appendix L. As outfalls are screened through our dry weather monitoring program, those that are found to be contributing a significant load of pollutants are toggled as being high risk.

Table 13 – Dry Weather Monitoring Illicit Discharge Summary

Outfall ID	Address	Date of initial inspection	Charecteristics of discharge	NOV Issued	Date of last inspection	Comments	Statu s
49960	12920 Hoadly Run Rd.	1/19/2018	Used mobil drainage	No	2/2/2018	The curb inlet, conveyance sewer and outfall was cleaned by Atlas Environmental Services before rainfall.	Close d
51058	7812 Bethlehem Rd	8/4/2017	Debris and sediments	No	8/4/2017	Paving Company has their own CSWMP 5678. The facility is a VPDES permitted facility and running business without discharging pollutant into County MS4 areas.	Close d
47274	14730 Potomac Mills Rd	10/3/2017	Grease and used mobil	No	10/6/2017	Grease and used mobil found to spill on parking lot, which subsequently discharged into stormwater curb and gutters inlet. Fresh stain observed at outfall. The case noticed to the management of PTRC (Omniride). The case was prudently resolved by the company employing professional cleaners.	Close d
52351	2314 Potomac Club Pkwy	10/26/2017	Orange Algae	No	4/25/2018	Excessive algae observed. Some water quality parameters were found exceeding standard limit from desktop analysis. The outfall has been selected for wet weather monitoring and got quaterly report from AMEC exceeding water quality parameters. Water sample collected and sent to Mooney Lab for verification. Inclusive investigation has been continued and transfer to new fiscal year.	Close d
21180	1920 Daniel Stuart Square	11/21/2017	Fats and cooking oils	Yes, 17-2017	12/20/2017	Frozen bulk volume of fats and cooking oil spill was potential for melting and flowing into storm sewer system with rain and raising temperature. NOV was issued to the restaurant owner to stop further spill and clean up pavement without discharging pollutant into stormwater system. Deficiencies found mittigated in follow up inspection, made on 12/20/2017.	Close d
10042	2700 Potomac Mills Circle	7/19/2017	Food waste fluid, grease and oils	Yes, 12-2017	Periodic: 8/18/2017; 9/14/2018	Deficiencies had been corrected by hauling accumulated waste and cleaning grease inceptor. Compactor was repaired to control leakage of waste food fluid.	Close d

20164	2141 Opitz Blvd	11/17/2017	vehicle wash water	Yes, 16- 2017	12/15/2017	Automotive sales and service use to discharge carwash discharge into stormwater management system.	Close d
49694	2300 Opitz Blvd	10/5/2017	Paper Pulp discharge	No	11/2/2017	Discharge tracked and found generating from the complex of Sentara Hospital. Meeting made with Building and Ground Manager and inspected whole facility. Particular source of pulp discharge was not identified. In follow up inspection, discharge was flowing without pulp.	Close d
3/19/2011	11858 Livingston Rd	1/19/2018	Green discharge, WQ Parameters Exceeded the limits	yes, 3; 4; 5; 6- 2018	2/20/2018	The source of discharge identified from commercial vehicle wash, wash water form commercial business plus melting snow. The source of green color investigated from green color snow melt salt used on parking lot. The outfall has selected for wet weather monitoring station. Investigation has been continued under wet weather monitoring program.	Close d
11619	2660 Prince William Pkwy	3/13/2018	Algae Developed; WQ Parameters Exceeded the Limits	No	3/13/2018	Orange algae observed at pipe and downstream concrete swale. Desktop analysis performed on 3/14/2018. Fluoride, Copper and Chlorine found exceeding the standard limits. Investigation made with CCTV's inspection. Source identified ground water seepage into storm sewer system	Close d
10033	13201 Worth Avenue	3/13/2018	Algae Developed; WQ Parameters Exceeded the Limits	No	3/13/2018	Excessive algae observed at outfall. Source of discharge could not identify but suspect to have from ground water seepage since it has disappeared while tracking upstream sewer. Desktop analysis performed on 3/14/2018. Phenol, Fluoride, Chlorine, Copper and Nitrate found exceeding the standard limits. CCTV inspection is scheduled and case transfered for next fiscal year.	Close d
41817	2645 Prince William Pkwy	3/13/2018	Algae Developed; WQ Parameters Exceeded the Limits	No	3/13/2018	Excessive algae observed at outfall. Desktop analysis performed on 3/14/2018. Fluoride, Chlorine and Copper found exceeding the standard limits. CCTV inspection is scheduled and case transfered for next fiscal year.	Close d

10236	14250 Telegraph Rd	3/15/2018	Algae Developed; WQ Parameters Exceeded the Limits	No	3/15/2018	Significant amount of algae found at outfall. Source of discharge couldn't identify. Flow disappeared while tracking along upstream sewer. Conductivity and pH didn't exceed the standard limits. Desktop analysis performed on 3/16/2018. Fluoride, Chlorine and Copper found exceeding the standard limits. CCTV inspection is scheduled and case transferred for next fiscal year.	Close d
27775	14200 Telegraph Rd	3/15/2018	Suds Developed; WQ Parameters Exceeded the Limits	No	3/15/2018	Suds slightly observed at the outfall. Conductivity and pH didn't exceed the standard limits. Desktop analysis performed on 3/16/2018. Fluoride, Chlorine and Copper found exceeding the standard limits. CCTV inspection is scheduled and case transferred for next fiscal year.	Close d
5371	2700 Potomac Mill Circle	3/15/2018	Oil Sheen Observed; WQ Parameters Exceeded the Limits	No	3/15/2018	Negative flow developed at outfall due to sediments and trash deposition in flow line. Oil sheen suspected to develop on plunged pool due to bacteria . Sample has been collected for desktop analysis. CCTV's inspection will conduct to identify the source beside the negligible upstream inflow. Desktop analysis performed on 3/16/2018. Fluoride, Chlorine and Copper found exceeding the standard limits. CCTV inspection is scheduled and case transferred for next fiscal year.	Close d
14745	1627 Hylton Ave	4/12/2018	Excessive algae formation at outfall and downstream channel	No	5/23/2018	Upon arrival excessive algae observed at outfall and downstream channel. Sewage odor noticed. Laboratory test of water sample performed and found some parameters highly exceed standard limits. Case forwarded to PWCSA for their check. CCTV inspection performed but cross connection did not find. PWCSA reported performing CCTV inspection in sanitary sewer and also did not get defects. Follow up Inspection made and observed clear discharge without odor. Sanitary Sewer found to be repaired by Service Authority at nearby street. Follow up inspection will continue for following year.	Close d
25332	12825 Rolling Brook Drive	6/14/2018	Pouring Carpet Cleaning Discharge into Storm Sewer System	No	6/14/2018	During inspection, Z cleaners LLC owner was observed discharging water from vacume truck into road curb and gutter inlet, found to release through outfall in swale. Discharge immediately revaccumed before reaching to the creek.	Close d

All cases of Illicit Discharge were completed satisfactorily.

BMP 2 – Develop and Maintain a Wet Weather Screening Program

Prince William County’s Wet Weather Screening Program began at the end of FY16, with first sample occurring in September of 2017. Two sites were selected for sampling and sampling will occur during qualifying storms on a quarterly basis.

The second year of sampling has shown multiple analytes exceeding water quality criteria. Figure 4, found below, summarizes the exceedances at both sites for FY18. The County has produced contributing drainage area maps for both sites, which can be found in Appendix L. In FY19 the County will continue to perform public outreach to businesses and HOAs in these areas in an effort to reduce pollutant loads. Dry weather monitoring will also occur in these areas in order to trackdown pollutant sources. Outfalls found with an active flow will have samples taken for additional analysis. If further analysis is needed of these samples, they will be sent to the Mooney Lab to further identify the types of pollutants. A description of site selection and final site locations, as well as Wet Weather Monitoring procedures and results are located in Appendix L.

Figure 4 – Exceedance tracking for the Wet Weather Monitoring Program

			2017		2018	
			Q3	Q4	Q1	Q2
Manassas (#941)	Copper	µg/L	9.4	231	133	58.9
	Lead	µg/L	ND	71.2	29.7	11.8
	Nickel	µg/L	ND	13.2	10.1	8
	Zinc	µg/L	388	686	679	141
	Total Suspended Solids	mg/L	29	167	101	47.7
	Nitrogen, Ammonia	mg/L	ND	0.14	ND	ND
	Nitrogen, Kjeldahl, Total	mg/L	0.65	2.7	2.3	1.3
	Nitrogen, NO2 plus NO3	mg/L	2.5	5.4	0.72	0.56
	Total Nitrogen	mg/L	3.15	8.1	3.02	1.86
	Phosphorus, Total	mg/L	0.083	0.36	0.24	0.34
	Chemical Oxygen Demand	mg/L	42	261	171	83
	pH	Std. Units	6.7	5.9	7.1	7.2
Dale City (#4684)	Copper	µg/L	29	53.4	47.9	--
	Lead	µg/L	7.3	6.7	ND	--
	Nickel	µg/L	ND	7.8	6.8	--
	Zinc	µg/L	241	396	504	--
	Total Suspended Solids	mg/L	81.3	135	84.7	--
	Nitrogen, Ammonia	mg/L	ND	2.9	0.37	--
	Nitrogen, Kjeldahl, Total	mg/L	0.65	0.29	1.8	--

Nitrogen, NO2 plus NO3	mg/L	0.5	2.3	0.46	--
Total Nitrogen	mg/L	1.15	5.49	2.63	--
Phosphorus, Total	mg/L	0.13	0.24	0.19	--
Chemical Oxygen Demand	mg/L	70	159	130	--
pH	Std. Units	6.8	2.9	6.7	--

m. Infrastructure Coordination

BMP 1 – Implement Annual Coordination Meeting with VDOT

Prince William County met with VDOT on July 26th 2018. The main discussion involved comparing and contrasting VDOT and Prince William County’s MS-4 Service area. VDOT and the County also exchanged demonstrations of mobile applications used for stormwater management and illicit discharge inspections. Our consultant confirmed that VDOT’s newly updated MS-4 service area maps will be taken into account prior to updating the County’s MS-4 Service areas for the next permit cycle.

In addition to the discussion on MS-4 service area, VDOT and Prince William County shared procedures and contacts for the reporting of Illicit Discharges. We also discussed the possibility of installing signage in regards to littering and pet waste within VDOT’s right of ways in the future.

Finally, we had preliminary discussions on TMDL action plan and implementation credits. The County has developed its TMDL action plan, but an understanding was made to look for potential projects where mutually beneficial outcomes could be made during the development process.

A sign in sheet showing members of the meeting is included in Appendix M. The County and VDOT plan to meet in FY19 in accordance with MS-4 permit requirements.

BMP 2 – Coordinate with VDOT on MS-4 Initiatives

During annual meetings with VDOT the County will discuss MS-4 interconnectivity issues such as:

Mapping – Status of mapping program and the ownership of MS-4 components

Chesapeake Bay TMDL – Means Methods and Schedule for reductions under the Chesapeake Bay TMDL special condition where impacts may occur to interconnected MS-4 areas.

Other TMDL Action Plans – Means Methods and Schedule for reductions under the other TMDL special conditions where impacts may occur to interconnected MS-4 areas.

TMDL Implementation Credit – Ensure BMP retrofits do not encounter double crediting. Discuss sharing of BMP credit if applicable.

Illicit Discharge – Share information pertaining to the County’s IDDE program and coordinate with VDOT on the identification of high risk facilities. Establish procedures for reporting discharges identified from the VDOT MS-4 system.

Water Quality Monitoring – Discuss and present results of the County’s water quality monitoring programs. This includes monitoring data collected from areas where the physically-interconnected MS-4 discharges to or flow is received from the VDOT MS-4.

II. Monitoring Requirements

1. Biological Stream Monitoring

Prince William County continued its Biological Monitoring Program in FY18 with its monitoring taking place in Q2 and Q4 of the reporting period. Sample collection occurred from October 6 to 13, 2017, and May 3 to 9, 2018 on five locations in Prince William County: Cow Branch, Dawkins Branch, Little Bull Run, Neabsco Creek, and Purcell Branch. Benthic sampling was conducted in accordance with the Sampling Plan. The multiple habitat sampling method was used for each of the sites, consisting of a total of 20 jabs or kicks, taken from each major habitat type in the reach. Benthic macroinvertebrate samples were placed on ice in coolers and shipped overnight to Amec Foster Wheeler’s benthic macroinvertebrate laboratory in Gainesville, Florida.

The RBP defines the following condition categories based on the physical habitat characterization scores, in an effort to determine the ability of the habitat to support an optimal biological community:

- **151-200 Optimal** - The physical habitat present meets natural expectations, and is capable of supporting an optimal benthic community.
- **101-150 Suboptimal** - Physical habitat is less than desirable, but satisfies expectations under most circumstances to support a benthic community.
- **51-100 Marginal** - Physical habitat has moderate levels of degradation, with a severity at frequent intervals throughout the reach, which limit the capability of supporting a benthic community.
- **0-50 Poor Physical** - habitat has been substantially altered with severe degradation to characteristics that would support a benthic community.

Table 14 below summarizes the results of the spring sampling session.

Table 14 – Fall 2017 Field Condition and Benthic Macroinvertebrate Results

Metric	Purcell Branch	Little Bull Run	Purcell Branch	Little Bull Run	Purcell Branch
RBP Habitat Score	3	3	3	3	3
RBP Habitat Category	Suboptimal	Suboptimal	Marginal	Suboptimal	Marginal
Water Temperature	18	18	18	18	18
Dissolved Oxygen	7	7	7	7	7
Flow Velocity	0.2	0.2	0.2	0.2	0.2
Percent Inorganic Carbon	100	100	100	100	100
Percent Iron Oxide	100	100	100	100	100
BOD	100	100	100	100	100
BOD Category	Good	Good	Good	Good	Good
TSS	100	100	100	100	100
TSS Category	Moderately Exceeded	Slightly Exceeded	Non Exceeded	Slightly Exceeded	Slightly Exceeded
Secchi	100	100	100	100	100
Secchi Category	Strong Stray	Stray	Good	Stray	Good

Measured field and laboratory water quality parameters are generally within the normal ranges for shallow, cool, turbulent, piedmont Virginia streams, and generally meet Virginia’s Water Quality Standards, as outlined in Section 3. However, there were elevated *E. coli* levels at each of the sites, and four sites had levels above the Virginia Water Quality standard, which could be indicative of sewage or animal waste. In addition, the physical habitat assessments and biological evaluations indicated impaired habitats and stressed benthic macroinvertebrate communities.

The RBP physical habitat assessments indicated marginal habitats at Little Bull run and Purcell Branch, with the remaining sites deemed suboptimal habitat. The “suboptimal” category indicates that the habitat criteria are less than desirable, but that the criteria satisfy expectations under most circumstances; the “marginal” category indicates a moderate level of degradation, with severity at frequent intervals throughout the reach that do not satisfy expectations. Each site’s condition did not change from baseline conditions, except for Little Bull Run which exhibited marginal habitat.

Despite Purcell Branch and Little Bull Run receiving “marginal” habitat assessment ratings, evaluation of the benthic communities indicated no significant impairment to the benthos at those sites, receiving a rating of “Good”. Conversely, the “suboptimal” habitat assessment rating indicated that the three remaining sites could support satisfactory benthic invertebrate communities under most circumstances, though the benthic invertebrate community measures showed that there was moderate to severe impairment to the benthos. Based on the biological scores, the habitat assessment and benthic community evaluations indicate impaired habitats at each of the five sites, as well as mostly impaired benthic communities at the five sites across Prince William County.

Table 15 – Spring 2018 Field Condition and Benthic Macroinvertebrate Results

Metric	Purcell Branch	Little Bull Run	Purcell Branch	Little Bull Run	Purcell Branch
RBP Habitat Score	3	3	3	3	3
RBP Habitat Category	Marginal	Suboptimal	Suboptimal	Suboptimal	Suboptimal
Water Temperature	18	18	18	18	18
Dissolved Oxygen	7	7	7	7	7
Flow Velocity	0.2	0.2	0.2	0.2	0.2
Percent Inorganic Carbon	100	100	100	100	100
Percent Iron Oxide	100	100	100	100	100

Metric	Cow Branch	Dawkins Branch	Little Bull Run	Neabsco Creek	Purcell Branch
RBP Habitat Score	1	2	2	2	2
RBP Habitat Category	Marginal	Suboptimal	Suboptimal	Suboptimal	Suboptimal
Percent Invertebrates	100%	100%	100%	100%	100%
Percent Trichoptera	100%	100%	100%	100%	100%
Benthic Index	1	1	1	1	1
Benthic Category	Fair	Fairly Poor	Fair	Fairly Poor	Poor
Macroinvertebrates	100%	100%	100%	100%	100%
Macroinvertebrate Category	Moderately Impaired	Moderately Impaired	Slightly Impaired	Moderately Impaired	Moderately Impaired
Score	100%	100%	100%	100%	100%
Score Category	Strong Structure	Structure	Structure	Structure	Structure

Measured field and laboratory water quality parameters are generally within the normal ranges for shallow, cool, turbulent, piedmont Virginia streams, and generally meet Virginia’s Water Quality Standards, as outlined in Section 3. However, the *E. coli* levels at Little Bull Run were again above the Virginia Water Quality standard, which could be indicative of sewage or animal waste. In addition, the physical habitat assessments and biological evaluations indicated impaired habitats and stressed benthic macroinvertebrate communities among the sites.

The RBP physical habitat assessments indicated suboptimal habitats for Dawkins Branch, Neabsco Creek, Little Bull Run and Purcell Branch, while Cow Branch indicated marginal habitats. This is in line with observed conditions during spring baseline sampling conditions.

Though the “suboptimal” habitat assessment rating indicated that four of the sites could support satisfactory benthic invertebrate communities under most circumstances, the benthic invertebrate community measures showed that there was moderate to severe impairment to the benthos at the sites, closer in agreement with the “marginal” category. The results specified that though habitat assessments indicated the possibility of normal benthic communities at four of the five sites, the benthic communities present were found to be under stress or severe stress for each of five sites. Based on the biological scores, the habitat assessment and benthic community evaluations indicate impaired habitats and impaired benthic macroinvertebrate communities at the five sampling locations in Prince William County, though the benthic community assessments appear to be improving from the previous year.

A copy of the entire FY2017 sampling report, along with field data sheets and laboratory results can be seen in Appendix 1.

2. In-stream Monitoring

The County has maintained an in-stream water quality monitoring program for the past 25 years. In partnership with the Virginia Tech Occoquan Laboratory, the County maintains 5 in stream water quality stations, 2 stations (Little Bull Run and Neabsco Creek) have been in operation since the early 1990s, and the remaining three stations were put on line during FY16:

1. The “Dawkins Branch Station”, with drainage to be comprised of older industrial and warehouse type of land uses. This station is to represent industrial land use in the County.

2. The “Cow Branch Station” with drainage area for the proposed station originating from commercial developments, such as, Potomac Mills Mall and several other commercial and residential uses along I-95 corridor. This represents a relatively high density and highly impervious area corridor.
3. The “Purcell Branch Station” was picked to represent large-acre residential lots, which is also a representative land use in the County.
4. Neabsco Creek at Delaney Rd. – Neabsco Creek is one of the most developed watersheds in the County. This station has drainage areas from several new and much older developments in Dale City area. Continuing this station will help us further establish the water quality trends for an older developed watershed.
5. Little Bull Run at Catharpin Road – Little Bull Run has drainage areas from major known developments such as Piedmont, Dominion Valley Country Club, etc. This Station represents the current development trends of well-planned subdivisions constructed with golf course amenities in the fast growing western part of the County. Continuing this station will help us further establish water quality trends.

a. Neabsco Creek Station

The Neabsco Creek water quality monitoring station has been in operation since 1990s. It is the County’s longest running water quality monitoring station for instream monitoring.

Table 16 – Neabsco Creek Station Water Quality Results

DATE	FLO cfs	TOTFLO cubic feet	OP mg/L	TSP mg/L	TP mg/L	NH3_ N mg/L	TKN mg/L	NO2_ N mg/L	NO3_ N mg/L	OX_N mg/L	COD mg/L	BOD5 mg/L	TSS mg/L	FCOLI org/ 100mL	ECOLI org/ 100mL
Aug-17	23.95	1,332,000	0.02	0.04	0.09	0.02	1.04	<0.01	<0.16	0.16	19	3.2	40.6	2400	2100
Oct-17	32.06	1,416,000	0.02	0.04	0.14	<0.01	0.79	<0.01	<0.17	0.17	27.4	6	95.6	3500	5790
Nov-17	43.28	2,137,000	0.03	0.06	0.21	<0.01	1.12	<0.01	<0.24	0.24	33.9	6.7	109	16000	9800
Feb-18	53.31	2,786,000	0.03	0.04	0.28	0.06	1.86	0.02	0.35	0.37	34.9	6	540		
Apr-18	109.1	8,049,000	0.03	0.05	0.31	0.12	2.27	0.02	0.35	0.37	36.6	8	512	7000	4880
Apr-18	46.60	5,439,000	0.02	0.07	0.18	0.04	1.45	0.01	0.22	0.23	32.6	4.3	148	3500	2250
Jul-18	24.87	1,016,000	0.01	0.03	0.26	0.03	1.18	<0.01	<0.32	0.32	36	6.8		160000	29100

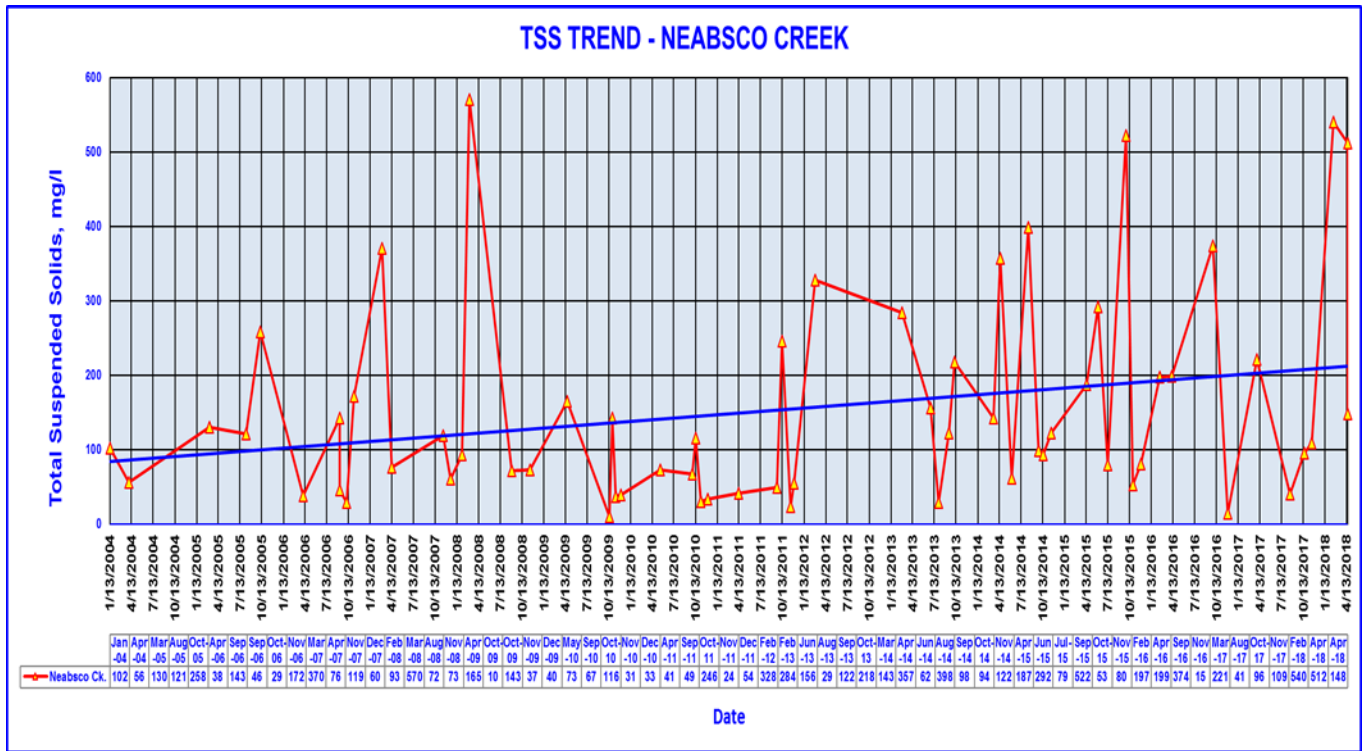


Figure 5 – Long Term TSS trends in Neabsco Creek Watershed

TSS samples show a slightly increasing trend in the Neabsco Creek Watershed.

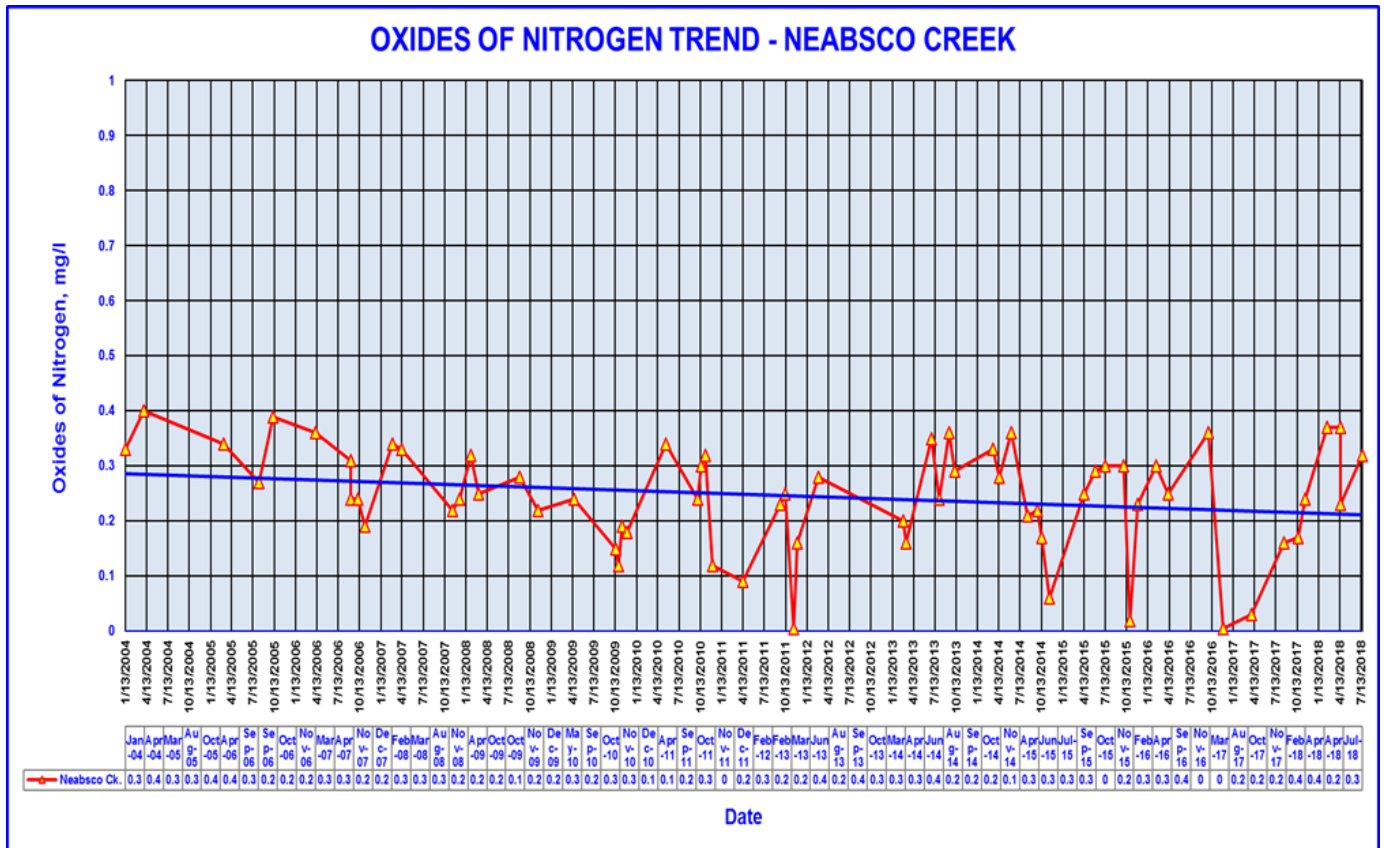


Figure 6 – Long Term TN trends in Neabsco Creek Watershed

Nitrogen is showing a decreasing trend within the Neabsco Creek Watershed. This can be interperated that stormwater control measures are making an impact within the watershed; however, with increases in TSS it may not be the case. With stream restoration and other projects the County has undertaken, the County anticipates decline in TSS over time.

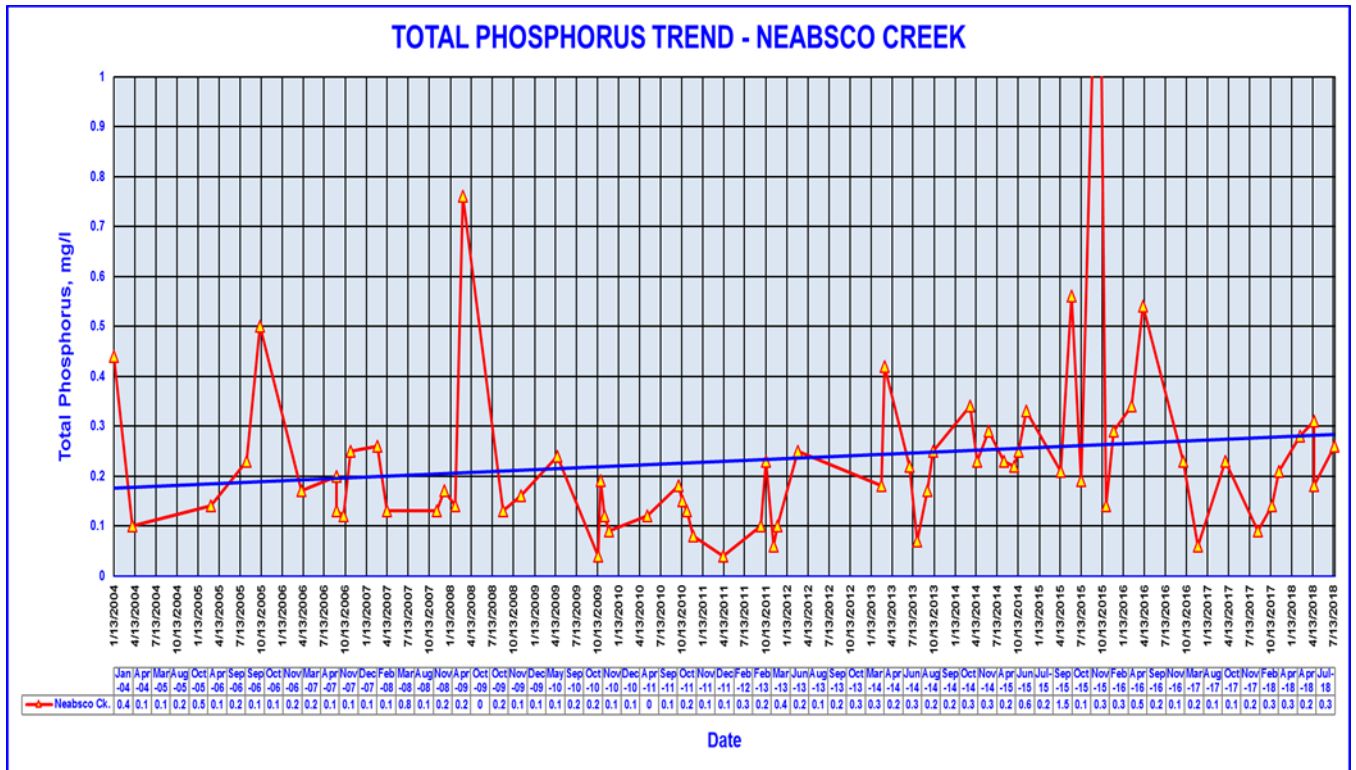


Figure 7 – Long Term TP trends in Neabsco Creek Watershed

Total Phosphorous shows an increasing trend within the Neabsco Creek Watershed. This data may be skewed more towards an increase due to several outlying peaks caused during large storm events. However in this reporting period all samples yielded results lower than the rising trend.. With stream restoration and other projects the County has undertaken in the watershed, the County anticipates a decline in TSS, and consequently, a decline in phosphorous over time.

b. Little Bull Run

The Neabsco Creek water quality monitoring station has been in operation since 2007. It is the County’s Second longest running in stream water quality monitoring station.

Table 17 – Little Bull Run Station Water Quality Results

DATE	FLO cfs	TOTFLO cubic feet	OP mg/L	TSP mg/L	TP mg/L	NH3_N mg/L	TKN mg/L	NO2_N mg/L	NO3_N mg/L	OX_N mg/L	COD mg/L	BOD5 mg/L	TSS mg/L	FCOLI org/ 100mL	ECOLI org/ 100mL
Aug-17	4.49	186,000	0.02	0.02	0.1	0.06	1.28	<0.01	<0.43	0.43	28.6		19.6	490	687
Oct-17	17.11	930,000	0.06	0.07	0.13	0.03	1.04	0.01	0.24	0.25	18.2	3	29.6	9200	5480
Oct-17	20.65	1,862,000	0.04	0.05	0.11	0.01	0.53	<0.01	<0.38	0.38	16	2.8	19	11000	4880
Nov-17	48.62	4,178,000	0.05	0.06	0.16	<0.01	0.78	<0.01	<0.52	0.52	16	2.9	37	1100	1730
Feb-18	52.04	3,644,000	0.04	0.07	0.2	0.05	1.03	0.01	0.56	0.57	21.8	3.7	170	14000	6130
Apr-18	108.6	14,910,000	0.02	0.05	0.28	0.07	2.32	0.01	0.46	0.47	35.5	8.4	330	3500	1990
Apr-18	42.15	4,176,000	<0.01	0.05	0.08	0.02	0.84	<0.01	<0.46	0.46	21	2.8	21.6		
Jul-18	32.69	2,381,000	0.04	0.09	0.29	0.01	1.89	<0.01	<0.35	0.35	30.0	7.4		160000	51700

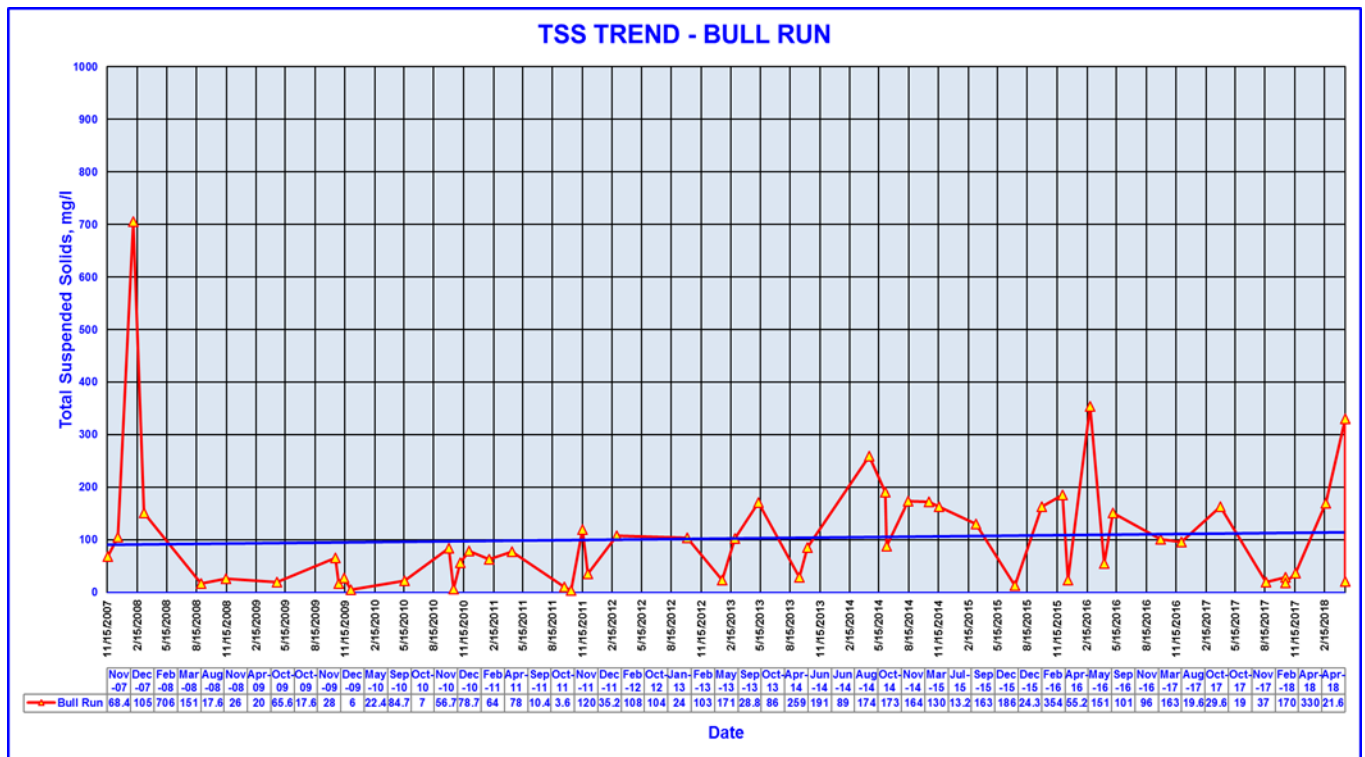
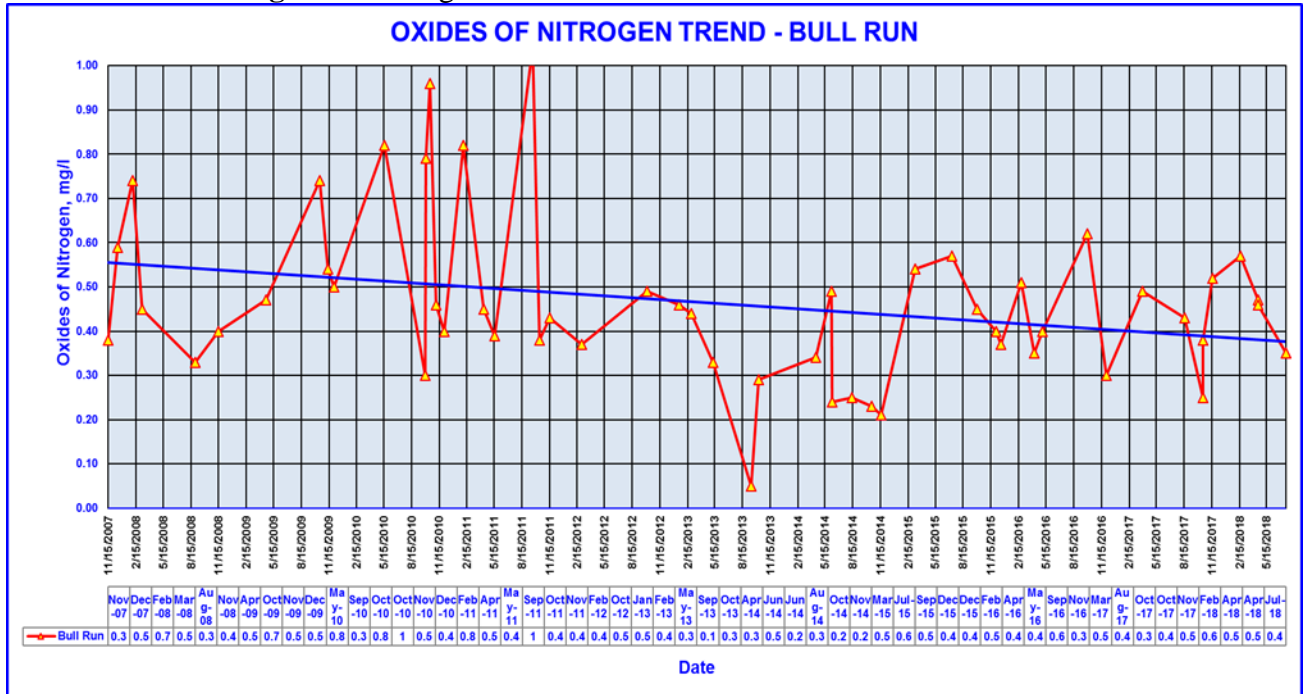


Figure 8 – Long Term TSS trends in the Bull Run Watershed

TSS in the Bull Run watershed trend is slightly increasing to steady. This year’s results are consistent with this trend.

Figure 9 – Long Term TN trends in the Bull Run Watershed



As with the Neabsco Creek watershed, Oxides of nitrogen show a strong decreasing trend. This could indicate the effectiveness of stormwater controls, but as with Neabsco Creek, this trend is not reflected in concentrations of TSS.

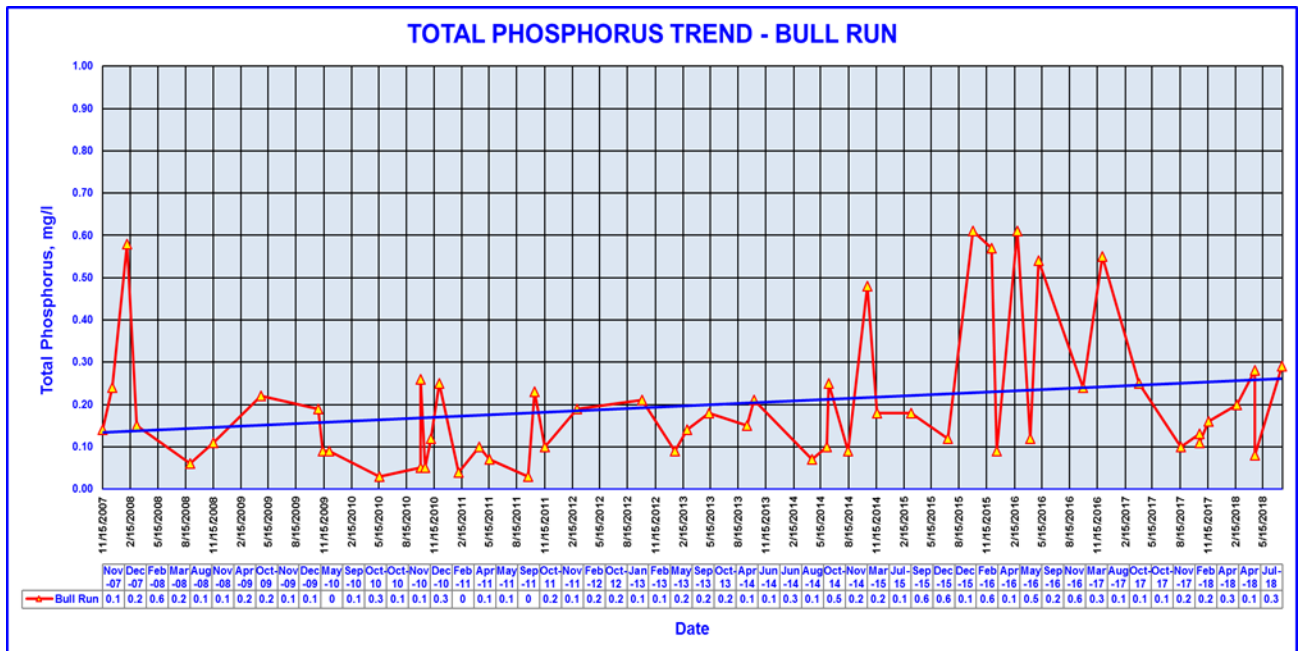


Figure 10 – Long Term TP trends in the Bull Run Watershed

TP has a strong increasing trend within the Bull Run watershed. The volatility observed in the Neabsco Creek watershed is again observed here. This seems to relate to increases in flow through the watershed due to storm events.

c. Dawkins Branch

The Dawkins Branch water quality monitoring station was installed during FY16 and produced four storm samples in FY17.

Table 18 – Dawkins Branch Water Quality Results

DATE	FLO	TOTFLO	OP	TSP	TP	NH3_N	TKN	NO2_N	OX_N	COD	BOD5	TSS	FCOLI	ECOLI
	cfs	cubic feet	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	org/100m L	org/100m L
Nov-16	9.55	323,300	0.02	0.03	0.10	0.01	0.9	0.02	0.28	31.1	8.8	40.5	1100	756
Dec-16	37.03	2,293,000	<0.01	0.02	0.18	0.01	0.99	0.01	0.21	29.4	6.3	88.0	460	517
Mar-17	23.37	2,117,000	0.02	0.02	0.16	0.06	1.03	0.01	0.35	35.8	4.9	153	4600	2420

No long term trends analysis is available for this site as not enough data points are available. E.Coli counts are much lower than last year.

d. Cow Branch

The Cow Branch Water Quality Monitoring Station was installed during FY16, and produced 7 samples in FY18.

Table 19 – Cow Branch Water Quality Results

DATE	FLO	TOTFLO	OP	TSP	TP	NH3_N	TKN	NO2_N	OX_N	COD	BOD5	TSS	FCOLI	ECOLI
	cfs	cubic feet	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	org/100m L	org/100m L
Nov-16	9.55	323,300	0.02	0.03	0.10	0.01	0.9	0.02	0.28	31.1	8.8	40.5	1100	756
Dec-16	37.03	2,293,000	<0.01	0.02	0.18	0.01	0.99	0.01	0.21	29.4	6.3	88.0	460	517
Mar-17	23.37	2,117,000	0.02	0.02	0.16	0.06	1.03	0.01	0.35	35.8	4.9	153	4600	2420

Aug-17	26.06	1,245,000	0.02	0.02	0.09	0.02	1.02	<0.01	0.11	18.4	3.8	39.1	3500	2420
Oct-17	6.47	197,300	0.01	0.01	0.13	0.02	<0.50	<0.01	0.4	28	8	90	5400	1300
Oct-17	27.82	1,560,000	0.02	0.02	0.12	0.02	0.8	<0.01	0.19	25.2	3.3	66.8		
Nov-17	25.45	1,464,000	0.02	0.13	0.14	0.03	0.54	<0.01	0.23	16.8	4.5	28.7		
Feb-18	53.70	2,150,000	0.02	0.02	0.29	0.16	1.37	0.02	0.28	37.7	7.6	660		
Apr-18	27.98	3,105,000	<0.01	0.03	0.12	0.03	0.81	0.01	0.22	24.6	4	61.3	4600	1550
Jul-18	19.55	707,300	0.01	0.02	0.06	<0.01	0.62	<0.01	0.22	19.2	4.2		54000	13000

No long term trends analysis is available for this site as not enough data points are available.

e. Purcell Branch

The Purcell Branch Water Quality Monitoring Station was installed during FY16. This station finished establishing its rating curve in FY18 and has begun sample collection for FY19.

No long term trends analysis is available for this site as not enough data points are available.

3. Floatables Solids Monitoring

The County has developed protocols for its Floatables Monitoring Program. The program began during FY17, with a pilot study used to complete the first round of monitoring during Q1. Monitoring will be completed at 5 sites throughout the County on a quarterly basis.

Table 20 – Floatable Monitoring from July-December 2017

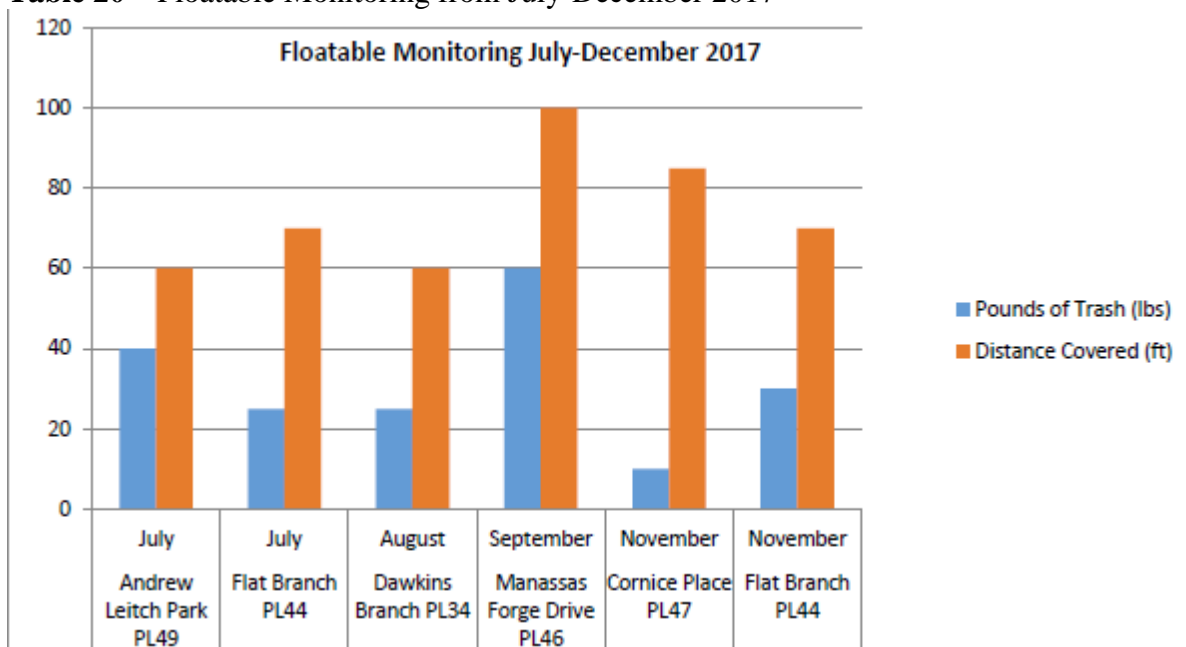


Table 21 – Floatable Monitoring from January-March 2018

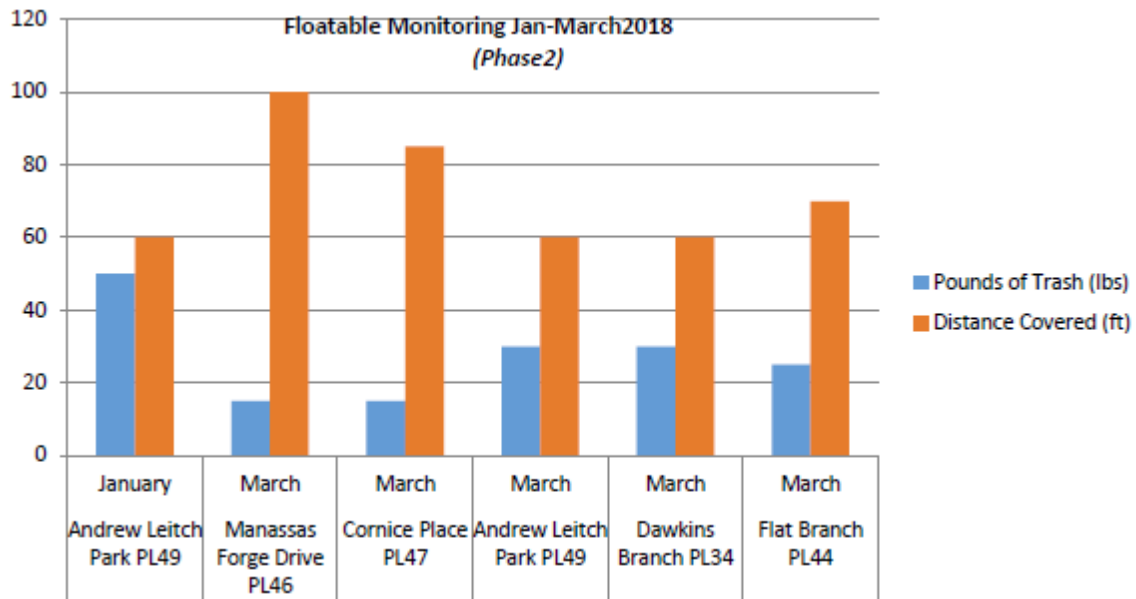
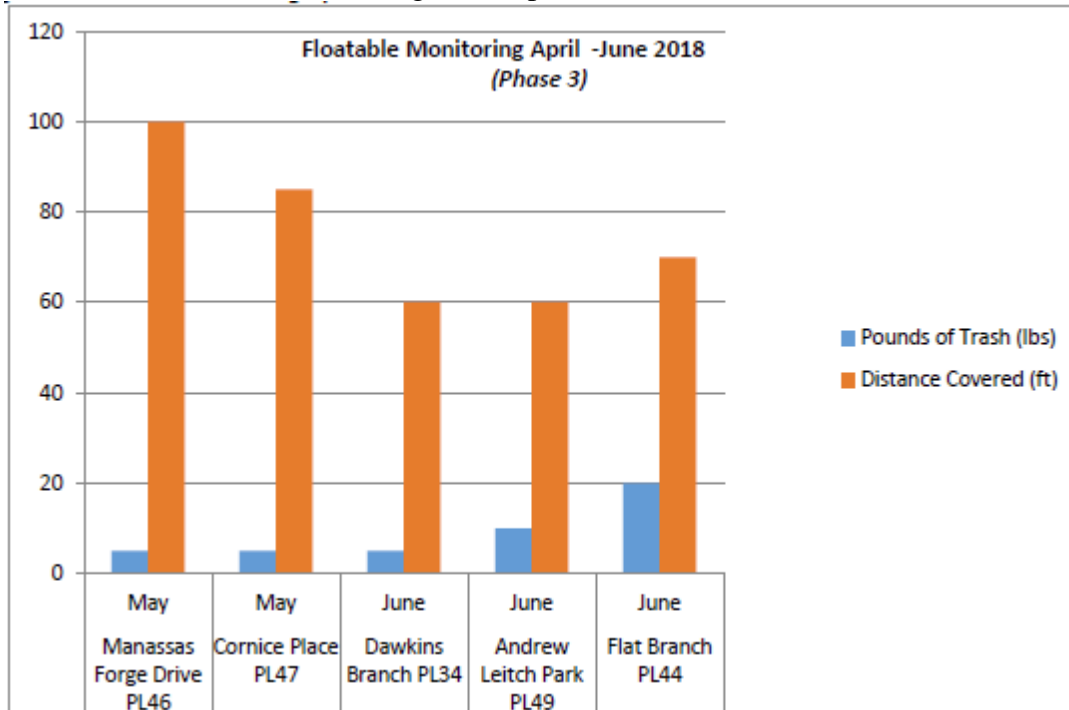


Table 22 – Floatable Monitoring from April-June 2018



July – December 2017

The first round of monitoring from four sites in 2016, registered a high amount of trash that was relative to the distance covered except with the Cornice Place which show a lower load. Comparing the results from the first and second rounds of monitoring, Dawkins Branch showed a drop in trash

load from 70 lbs. to 15lbs while the Flat Branch maintained a relative high load despite a slight reduced in the distance covered.

January – June 2018

Phase 2 and Phase 3 2017 showed a decrease in trash load from all sites but leaving Andrew Leitch, Flat Branch and Dawkin’s Branch with high trash counts compared to the other sites. Cornice Place and Manassas Forge maintained a low trash load.

Conclusion

With the Floatable monitoring program in its second year of monitoring, other factors that directly or indirectly related to trash load at the different monitoring sites still needs to be identified. For example, a close examination of the relation of periods/seasons of the year and trash load at particular sites. Getting Prince William County residents and schools; especially students, in a general trash awareness campaign will also be a significant step in reducing environmental pollution and debris in Prince William County waterways.

4. Structural and Source Controls Compliance Monitoring

An electronic database containing all BMP/SWM facilities within Prince William County will be provided with this document when submitted. The database contains information on a facilities type, latitude and longitude, impervious and total acres treated, installation date, HUC 12, privately or permittee maintained status, discharging MS-4 and dates of inspection and maintenance for all new facilities since July 2016.

Prince William County maintains a program for the inspection and maintenance of permittee and privately maintained SWM/BMP facilities. More information on these inspection programs, and a list of newly constructed SWM facilities, can be found in section II.f of this document.

III. TMDL Action Plan Implementation

1. Chesapeake Bay Watershed TMDL Planning

Prince William County submitted the required Chesapeake Bay TMDL Action Plan (Action Plan) on December 16, 2016, which was subsequently approved on June 28, 2017. A copy of the approval letter is included in Appendix III. The Action Plan documents how the County intends to meet the requirements of the Chesapeake Bay Special Condition included in the MS4 Permit.

In Section I.D.1, Chesapeake Bay Special Condition, the County is required to document the means and methods that will be utilized to meet the required reductions of specific Pollutants of Concern (POCs) allocated in the Special Condition of the Commonwealth of Virginia’s Phase I and II Chesapeake Bay Total Maximum Daily Load (TMDL) Watershed Implementation Plans (WIPs). These reductions are based on the Level 2 (L2) scoping run of the Chesapeake Bay Watershed Model for existing developed lands (pervious and impervious regulated urban lands

developed prior to July 1, 2009). Level 2 implementation equates to an average reduction of 9% of nitrogen loads, 16% of phosphorous loads, and 20% of sediment loads from impervious regulated areas and 6% of nitrogen loads, 7.25% of phosphorous loads, and 8.75% of sediment loads from pervious regulated acres beyond the 2009 progress run loadings.

As part of this effort, Virginia Department of Environmental Quality (VADEQ) has committed to a phased approach for MS4 permittees to implement necessary reductions. Permittees will have up to three, five-year permit cycles to achieve required reductions. Prince William County’s first permit cycle (December 17, 2014 – December 16, 2019) represents implementation of 5% of the L2 as specified in the 2010 Phase I WIP. The second permit cycle will require an additional 35% of total L2 reductions (40% cumulative), while the final permit cycle will require implementation of the remaining 60% of reductions (100% cumulative).

The total reductions planned to be achieved during the first permit cycle, as identified in the approved Action Plan, are listed in Table 23. The table also identifies the percent of the L2 scoping run reductions that will be achieved after implementation of the Action Plan.

Table 23 - Planned Reductions per Approved Action Plan

Pollutant of Concern	Planned 1st Permit Cycle Load Reductions (lbs/yr)	Percentage of L2 Reduction Achieved After Implementation
Total Nitrogen (TN)	6,706.58	33.5%
Total Phosphorus (TP)	1,370.40	62.0%
Total Suspended Solids (TSS)	893,286.63	49.4%

Prince William County has a comprehensive watershed improvement program, which aims to improve water quality through the implementation of water quality improvement projects such as stormwater facility retrofits, stream restorations, and reforestation projects. During the reporting period, five projects were implemented, which resulted in pollutant reductions as shown in Table 24.

Table 24 - Pollutant Reductions Achieved During Reporting Period

Project Name	Project Type	TN Reduction (lbs/yr)	TP Reduction (lbs/yr)	TSS Reduction (lbs/yr)
SWM Facility #489	Retrofit	151.57	7.72	4,838.12
Bristoe Station Battlefield Phase 2	Reforestation	32.22	1.71	598.32
SWM Facility #147	Retrofit	64.01	6.14	5,419.30
Dewey's Creek Reach 1	Stream	68.35	61.97	13,788.21

SWM Facility #109	Retrofit	160.29	11.97	9,723.03
Total Reductions		476.43	89.51	34,366.98

For project descriptions as well as before and after photographs of the projects implemented this period please refer to the next section. In addition, the updated reduction summary tables and associated reduction calculation worksheets are included as Appendix III.

Based on the reductions achieved through implementation of the above listed water quality improvement projects and the previous reductions identified in the approved Action Plan, Table 25 summarizes the cumulative progress toward meeting the compliance targets. The permit requires that 5% of the L2 reductions be achieved during the first permit cycle. As shown in the table below, this requirement has been exceeded and the additional reductions will be applied toward the second permit cycle required reductions.

Table 25 - Cumulative Progress Toward Meeting Compliance Targets

Pollutant of Concern	Previous Reductions Achieved (lbs/yr)	FY18 Reductions (lbs/yr)	Total Reductions to Date (lbs/yr)	Percent of L2 Reduction Achieved to Date
Total Nitrogen (TN)	5,845.18	500.65	6,353.25	31.7%
Total Phosphorus (TP)	1,032.51	111.65	1,150.89	52.1%
Total Suspended Solids (TSS)	722,115.62	39,252.57	762,865.12	42.2%

During the next reporting period, a total of six projects are planned for implementation. Please refer to Table 26 for a list of planned projects and their associated pollutant reductions.

Table 26 - Planned Projects for FY19 Implementation

Project Name	Project Type	TN Reduction (lbs/yr)	TP Reductions (lbs/yr)	TSS Reduction (lbs/yr)
Powells 725 Phase 1	Stream	189.16	171.50	113,192.38
SWM Facility #424	Retrofit	217.71	34.49	25,290.37
SWM Facility #91	Retrofit	73.41	12.54	9,541.59
Dewey's Creek Reach 2	Stream	364.88	330.82	73,607.45
Total		845.16	549.35	221,631.79

SWM Facility #489

The project entailed the retrofit of an existing dry detention facility with significant sediment accumulation and short circuiting to an extended detention facility. The conversion included a new BMP structure, sediment forebay and micropool. The project was started in late FY17 and completed in the first quarter of FY18. SWM Facility #489 is located at the downstream end of the Reach 5 stream restoration project, which was completed in the prior year.

This project began in FY17 and was completed during Q1 2018.



Bristoe Station Battlefield Phase 2

The project involved the reforestation of 4.5 acres within the Bristoe Station Battlefield Heritage Park and was a continuation of Phase 1, which totaled over 13 acres. The perpetuation of the reforestation is guaranteed by a Deed of Easement with the Virginia Department of Historic Resources.

SWM Facility #147

The project entailed the retrofit of an existing dry detention facility with significant sediment accumulation and short circuiting to a level one, constructed wetland. The conversion included a new BMP structure, sediment forebay and micropool.



Dewey's Creek Reach 1

Reach 1 of Dewey's Creek began at Route 1 and extended 1,270 linear feet downstream. Dewey's Creek is located in the Quantico Creek watershed. The restoration followed natural channel design methodology and utilized bioengineering techniques to stabilize the channel, reduce bank erosion, provide infrastructure protection and enhance aquatic and terrestrial habitat.



SWM Facility #109

The project entailed the retrofit of an existing dry detention facility with significant sediment accumulation and short circuiting to a level one, wet pond. The conversion included a new BMP structure, sediment forebay and micropool.



2. TMDL Action Plans other than the Chesapeake Bay TMDL

The County submitted Action Plans for bacteria, benthic, and PCB TMDL's in December of 2016. DEQ provided comments to the County on May 4th, 2018. The County provided responses to DEQ on June 29th, 2018. A copy of this response letter is included in Appendix III.

IV. Additional Reporting Requirements

1. Roles and responsibilities

Roles and responsibilities are provided as part of the County's MS4 program plan. Roles and responsibilities can be reviewed as part of each BMP section within the MS4 Program plan.

2. Non Compliance

There were no instances of non-compliance to record during the Reporting period.

3. Budget

Environmental Services Division - Watershed Management Branch FY18 Annual Budget Summary by Activity

Stormwater Infrastructure Management	\$	3,554,418
Site Development	\$	3,548,301
Watershed Improvement	\$	7,828,811
Total FY18 Expenditure Budget	\$	14,931,530

4. Permit Fees

Permit fees for FY19 were submitted to the Department on September 11th 2018 with Check #598269.

Appendix A – Construction Site Runoff and Post Construction Runoff

Appendix B – Retrofitting on Prior Developed Lands

Appendix C - Roadways

Appendix D – Pesticide Herbicide and Fertilizer Application

Appendix E – Illicit Discharges and Improper Disposal

Appendix F – Spill Prevention and Response

Appendix G – Industrial and High Risk Runoff

Appendix H – Stormsewer Infrastructure Management

Appendix I – County Facilities

Appendix J – Public Education/Participation

Appendix K - Training

Appendix L – Water Quality Programs

Appendix M – Infrastructure Coordination

Appendix 1 – Biological Stream Monitoring

Appendix 2 – In-Stream Monitoring

Appendix 3 – Floatables and Solids Monitoring

Appendix 4 – Structural and Source Controls

Appendix III – Administrative and Programmatic

Appendix A – Construction Site Runoff and Post Construction Runoff

Last Name	First Name	Job Title	Stormwater Management - Plan Reviewer		Erosion and Sediment Control (ESC) Combined Administrator		Dual Plan Reviewer - Erosion and Sediment Control and Stormwater Management		Stormwater Management Program Administrator		Assoc. of State Floodplain Managers		Va. Engineering License	
			Cert. #	Exp. Date	Cert. #	Exp. Date	Cert. #	Exp. Date	Cert. #	Exp. Date	Issued	Expiration	Lic. #	Expiration
Bidari	Rajendra P.	Engineer IV					DPR0117	12/28/2021		SWPA0156	3/9/2022	4/30/2010	7/31/2020	
Djebbari	Youssef	Engineer II	SWPR0217	4/18/2019									402036273	1/31/2020
El-Hage	Michael K.	Engineer III	SWPR0213	4/2/2019	304	11/30/2020							402026250	6/30/2019
Feshari	Farhang	Engineer III					DPR0124	5/17/2019					402028201	2/28/2019
Maxwell	David	Engineer III	SWPR0218	4/21/2019									402046547	1/31/2020
Dindigal	Vijay	E&S Program Manager			ESPA0197	8/3/2021	DPR0135	10/5/2020						

Inspector Name	Job Title	State Water Control Board - Stormwater Management Certification		State Water Control Board Dual Inspector		State Water Control Board E&S Inspector Certification	
		Cert. #	Exp. Date	Cert. #	Exp. Date	Cert. #	Exp. Date
Todd Barton	Site Inspector Area 5			DIN0794	8/3/2019		
Bob Cook	Site Inspection Supervisor (West County)			DIN0533	7/11/2019	1465	11/30/2018
Shawn Wray	Site Inspection Supervisor (East County)	SWIN0360	10/15/2018			3774	11/30/2019
Philip Darko	Site Inspector Area 6A&B	SWIN0528	1/28/2019	DIN0538	1/28/2019	3532	11/30/2018
Stefan Gitchev	Site Inspector Area 2			DIN0535	10/3/2019	ESIN0351	2/23/2019
Jeremiah Goodman	Site Inspector - Area 6C	SWIN0889	11/28/2019	DIN0537	11/28/2019	ESIN0475	9/30/2019
Doo Lee	Site Inspector - Area 4			DIN0968	10/16/2020		
Jalal Qaradaghi	Site Inspector - Area 1	SWIN0871	11/2/2019	DIN0536	11/30/2019		
Mukesh Patel	SWM Facilities Inspector	SWIN0371	10/20/2018	DIN0513	11/30/2018	1/21/2006	11/30/2018
Arjun Dhungel	Site Inspector - Area 3	SWIN1097	9/6/2020			ESIN0951	3/18/2020
Brian Srey	Site Inspector - Areas 7 & 8			DIN0306	2/23/2019		
Jessica Adams	SWM Facilities Inspector			DIN0678	6/24/2020		
Prem Poudel	SWM Facilities Inspector	SWIN0871	11/2/2019	DIN0536	11/30/2019		

Project Name	LND Number	Date Issued	Plan Number	WorkClassDesc	Disturbed Area (acres)
FEATHERSTONE SQUARE ADDITION	LND2018-00195	03-09-2018	SDR2017-00067	Site Development	1.69
DEWEY'S CREEK STREAM RESTORATION PROJECT - PHASE 2	LND2018-00225	04-18-2018	SPR2018-00154	Site Development	15.89
STOR-ALL SELF STORAGE	LND2018-00062	09-26-2017	SPR2016-00372	Site Development	3.58
ANDREW LEITCH WATER PARK	LND2017-00142	09-27-2017	SPR2017-00207	Site Development	0.55
STEALTH CONSTRUCTION-SHED	LND2018-00033	08-15-2017	SPR2017-00252	Site Development	0.00
BLACKBURN - COVERSTONE DR & BETHLEHEM RD	LND2018-00134	12-22-2017	SPR2016-00337	Site Preparation	4.28
DUMFRIES ROAD SHARED USE PATH	LND2017-00221	08-30-2017	SPR2017-00235	Site Development	0.39
PWC ADULT DETENTION CTR PH 2 - EXPANSION	LND2018-00063	11-02-2017	SPR2017-00062	Site Development	4.35
HAMPTON SQUARE	LND2018-00054	09-14-2017	SPR2017-00226	Site Development	7.50
DALE CITY VOLUNTEER FIRE DEPARTMENT STATION 13	LND2018-00041	08-24-2017	SPR2017-00408	Site Development	0.01
POTOMAC SHORES - TEMPORARY PARKING LOT	LND2018-00015	07-26-2017	SPR2017-00429	Site Development	0.25
WAWA-GAINESVILLE ADA	LND2018-00002	07-07-2017	SPR2017-00256	Site Development	0.16
VINT HILL PLAZA - CONVENIENCE STORE	LND2018-00021	08-03-2017	SPR2017-00113	Site Development	4.70
WOODBIDGE MIDDLE SCHOOL	LND2018-00026	08-07-2017	SPR2017-00410	Site Development	0.01
MITCHELL PROPERTY	LND2018-00039	08-22-2017	SPR2017-00150	Site Development	4.15
THEATER ADDITION AT POTOMAC TOWN CENTER	LND2018-00008	07-12-2017	SPR2017-00199	Site Development	3.60
CAYDEN RIDGE - TRAIL PLAN	LND2017-00238	07-19-2017	SPR2017-00133	Site Development	1.44
WAWA AT GAINESVILLE	LND2018-00002	07-07-2017	SPR2017-00256	Site Development	0.16
T-MOBILE @ OAKMONT	LND2018-00001	07-06-2017	SPR2017-00425	Site Development	0.00
WOODBIDGE MIDDLE SCHOOL PEDESTRIAN (ADA) ACCESS	LND2018-00009	08-10-2017	SPR2017-00372	Site Development	0.73
POTOMAC MILLS MALL	LND2018-00076	10-03-2017	SPR2017-00459	Site Development	0.00
WOODBIDGE STATION APARTMENTS - TRAIL LIGHTS	LND2018-00050	09-12-2017	SPR2017-00467	Site Development	0.00
BRISTOW INDUSTRIAL PARK PARC B-1A1	LND2018-00005	07-11-2017	15-00047	Underground Utility	0.00
STARBUCKS AT WORTH AVE	LND2018-00052	09-13-2017	SPR2017-00341	Site Development	0.11
COPPER MILL ESTATES	LND2018-00085	10-18-2017	SDR2017-00043	Site Development	26.88
Verizon Wireless @ Joplin and Aden	LND2018-00009	07-14-2017	SPR2017-00458	Site Development	0.01
Verizon at Signal Hill Park	LND2018-00010	07-17-2017	SPR2017-00315	Site Development	0.29
COLES FIRE STATION #6	LND2018-00024	08-04-2017	SPR2017-00101	Site Development	3.70
LIFE TIME FITNESS AT VIRGINIA GATEWAY	LND2018-00017	08-01-2017	SPR2017-00190	Site Development	21.60
DUMFRIES ROAD SOUTHBOUND LEFTS AT HOADLY ROAD	LND2018-00019	08-02-2017	SPR2017-00283	A-1 Agricultural	0.00
BELMONT ELEMENTARY SCHOOL	LND2018-00016	07-30-2017	SPR2017-00432	Site Development	1.96
TACO BELL @ DALE BOULEVARD	LND2018-00080	10-13-2017	SPR2017-00456	Site Development	0.02
BELMONT ELEMENTARY SCHOOL	LND2018-00016	07-28-2017	SPR2017-00432	Site Development	1.96
U.S FOODSERVICE - FACILITY EXPANSION	LND2018-00013	07-24-2017	SPR2017-00348	Site Development	20.00
WAL-MART AT DUMFRIES - PARKING FOR ONLINE GROCERY	LND2018-00044	08-28-2017	SPR2018-00016	Site Development	0.10
KREITZER PROPERTY PARCEL A - BASKETBALL COURT	LND2018-00012	07-19-2017	LGR2017-00699	Land Disturbance	0.00
WOODBINE WOODS SEC 1 LOT 15	LND2018-00022	08-03-2017	PWR2018-00009	Land Disturbance	0.07
JENSEN PROPERTY	LND2018-00020	08-02-2017	PWR2018-00008	Land Disturbance	0.00
GARFIELD HIGH SCHOOL ADA ACCESSIBLE WALK	LND2018-00030	08-10-2017	SPR2017-00428	Site Development	0.59
BULL RUN MOUNTAIN SEC 3 LOT 15B	LND2018-00027	08-08-2017	LGR2017-00755	Land Disturbance	0.33
PRESGRAVES DIVISION LOT 3	LND2018-00025	08-04-2017	PWR2018-00010	Land Disturbance	0.00
LAKE MANASSAS WEST GATE - BY-PASS LANE	LND2018-00047	09-01-2017	SPR2016-00371	Site Development	0.16

PANTHER PRIDE SELF STORAGE	LND2018-00109	11-22-2017	SPR2017-00407	Site Development	4.12
BETHEL FREE WILL BAPTIST CHURCH, INC.	LND2018-00032	08-14-2017	SPR2017-00114	A-1 Agricultural	0.00
U.S FOODSERVICE - FACILITY EXPANSION	LND2018-00055	09-14-2017	SPR2017-00348	Site Development	19.74
RESERVE AT JENNEL ESTATES	LND2018-00046	09-01-2017	SDR2017-00066	Site Development	12.13
HUSS PROPERTY	LND2018-00037	08-18-2017	PWR2018-00011	Land Disturbance	0.00
THUNDER OAKS SEC 3 LOT 12	LND2018-00038	08-21-2017	PWR2018-00012	Land Disturbance	0.22
VERIZON @ DOVE LANE	LND2018-00036	08-18-2017	SPR2017-00344	Site Development	0.01
LND2018-00038	LND2018-00038	08-21-2017	PWR2018-00012	Land Disturbance	0.22
WELLS FARGO BANK AT ASHDALE PLAZA	LND2018-00101	11-09-2017	SPR2017-00464	Site Development	0.00
GAINESVILLE SQUARE - BANK OF AMERICA	LND2018-00050	10-20-2017	SPR2018-00050	Site Development	0.05
AT&T @ BEN LOMOND PARK	LND2018-00070	10-04-2017	SPR2018-00072	Site Development	0.00
DOMINION VALLEY COUNTRY CLUB SEC 53 TEMP PARKING	LND2018-00099	08-03-2017	SPR2018-00036	Site Development	0.53
LINDSAY YORKSHIRE PARKING	LND2018-00058	09-21-2017	SPR2017-00316	Site Development	3.59
SUDLEY MOUNTAIN PARCEL A-2 SEC 1	LND2018-00018	08-01-2017	PWR2018-00006	Land Disturbance	0.13
SUDLEY MANOR HOUSE	LND2018-00023	08-03-2017	98-00115	Site Development	4.42
REGENCY BRAEMAR PH II (FORMELY FIRESTONE BRAEMAR)	LND2018-00053	09-13-2017	12-00096	Site Preparation	4.99
BARTON RESIDENCE	LND2018-00056	09-15-2017	PWR2018-00015	Land Disturbance	0.07
ROSE CONNER CENTER	LND2018-00086	10-19-2017	SPR2017-00260	Site Development	5.65
U.S. FOODS - FACILITY EXPANSION	LND2018-00059	09-21-2017	SPR2018-00076	Site Development	0.00
POTOMAC SHORES MIDDLE SCHOOL POND	LND2018-00069	10-04-2017	SPR2017-00175	Site Development	28.70
YOUTH FOR TOMORROW	LND2018-00057	09-20-2017	SPR2017-00105	Site Development	9.34
SUPERIOR PAVING	LND2018-00094	10-31-2017	SPR2017-00278	Site Development	20.09
CAMPING WORLD - ABOVE GROUND TANK	LND2018-00083	10-16-2017	SPR2018-00090	Site Development	0.00
NEABSCO CREEK BOARDWALK CROSSING	LND2018-00028	08-09-2017	SPR2017-00149	Site Development	2.26
NEW BRISTOW VILLAGE COMMERCIAL CENTER PH 2	LND2018-00042	08-25-2017	SPR2015-20109-SPR2	Site Development	4.23
BROAD RUN INDUSTRIAL PARK LOT 4-B3	LND2018-00064	09-27-2017	SPR2018-00058	Site Development	0.00
KETTLE RUN ESTATES	LND2018-00060	09-21-2017	PWR2018-00016	Land Disturbance	20.00
PIEDMONT GOLF CLUB - PATIO ADDITION	LND2018-00210	03-27-2018	SPR2017-00368	Site Development	0.23
BATTLEFIELD GARDEN AND HARDSCAPE CENTER	LND2018-00229	04-20-2018	SPR2017-00245	Site Development	0.96
MARUMSCO ACRES PUMP STATION	LND2018-00066	09-27-2017	14-00094R00S03	Site Development	0.00
LAKEVIEW FOREST LOT 8	LND2018-00073	10-06-2017	PWR2018-00020	Land Disturbance	0.19
NOKESVILLE RD WIDENING PI PLAN	LND2018-00079	10-13-2017	SPR2016-00020	Public Improvement	61.45
PADDOCKS AT DOWDEN DOWNS - LOT 15	LND2018-00074	10-10-2017	PWR2018-00002	A-1 Agricultural	0.00
11019 ROUND HILL DR	LND2018-00081	10-13-2017	PWR2018-00024	Land Disturbance	0.09
YORKSHIRE ACRES BLOCK D SECTION 1 LOT 215	LND2018-00054	10-13-2017	PWR2018-00023	Land Disturbance	0.53
POTOMAC SHORES PH 2A SEC 1B & 1C	LND2018-00077	10-12-2017	14-00086	Underground Utility	44.49
BLACKBURN LANDBAY 2A	LND2018-00115	12-04-2017	SDR2016-00096	Site Preparation	15.84
PORT POTOMAC COMMERCIAL	LND2018-00102	11-13-2017	SPR2018-00069	Site Development	0.01
WESTMINSTER @ LAKE RIDGE - ADDITION AND PATIO	LND2018-00091	10-25-2017	SPR2018-00074	Site Development	0.01
16895 STORMY DRIVE	LND2018-00088	10-23-2017	PWR2018-00026	Land Disturbance	0.06
BANK OF AMERICA GAINESVILLE SQUARE ADA	LND2018-00087	10-20-2017	SPR2018-00050	Site Development	0.05
CAYDEN RIDGE LANDBAY A SEC 1 -MODEL HOME & PARKING	LND2018-00224	04-18-2018	SPR2018-00078	Site Development	0.34
OLD TRIANGLE ROAD DRAINAGE IMPROVEMENT PROJECT	LND2018-00071	10-05-2017	PWR2018-00018	Land Disturbance	0.86

VINT HILL SWITCHING STATION	LND2018-00103	11-13-2017	SPR2018-00336	Site Development	6.03
18245 COCKPIT POINT ROAD	LND2018-00089	10-24-2017	PWR2018-00027	Land Disturbance	0.11
THUNDER OAKS SEC 3 LOT 12	LND2018-00038	08-21-2017	PWR2018-00012	Land Disturbance	0.22
MGP GROCERY - FORTUNA	LND2018-00092	10-25-2017	SPR2016-00011	Site Development	6.01
BURGER KING AT BALLS FORD ROAD	LND2018-00125	12-13-2017	SPR2017-00266	A-1 Agricultural	1.20
BLACKBURN LANDBAY 1B	LND2018-00135	12-22-2017	SDR2017-00001	A-1 Agricultural	45.05
PWC ADULT DETENTION CTR PH 2 - EXPANSION	LND2017-00063	11-02-2017	SPR2017-00062	A-1 Agricultural	4.35
BLACKBURN LANDBAY 3A	LND2018-00136	12-22-2017	SDR2017-00005	Site Preparation	8.20
INNOVATION - TEMPORARY GRAVEL PARKING LOT	LND2018-00105	11-16-2017	SPR2018-00152	A-1 Agricultural	0.99
ENVIRONMENTAL REMEDIATION - EROSION CONTROL	LND2018-00116	12-05-2017	SPR2018-00110	Grading / Infrastructure	34.40
POTOMAC TRUCK CTR - PROGRESS BUSINESS CTR LOT 6A	LND2018-00176	02-21-2018	SPR2017-00437	Site Development	0.40
VERIZON AT BUCKLAND	LND2018-00182	03-01-2018	SPR2018-00136	Site Development	0.00
7629 CHESTNUT	LND2018-00078	10-13-2017	LGR2018-00054	Site Development	0.53
DOMINION VALLEY COUNTRY CLUB SEC 52	LND2018-00164	01-31-2018	SDR2018-00034	Site Development	0.22
RIVER FALLS HOA- WALK WAY LIGHING	LND2018-00127	12-18-2017	SPR2018-00160	Site Development	0.00
6661 RIVER FORD CT MANASSAS	LND2018-00108	11-22-2017		Flood Hazard Use	0.00
FOX RIDGE LOT 13 - 11446 HUNTSMAN	LND2018-00117	12-05-2017	PWR2018-00034	Land Disturbance	0.94
VERIZON WIRELESS @ JOPLIN AND ADEN ROAD	LND2018-00120	12-06-2017	SPR2018-00132	Site Development	0.00
TACO BELL AT OLD BRIDGE RD	LND2018-00183	03-02-2018	SPR2017-00269	A-1 Agricultural	0.99
5135 DAVIS FORD ROAD	LND2018-00118	12-06-2017	PWR2018-00036	Land Disturbance	0.12
5212 SUDLEY RD	LND2018-00119	12-06-2017	PWR2018-00037	Land Disturbance	1.03
QUALITY INN / HAMPTON INN DUMPSTER ENCLOSURE	LND2018-00121	12-07-2017	SPR2018-00109	Site Development	0.01
MILESTONE -T-MOBILE @ DOMINION DUMFRIES SUBSTATION	LND2018-00124	12-05-2017	SPR2018-00043	Site Development	0.11
WHEELER SWITCHING STATION	LND2018-00144	01-09-2018	SPR2017-00338	Site Development	5.57
NOKESVILLE VOL FIRE STATION #5	LND2018-00193	03-07-2018	SPR2017-00328	Site Development	4.72
BLACKBURN - BALLS FORD RD & ASHTON AVE PI PLAN	LND2018-00133	12-22-2017	SPR2016-00298	Site Preparation	27.40
MILESTONE - T-MOBILE AT VETERANS MEMORIAL PARK	LND2018-00130	12-19-2017	SPR2018-00035	Site Development	0.31
LAKE RIDGE SEC 9A LOT 177	LND2018-00126	12-14-2017	N/A	Underground Utility	0.00
3706 TANYARD LN	LND2018-00107	11-22-2017	PWR2018-00031	Land Disturbance	0.00
MANASSAS SALT DOME	LND2018-00137	12-28-2017	SPR2016-00342	Site Development	0.05
MONTCLAIR ELEMENTARY SCHOOL - KITCHEN ADDITION	LND2018-00221	04-12-2018	SPR2018-00183	Site Development	0.05
GRANT AVENUE IMPROVEMENT & SWM	LND2018-00138	12-28-2017	SPR2017-00061	Site Development	6.65
LEESYLVANIA ELEMENTARY SCHOOL ADDITION	LND2018-00190	03-07-2018	SPR2018-00039	Site Development	1.16
MILESTONE - T-MOBILE AT VETERANS MEMORIAL PARK	LND2018-00130	12-19-2017	SPR2018-00035	Site Development	0.31
LAKE RIDGE SECTION 18 AND 19 POOL SITE	LND2018-00146	01-11-2018	SPR2018-00191	Site Development	0.00
SMOKETOWN ROAD PUMP STATION - GENERATOR	LND2018-00141	01-05-2018	SPR2018-00189	Site Development	0.01
DUMFRIES FORTUNA GROCERY	LND2018-00167	02-05-2018	SPR2017-00157	Site Development	6.01
ANTIETAM ELEMENTARY SCHOOL - CLASSROOM ADDITION	LND2018-00161	01-26-2018	SPR2018-00041	Site Development	4.25
BRADLEY SQUARE SEC 9	LND2018-00140	01-02-2018	SDR2017-00011	Site Preparation	13.15
INNOVATION - POWER LOFT DATA CENTER LAND BAY II	LND2018-00150	01-19-2018	SPR2018-00177	Site Development	0.23
JIFFY LUBE LIVE - ADDITIONAL POINTS OF SALE	LND2018-00215	04-06-2018	SPR2018-00325	Site Development	0.00
PAUL AND JUDITH OMEARA	LND2018-00147	01-17-2018	SPR2018-00175	Site Development	0.01
LAKE RIDGE ELEMENTARY SCHOOL-BUILDING ADDITION	LND2018-00169	02-07-2018	SPR2018-00047	Site Development	3.15

WELLINGFORD IND PARK LOT 24A - INSTALL CANOPY	LND2018-00211	03-30-2018	SPR2018-00222	Site Development	0.01
BENTON MIDDLE SCHOOL - MUSIC ROOM ADDITION	LND2018-00159	01-24-2018	SPR2018-00022	Site Development	0.21
EVERBROOK ACADEMY @ NEW BRISTOW VILLAGE	LND2018-00153	01-23-2018	SPR2017-00156	Underground Utility	2.52
CHESHIRE STATION - SHOPPING CENTER	LND2018-00157	01-23-2018	01-00144	Underground Utility	19.00
LAKE RIDGE PARK - OXFORD BOATHOUSE	LND2018-00004	01-30-2018	SPR2018-00091	Site Development	0.00
BLACKBURN ROAD PEDESTRIAN IMPROVEMENT	LND2018-00171	02-08-2018	SPR2017-00427	Site Development	2.20
GARCIA OFFICE PARK - PUBLIC IMPROVEMENT	LND2018-001755	02-21-2018	SPR2018-00086	Site Development	0.27
10200 HEDDINGS RD	LND2018-00165	02-01-2018	PWR2018-00047	Land Disturbance	3.20
COPT DC-23 @ BETHLEHEM TECHNOLOGY PK BLDG 4	LND2018-00178	02-23-2018	SPR2018-00052	Site Development	18.34
MARSHALL ELEMENTARY SCHOOL	LND2018-00188	03-07-2018	SPR2018-00186	Site Development	0.29
WEBSTER'S LANDING DAYCARE	LND2018-00194	03-09-2018	SPR2017-00431	Site Development	1.97
INNOVATION - BIRKETT BARN	LND2018-00192	03-07-2018	SPR2017-00414	Site Development	1.20
OLD BRIDGE ELEMENTARY SCHOOL	LND2018-00189	03-07-2018	SPR2018-00151	Site Development	0.89
T-MOBILE @ MINNIEVILLE ROAD WATER TANK	LND2018-00200	03-15-2018	SPR2018-00229	Site Development	0.01
SIGNAL HILL ELEMENTARY SCHOOL - PARKING ADDITION	LND2018-00152	01-23-2018	SPR2017-00468	Site Development	1.72
SHEETZ AT MAPLEDALE PLAZA	LND2018-00191	03-07-2018	SPR2018-00004	Site Development	2.58
AMERICAN DISPOSAL SERVICES - YODER STEEL	LND2018-00173	02-08-2018	SPR2018-00221	Site Development	0.00
AMERICAN DISPOSAL SERVICES - YODER STEEL	LND2018-00173	02-14-2018	SPR2018-00221	Site Development	0.00
OLD BRIDGE ROAD SIDEWALK - PI	LND2018-00177	02-23-2018	SPR2016-00375	Site Development	0.43
WESTERN BUS FACILITY	LND2018-00180	02-28-2018	SPR2018-00082	Site Development	16.36
MILESTONE-VERIZON AT FREEDOM HIGH SCHOOL	LND2018-00174	02-16-2018	SPR2018-00051	Site Development	0.70
MALLARD'S OVERLOOK SOUTH - TEMP SALES TRAILER L 1	LND2018-00186	03-02-2018	SPR2018-00216	Site Development	0.00
MILESTONE - VERIZON AT FREEDOM HIGH SCHOOL	LND2018-00174	02-16-2018	SPR2018-00051	Site Development	0.70
GREENWOOD FARM E&S	LND2018-00181	03-01-2018	15.00091	Site Development	10.25
JIFFY LUBE LIVE / CELLAR DOOR	LND2018-00187	03-06-2018	SPR2018-00239	Site Development	0.01
NOVEC - ADDING A STORAGE BUILDING	LND2018-00179	02-27-2018	SPR2018-00255	Site Development	0.00
BRIGHTWOOD FOREST PH 5 PAR B	LND2018-00184	03-02-2018	09-00194	Site Development	2.89
VERIZON @ COMMISSION COURT	LND2018-00236	04-30-2018	SPR2018-00289	Site Development	0.01
EAGLES POINTE WEST LANDBAY A SEC 2	LND2018-00197	03-13-2018	14-00203	Site Development	24.93
U.S. FOODSERVICE - FACILITY EXPANSION	LND2018-00220	04-12-2018	SPR2018-00178	Site Development	19.74
PRINCETON WOODS SELF STORAGE	LND2018-00214	04-04-2018	SPR2018-00125	Site Development	1.36
STONEWALL MIDDLE SCHOOL ADDITION	LND2018-00222	04-16-2018	SPR2018-00181	Site Development	2.69
PW PARKWAY ELEMENTARY SCHOOL	LND2018-00209	03-27-2018	SPR2018-00122	Site Development	19.00
DALE CITY SEC 8	LND2018-00196	03-12-2018		Underground Utility	0.00
MONTCLAIR DAM SPILLWAY UPGRADAE	LND2018-00230	04-20-2018	SPR2018-00061	Site Preparation	2.78
BRADLEY SQUARE SEC 9/SD	LND2018-00185	03-05-2018	SDR2017-00011	Site Development	13.15
THOMAS MILL	LND2018-00203	03-22-2018	SDR2018-00059	Site Development	28.32
POTOMAC SHORES - ATHLETIC FIELDS REVISION	LND2018-00204	03-23-2018	SPR2017-00455	Site Development	28.30
WELLINGTON PLAZA-BLDG 6 PARKING ADDITION	LND2018-00247	05-14-2018	SPR2018-00140	Site Development	9.80
BEAR CREEK SEC 2 - POND RETROFIT #109	LND2018-00208	03-26-2018	SDR2016-00057	Site Development	0.33
INNOVATION EXECUTIVE CENTER - EARLY GRADING PLAN	LND2018-00219	04-11-2018	SPR2018-00298	Early Grading	23.80
LINDSAY AUTOMOTIVE - CHRYSLER, DODGE, JEEP, RAM EG	LND2018-00245	05-11-2018	SPR2018-00202	Grading / Infrastructure	7.20
BRISTOW RETIREMENT RESIDENCE - EARLY GRADING	LND2018-00274	06-26-2018	SPR2018-00196	Site Development	6.76

RUDDLE PROPERTY	LND2018-00240	05-02-2018	PWR2018-00065	Land Disturbance	0.23
JOHN K & APRIL A. TAYLOR	LND2018-00241	05-02-2018	PWR2018-00066	Land Disturbance	0.06
CANNON BLUFF SEC 4 LOT 148	LND2018-00242	05-08-2018	PWR2018-00242	Land Disturbance	0.25
RICHMOND STATION PUBLIC IMPROVEMENT PH 1	LND2018-00238	05-02-2018	SDR2016-00088	Site Development	1.28
PORT POTOMAC DOG PARK	LND2018-00268	06-19-2018	SPR2018-00092	Site Development	0.85
BULL RUN PLAZA	LND2018-00265	06-14-2018	SPR2018-00279	Site Development	0.01
17438 VAN BUREN RD	LND2018-00253	05-17-2018	PWR2018-00071	Land Disturbance	0.10
8996 WESTCHESTER	LND2018-00255	05-25-2018	PWR2018-00073	Land Disturbance	0.08
WELLINGFORD INDUSTRIAL PARK LOT 6A	LND2018-00275	06-26-2018	SPR2018-00278	Site Development	2.30
PERDOMO PROPERTY - 7330 CARVER ROAD	LND2018-00264	06-12-2018	PWR2018-00077	Land Disturbance	0.00
VIRGINIA GATEWAY SOUTH STORAGE	LND2018-00272	06-21-2018	SPR2018-00220	Site Development	4.91
4610 SUDLEY ROAD LAND DISTURBANCE	LND2018-00276	06-26-2018	PWR2018-00082	Land Disturbance	0.46
WALMART AT DUMFRIES	LND2018-00275	06-26-2018	SPR2018-00097	Site Development	0.00
MACKINTOSH COMMERCIAL (STARBUCKS)	LND2018-00279	06-29-2018	SPR2018-00087	Site Development	1.24
6195 RIVER FOREST LAND DISTURBANCE	LND2018-00270	06-20-2018	PWR2018-00081	Land Disturbance	0.09
				Total (Acres)	866.54

Appendix B – Retrofitting on Prior Developed Lands

Design Arrati

Background

Storm Water Management Facility is a privately maintained facility within Suwannee County located in Goodridge, Virginia. The facility is located on the north side of Old Bridge Road within the existing border area adjacent to the State for vicinity Map.

The retrofit design was developed from the conceptual design initially presented in the Suwannee County Study of our Suwannee County dated Section for the proposed for the County by the Land Study and Solution Inc. SS is stated in the study that the goal of the retrofit is to improve water quality treatment by storing the water quality treatment and detaining it for a minimum of four hours to protect the downstream channel and maintain the existing outlet at existing level and provide a minimum outlet board for the dam during the dry year for the.

Existing Condition

The existing facility is situated within a moderately steep portion of the existing maintained border area and is currently in a poor and deteriorating condition. The facility is in line with a perennial stream restoration project under separate contract and is the primary inflow to the drainage area. The existing facility is a concrete structure and the existing outlet along with an associated structure are located at the existing outlet and.

The outlet structure is currently a reinforced concrete structure with no load bearing structure. It is continuously clogged by litter and debris. The structure is tall and is made of concrete material and is actively used for access through the utility area. Survey data collected July 2000 indicates that the dam is currently in a poor condition. The structure is currently in a poor condition and the existing grade and the existing grade utility line is currently in a poor condition. The structure is currently in a poor condition and the existing grade utility line is currently in a poor condition. The structure is currently in a poor condition and the existing grade utility line is currently in a poor condition.

The structure was not available for the facility in May 2000. The structure was in a poor condition and obtained a permit to construct a new structure. The structure was in a poor condition and obtained a permit to construct a new structure. The structure was in a poor condition and obtained a permit to construct a new structure.

Retrofit Methodology

The proposed retrofit facility is an extended dry detention pond. The goal of the facility is to increase the storage and drainage time of the facility and thereby affecting the flow of water. The facility is currently in a poor condition and the existing grade utility line is currently in a poor condition. The structure is currently in a poor condition and the existing grade utility line is currently in a poor condition.

The existing area of the existing structure is not being utilized due to the existing structure and the dam is currently being overtopped. The structure is currently in a poor condition and the existing grade utility line is currently in a poor condition.

The data in the fact of the existing structure and the existing condition of the structure is currently in a poor condition. The structure is currently in a poor condition and the existing grade utility line is currently in a poor condition. The structure is currently in a poor condition and the existing grade utility line is currently in a poor condition.

Proposed grading is based on the grading plan. Horizontal and vertical clearance of the facility is limited by utility factors.

Horizontal clearance is limited by the surrounding site terrain, existing roadways and existing utility columns. Opportunities for vertical clearance are also restricted to maintain and coordinate over the existing gas and sewer lines. Practically, the existing gas and sewer lines can be found on the utility tract color report sheet. Considering the constraints and inclusion of a diaphragm wall and microtunneling, proposed grading will increase the condensation of the existing data room access to the access in addition to the permanent pool. In addition, the BM orifice is a relatively flat access or the site.

The proposed road is located at the proposed location and near river with a BM orifice. The and sewer flow rates are comparable to the site at the existing conditions. In addition, sufficient roadway is still provided on the data raised area. Relatively, the location of the proposed road on the grading plan to the agency will pay bill be upgraded to an elevation of the road to prevent the sewer from flooding over and will be slightly relocated to account for the rise in data elevation. The required pipe is also obtained for the four pipe.

To prevent clogging, an inserted pipe on the microtunneling is proposed that would inhibit leaves and other floating debris from clogging the BM orifice.

Conclusion

Facility will be located to increase overall condensation by the sewer existing and create a permanent pool. In addition, the near river site will be retrofitted and detailed design to increase storage and detention of the resulting effluent and sewer flow rates are comparable to existing conditions.

The local rate of organic and nitrogen are estimated using Bay Program efficiency calculation and based on Soot of the pipe and the results are compared to the calculation and based on the design criteria for a standard extended dry detention facility.

	Total Nitrogen	Total BOD	Total Suspended Solids
Groundwater Revised Flow	1000	100	100000

The facility layout will still provide access to the near river and allow required maintenance of the diaphragm wall and microtunneling. For the retrofit, all disturbed areas will be reseeded at the site provided on the Vegetation Schedule.

Appendix C - Roadways

Appendix D – Pesticide Herbicide and Fertilizer Application



Reporting

Mosquito Treatment

Adult ID

Larva ID

Gypsy Moth

Cankerworm

Adult ID Export

Mosquito Pools Log

Generic Pest Export

Mosquito Treatment Export

Cankerworm Export

Gypsy Moth Export

Site Visit Export

Site Type Export

From:

7/1/2017



To:

06/30/2018



Technician:

Map page:

Site type:

Site Visit

Non-SWM

SWM

Other



Mosquito Treatment Report

This data is filtered by the following parameters:

From

7/1/2017

To

06/30/2018

Site Type

Non-SWM

Treatment summary

2816 total inspections.

844 total treatments.

27.597111340679522 acres treated.



Reporting

Mosquito Treatment

Adult ID

Larva ID

Gypsy Moth

Cankerworm

Adult ID Export

Mosquito Pools Log

Generic Pest Export

Mosquito Treatment Export

Cankerworm Export

Gypsy Moth Export

Site Visit Export

Site Type Export

From:

7/1/2017



To:

06/30/2018



Technician:

Map page:

Site type:

Site Visit

Non-SWM

SWM

Other



Mosquito Treatment Report

This data is filtered by the following parameters:

From

7/1/2017

To

06/30/2018

Site Type

SWM

Treatment summary

2938 total inspections.

530 total treatments.

14.848300734618917 acres treated.



Reporting

Mosquito Treatment

Adult ID

Larva ID

Gypsy Moth

Cankerworm

Adult ID Export

Mosquito Pools Log

Generic Pest Export

Mosquito Treatment Export

Cankerworm Export

Gypsy Moth Export

Site Visit Export

Site Type Export

From:

7/1/2017



To:

06/30/2018



Technician:

Map page:

Site type:

Site Visit

Non-SWM

SWM



Mosquito Treatment Report

This data is filtered by the following parameters:

From

7/1/2017

To

06/30/2018

Treatment summary

5754 total inspections.

1374 total treatments.


42.44541207529844 acres treated.




Standard Operating Procedure

Department of Public Works

Environmental Services Division

Title:	Insecticide Storage, Disbursement, Transport and Inventory
Number:	3.017.7
Subject:	Procedures for Insecticide Storage, Disbursement, Transport and Inventory
Cross Reference:	APWA Management Practice (s) 28.4
Date Issued:	May 3, 2010
Date Revised:	June 30, 2015
Date Last Reviewed:	June 30, 2015
Signature of Issuer:	 _____ Marc T. Aveni, Environmental Services Division Chief
Applicability:	Environmental Services Division
Effective Date:	June 30, 2015



	SOP Title: Insecticide Storage, Disbursement; Transport and Inventory	SOP No.: 3.017.7
	Effective Date: 06/30/2015	Supersedes Policy Dated: 05/03/2010

A. Purpose

The purpose of this standard operating procedure (SOP) is to establish a guide for the storing, handling, and disbursement of insecticides.

B. Applicability

This SOP applies to all employees of the Mosquito and Forest Pest Management Branch (MFPM).

C. Guidelines

Storage: Insecticides such as solid and liquid larvicides, and insecticide tank flush used in the program are stored in the Mosquito Shed located at the MFPM building. Insecticides used on a regular basis during the mosquito season may be held in County vehicles. The liquid adulticide is stored off site at the Operations Building in two roll top hardcover drum storage pallets with drains. The pallets rest on a 4-inch concrete slab. Each drum storage pallet is properly labeled.

Disbursement: Larvicides and adulticides are distributed on an “as needed basis”. Technicians pick up the larvicide or adulticide. The amount of material that is taken is recorded on an inventory sheet located at the storage sites. The inventory at the storage sites is managed by the Field Supervisor.

Transport: Insecticides must be secured while being transported in County trucks.


Disposal of Empty Insecticide Containers: Empty larvicide bags can be disposed of in the trash. Empty adulticide insecticide containers are picked up by the vendor they were purchased from. Always refer to the Product Label before disposal.

Disposal of Unwanted Insecticide Material: Expired and unwanted insecticides are identified by any staff member and turned over to the County’s Hazardous Waste Contractor by the Field Supervisor.

Safety: Read and follow all instructions on Product Labels. SDS (see below) must also be reviewed.

Material Safety Data Sheets (MSDS): MSDS information on all insecticides in use may be found in the storage sheds, staff vehicles and in the department shared drive and the MSDS online portal. The Field Supervisor must ensure that all staff has access to the latest versions (in an electronic format) on an at least annual basis.



	SOP Title: Insecticide Storage, Disbursement, Transport and Inventory	SOP No.: 3.017.7
	Effective Date: 06/30/2015	Supersedes Policy Dated: 05/03/2010

Chemical Spill: If the amount is less than 1 gallon, the operator will contain and clean up the spill. The operator must also notify MFPM's on-call person immediately after the clean-up. If the amount is greater than 1 gallon, the operator will contain the spill as best as possible and immediately notify MFPM's on-call person. If the situation is deemed to be a hazardous materials emergency by the on-call person, he/she must call 911.

Pesticide Accidents: Pesticide accidents or incidents that constitute a threat to any person, to public health or safety, and/or to the environment must be reported to the VDACS Office of Pesticide Services. Initial notification must be made by telephone within 48 hours of the occurrence; a written report describing the accident or incident must be filed within 10 days of the initial notification. The above is the responsibility of the Field Supervisor and in his/her absence, the Mosquito and Forest Pest Management Branch Chief (Branch Chief). Additionally, it is their responsibility to notify Finance-Risk Management within 24 hours of a spill that is above the thresholds established by this agency.

Spill Response: All vehicles and storage facilities will contain spill kits suitable to address pesticide spills. All staff that use or may potentially come into contact with pesticides will undergo training on spill response.

D. Authority

The approving authority for this SOP is the Environmental Services Division Chief. Any changes to or deviations from this SOP must be approved by the Environmental Services Division Chief.

E. Administration

The administration of this SOP shall be the responsibility of the Mosquito and Forest Pest Management Branch Chief.







Standard Operating Procedure

Department of Public Works

Environmental Services Division

Title:	Adulticiding
Number:	3.017.2
Subject:	Adulticiding
Cross Reference:	APWA Management Practice (s) 28.2
Date Issued:	May 3, 2010
Date Revised:	June 30, 2015
Date Last Reviewed:	June 30, 2015
Signature of Issuer:	 _____ Marc T. Aveni, Environmental Services Division Chief
Applicability:	Environmental Services Division
Effective Date:	June 30, 2015



	SOP Title: Adulticiding	SOP No.: 3.017.2
	Effective Date: 06/30/2015	Supersedes Policy Dated: 05/03/2010

A. Purpose

The purpose of this standard operating procedure (SOP) is to establish a guide to mosquito spraying operations. It is established to ensure that targeted spraying is conducted; it also ensures that adequate safety measures and EPA guidelines on the application of chemicals are followed.

B. Applicability

This SOP applies to all employees of the Mosquito and Forest Pest Management Branch (MFPM).

C. Adulticiding Process

Adulticiding may be triggered by high mosquito trap counts for specific species (mainly *Culex pipiens* and *Cx. restuans*) and positive West Nile virus pools in residential areas. The decision to spray is further determined by species composition, presence or absence of non-participants, weather, location, proximity to human habitation and housing density among other factors. Adulticiding is conducted in the spray block where the infected mosquitoes were collected. Additional areas may be treated based on proximity to the trap site associated with the positive pools.


The program does not generally spray based on the density of the Asian Tiger Mosquito (*Aedes albopictus*) or other container breeders. In exceptional cases where highly pestiferous species are present in huge numbers (as evidenced by trap data) such as *Psorophora* spp., spray may also be justified. Furthermore, the branch generally does not spray if it is raining continuously, extreme heat, high winds or Code Red conditions. It is recommended that the sprayer is turned off at a distance of 100 feet from non-participants (NPs).

Citizens are allowed to opt-out via email or phone call if they do not want their property to be sprayed. This non-participant database is maintained by the Field Supervisor and updated annually. Spray block maps include this information when it becomes available.

A public notification is published on the day of spraying once the decision is made to spray. The County's website and telephone hotline (voice recordings) are used as the medium for public notification. The public notification lists the blocks to be sprayed and information on how to access spray block maps on the County Mapper XM.

MFPM has two designated spray trucks both of which are equipped with a spray machine. The Field Supervisor is responsible for general vehicle maintenance and spray machine calibration to ensure that the vehicles are in a state of readiness to be deployed during the mosquito season. Each vehicle is also equipped with a Spill Kit which must be checked before each spray operation by the sprayer.



	SOP Title: Adulthood	SOP No.: 3.017.2
	Effective Date: 06/30/2015	Supersedes Policy Dated: 05/03/2010

Once a spray operation is assigned, the sprayer/driver may request additional staff support. The driver operates the fogger machine while the second person is required to assist with navigation and alert the driver of any impending danger that might not be immediately visible to the driver. A paper map of the spray route is prepared by the GIS Analyst and made available to the vehicle operator.

MFPM uses Sentinel GIS which runs on ESRI's ArcPad to track and map areas sprayed. GIS data layers (spray route, spray block & NPs) are prepared at the office by the GIS Analyst and then deployed to a handheld Field PC. This device is then attached to the vehicle's control box which is equipped with a GPS. At the end of the spray session the device is disconnected and returned to the office. The data collected is uploaded to GIS and is used to create a spray information map showing the spray line and GPS points indicating when the sprayer was turned on and off. A detailed spray report is produced after the spray operation on the quantity of chemical used, the acreage sprayed and spray activity times and made available to the Field Supervisor and Mosquito and Forest Pest Management Branch Chief (Branch Chief).

D. Chemical Spills

If the amount is less than 1 gallon, the operator will contain and clean up the spill. The operator must also notify the MFPM's on-call person immediately after the clean-up. If the amount is greater than 1 gallon, the operator will contain the spill as best as possible and immediately notify MFPM's on-call person. If the situation is deemed to be a hazardous materials emergency by the on-call person, he/she must call 911.


Pesticide accidents or incidents that constitute a threat to any person, to public health or safety, and/or to the environment must be reported to the VDACS Office of Pesticide Services. Initial notification must be made by telephone within 48 hours of the occurrence; a written report describing the accident or incident must be filed within 10 days of the initial notification. The above is the responsibility of the Field Supervisor and in his/her absence, the Branch Chief. Additionally, it is their responsibility to notify Finance-Risk Management within 24 hours of a spill that is above the thresholds established by this agency.

All vehicles and storage facilities will contain spill kits suitable to address pesticide spills. All staff that use or may potentially come into contact with pesticides will undergo training on spill response.

E. Authority

The approving authority for this SOP is the Environmental Services Division Chief. Any changes to or deviations from this SOP must be approved by the Environmental Services Division Chief.



	SOP Title: Adulticiding	SOP No.: 3.017.2
	Effective Date: 06/30/2015	Supersedes Policy Dated: 05/03/2010

F. **Administration**

The administration of this SOP shall be the responsibility of the Mosquito and Forest Pest Management Branch Chief.



Appendix E – Illicit Discharges and Improper Disposal

**PRINCE WILLIAM COUNTY DEPARTMENT OF PUBLIC WORKS
WATERSHED BRANCH
ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM
5 COUNTY COMPLEX COURT, SUITE 170
PRINCE WILLIAM, VA 22192-5308
OFFICE: 703-792-7070 FAX: 703-792-6297**

INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 7/2017-18	Date : 3/8/2017	Time : 2:45 PM
Business : Residential	Report Completed By : Prem Popudel	
Address: 1405 Colchester Rd.	City : Woodbridge, VA	Zip Code: 22191
Complain or Case Received From: PWC Watershed staff got an anonymous complaint regarding oil spill on drive way and street, potential for being washed away into storm sewer system.		

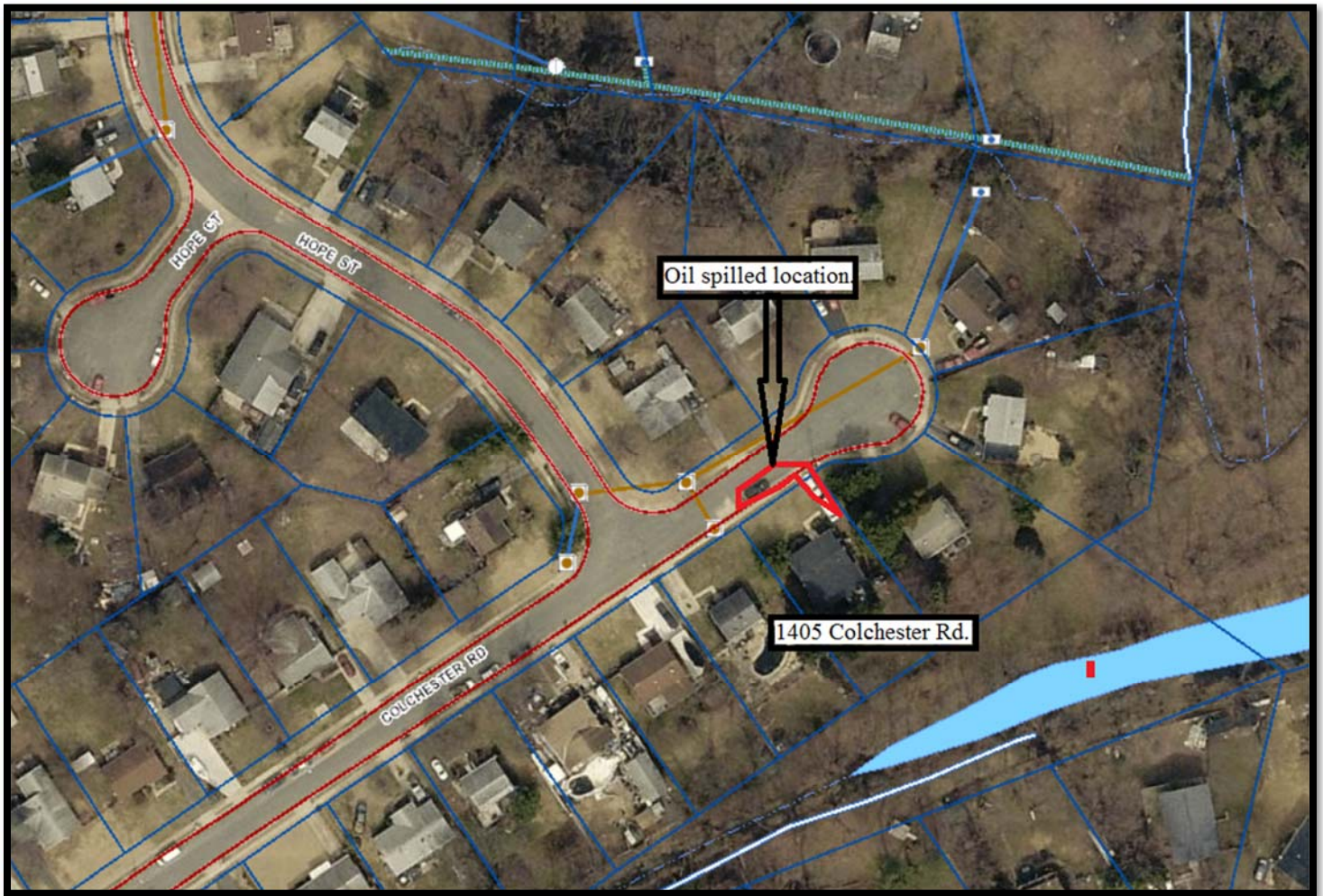
Photo of discharge:



Onsite Water Quality Test performed: Choose an item. If yes, observed results:

pH :NA	Limit: NA	Conductivity :NA	μS/cm Limit: NA	Temp.: °F	Limit: NA
Discharge related Indicators	Odor: Other	Color: NA	Turbidity: NA		
	Floatables: NA	Stains: Oily	Other: NA		

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: Matthew Peters	Name:
Company: Home Owner	Company:
Address: 1405 Colchester Rd.	Address:
Phone #: 571-253-0859; 703-491-8342	Phone #:
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

Upon arrival, oil and grease stain observed at drive way and adjoining street of 1405 Colchester Rd. The spill found to be localized and the attempt found had taken immediately after the spill with spill absorbent granular materials. The homeowner, Mr. Matthew Peters said, incident happened unintentionally and he was willing to run cleanup work immediately. Since he was positive and environmentally sensitive, NOV wasn't issued. Follow up inspection made [8/10]; spill spots observed to be cleaned with hydrocarbon absorbent dust. Dust found to be removed from drive away and street.

Conclusion:

Spill had been immediately captured from flowing and stain found to be cleaned with hydrocarbon absorbent granular materials. NOV did not issue. The case has been closed.

Notifications:

Citation Code Section: NA

Citation Narration: NA

NOV Issued: NA

NOV # :NA

EnerGov Case # : NA

Photos:



After Cleanup





PRINCE WILLIAM COUNTY DEPARTMENT OF PUBLIC WORKS
WATERSHED BRANCH
ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM
 5 COUNTY COMPLEX COURT, SUITE 170
 PRINCE WILLIAM, VA 22192-5308
 OFFICE: 703-792-7070 FAX: 703-792-6297

INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 36-2017/18	Date : 11/21/2017	Time : 1:30 PM
Business : Checkers	Report Completed By : Prem Poudel	
Address: 1920 Daniel Stuart Square	City : Woodbridge, VA	Zip Code: 22191
Case Detail: Noticed a black color and weed growth in the pond located at 2141 Opitz Blvd. There are various restaurants at the catchment drainage areas. Among them, spill of fat and cooking oil observed around grease collection container of Checkers Restaurant and flowing mark was observed towards storm sewer system.		

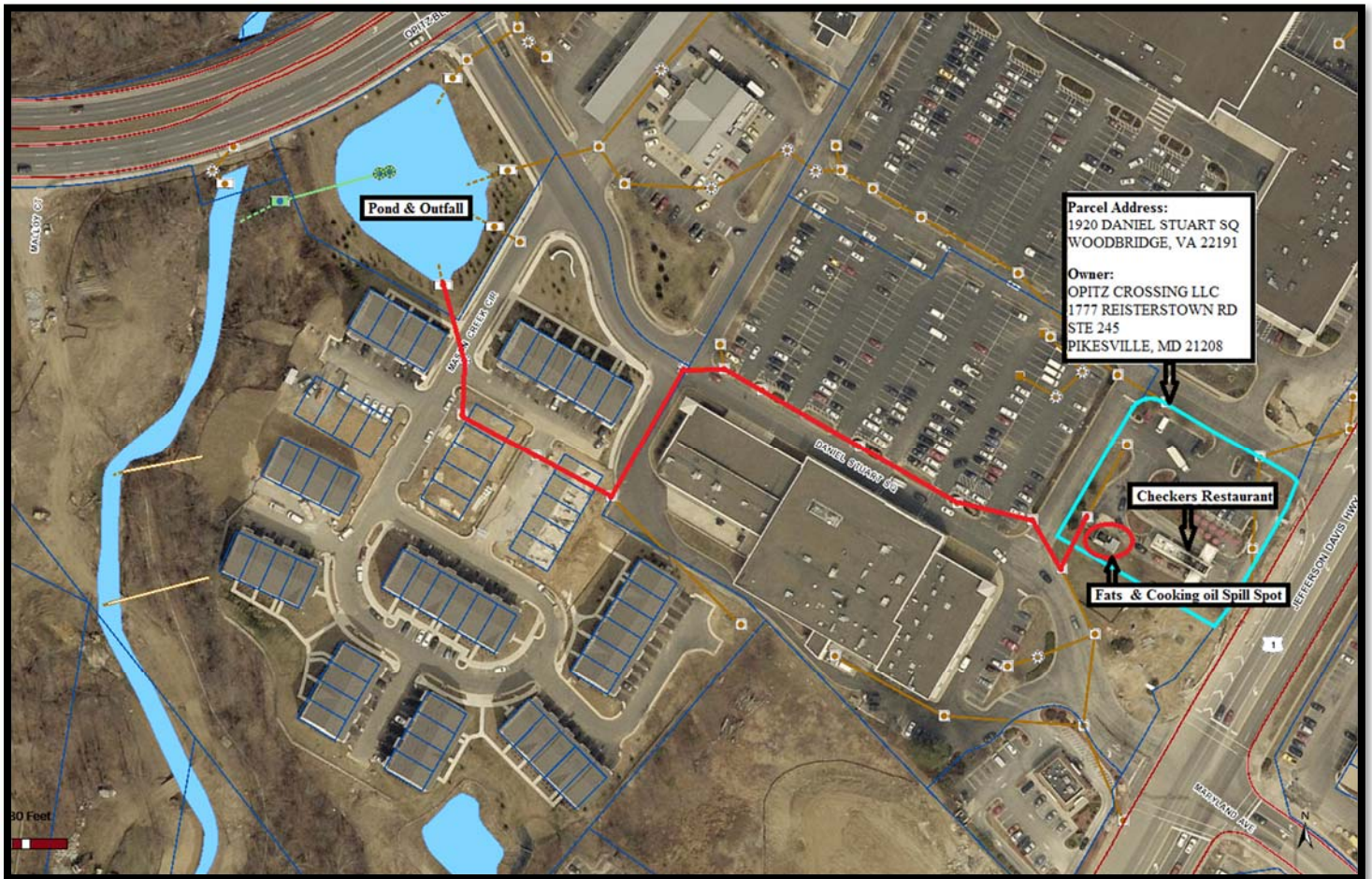
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

PH: NA Limit NA	Conductivity (µS/cm): NA Limit:NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: NA	Color: NA
	Floatables: NA	Stains: Oily
		Turbidity: NA
		Deposits: Debris

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name:	Name: Manager Mr. Edgar Cruz
Company: Opitz Crossing LLC	Company: Checkers Restaurant
Address: 1777 Reisterstown Rd, Suite 245 Pikesville, MD 21208	Address: 1920 Daniel Stuart Sq. Woodbridge, VA 22191
Phone #: NA	Phone #: 703-492-6663 Email: marchek967@gmail.com
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:
Comments/ Deficiencies:	
Bulk volume of fats and waste cooking oil was observed being spilled and frozen around grease collection tank which was potential for melting and flowing into storm sewer system with rain and raising temperature. The impact was visible in downstream pond.	

Conclusion:

Discharge of fats and waste cooking oil into storm sewer system is a violation of County Ordinances Sec. 23.2-4.1 so notice of violation (NOV# 17-2017) was issued to the restaurant to stop further spill and clean pavement professionally without allowing discharge into storm sewer system. After interaction, NOV was hand over to the Manager Mr. Edgar Cruz with education materials. Following actions need to follow to mitigate all deficiencies.

- 1) Immediately stop dumping fats and oils over overflowing tank.
- 2) Replace grease collection tank prior getting full and keep container compatible to stop further leakage on pavement.
- 3) Maintain good housekeeping practice to stop unlawful discharge into storm sewer system.

Notifications:

Citation Code Section:23.2-4.1		
Unlawful discharge to the storm water system and water of the county.		
NOV Issued: Yes	NOV # : 17-2017	EnerGov Case # :

Photos:



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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 42/2017-18	Date : 5/3/2018	Time : 10:30 AM
Business : Potomac Mills Shopping Center	Report Completed By : Prem Poudel	
Address: 2700 Potomac Mills Circle	City : Woodbridge, VA	Zip Code: 22192
Complain or Case Received From: Prince William County Watershed Staff received a complaint from DEQ staff regarding salt dumping and leaching into the storm sewer system at the parking lot located near the intersection of Nazarene Way and Potomac Mills Circle on 05/02/2018.		

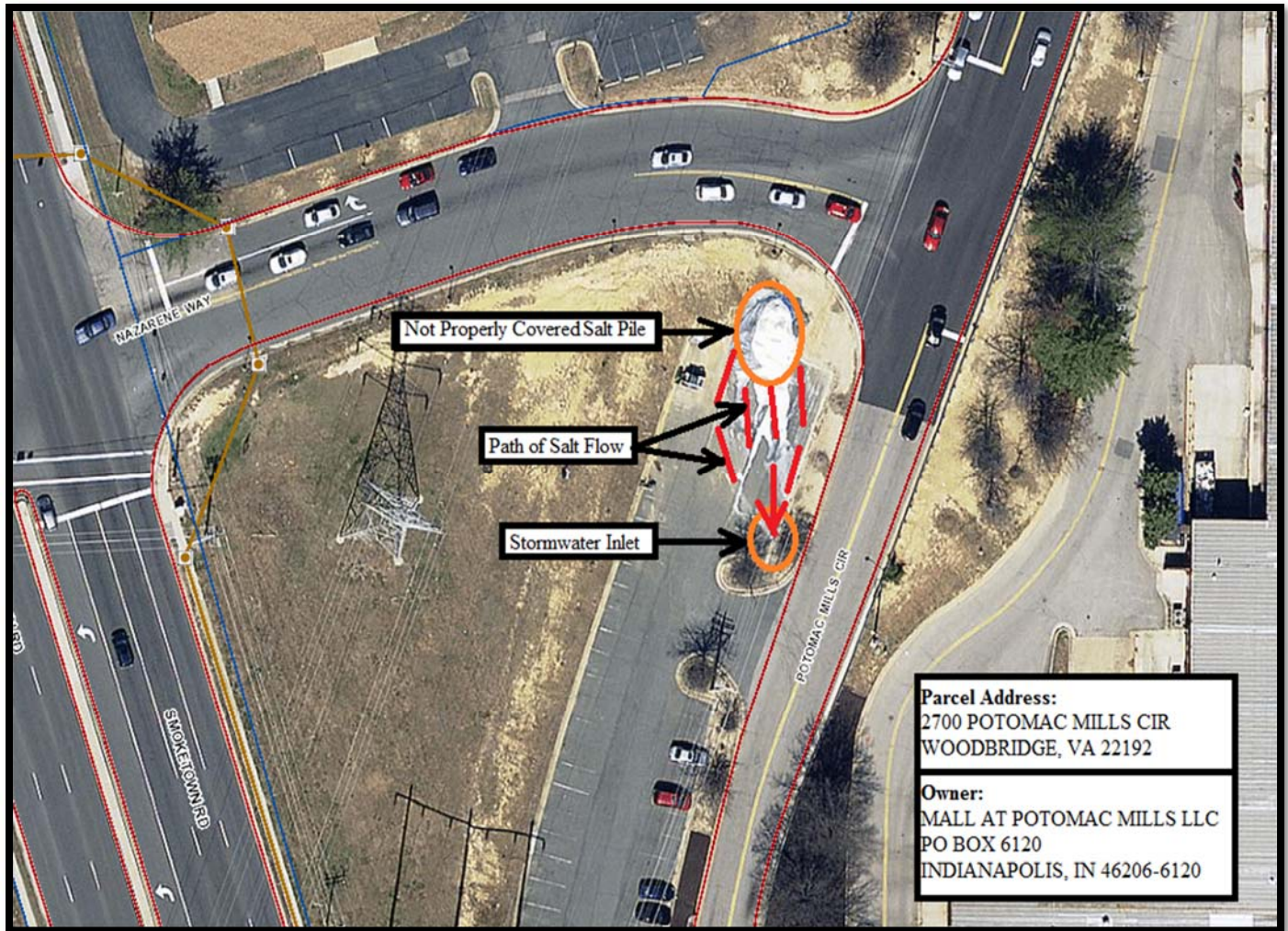
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

pH : NA Limit: NA	Conductivity : - μ S/cm Limit:NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: NA	Color: NA
	Floatables: Others	Stains: White
		Turbidity: NA
		Other: Salt

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: NA	Name: Ryan Nauman (Director of Operation)
Company: MALL AT POTOMAC MILLS LLC	Company: Simon.com
Address: C/O SIMON PROPERTY GROUP PO BOX 6120 INDIANAPOLIS IN 46206-6120	Address: 2700 Potomac Mills Circle Suite 307 Woodbridge, VA 22192
Phone #:	Phone: 703-496-9301(Office) Cell: (571) 572-0052
Note:	Note: NOV# 8-2018 handover on site
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

Upon arrival, salt pile was non-confined and leaching out on parking lot. White salt stain observed directed towards storm sewer system. By the evidence, the runoff with concentrated salt has flowed into storm sewer system in previous rainfall events.

Improper handling of salt increases the salinity of fresh water and harmful to the plant and aquatic life in a creek and river. The deficiency needs to be addressed by the property owner with following actions:

- 1) Immediately clean salt stain and residual debris from the pavement and dispose properly without allowing discharge into storm sewer system.
- 2) Remove or properly confine salt at designated spot to control further leachate from the point of storage.

Conclusion:

Concentrated salt solution is an illicit discharge as per County Code Section 23.2-4.1. The violator is requested to mitigate the deficiencies as soon as possible with actions mentioned above. The deadline to complete mitigation activities is 5/18/2018.

Notifications:

Citation Code Section: 23.2-4.1

Citation Narration: Unlawful discharge to the stormwater system and water of the county.

NOV Issued: Yes

NOV # : 8-2018

EnerGov Case # : NA

Photos:





Follow up Inspection:

Follow up inspection made- 05/15/2017

Salt pile- Removed

NOV# 8- 2018 – Closed

Closing Date- 05/16/2018

Pictures:







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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 4-2017/18	Date : 7/19/2017	Time : 3:30 PM
Business : Potomac Mills Shopping Center	Report Completed By : Prem Poudel	
Address: 2700 Potomac Mills Circle Suite - 307	City : Woodbridge, VA	Zip Code:22192
Case Detail: Waste food fluid was leaking from compactor. Waste food debris were spread out and being washed away with both air condense water and waste food fluid leaking from compactor into storm sewer system.		

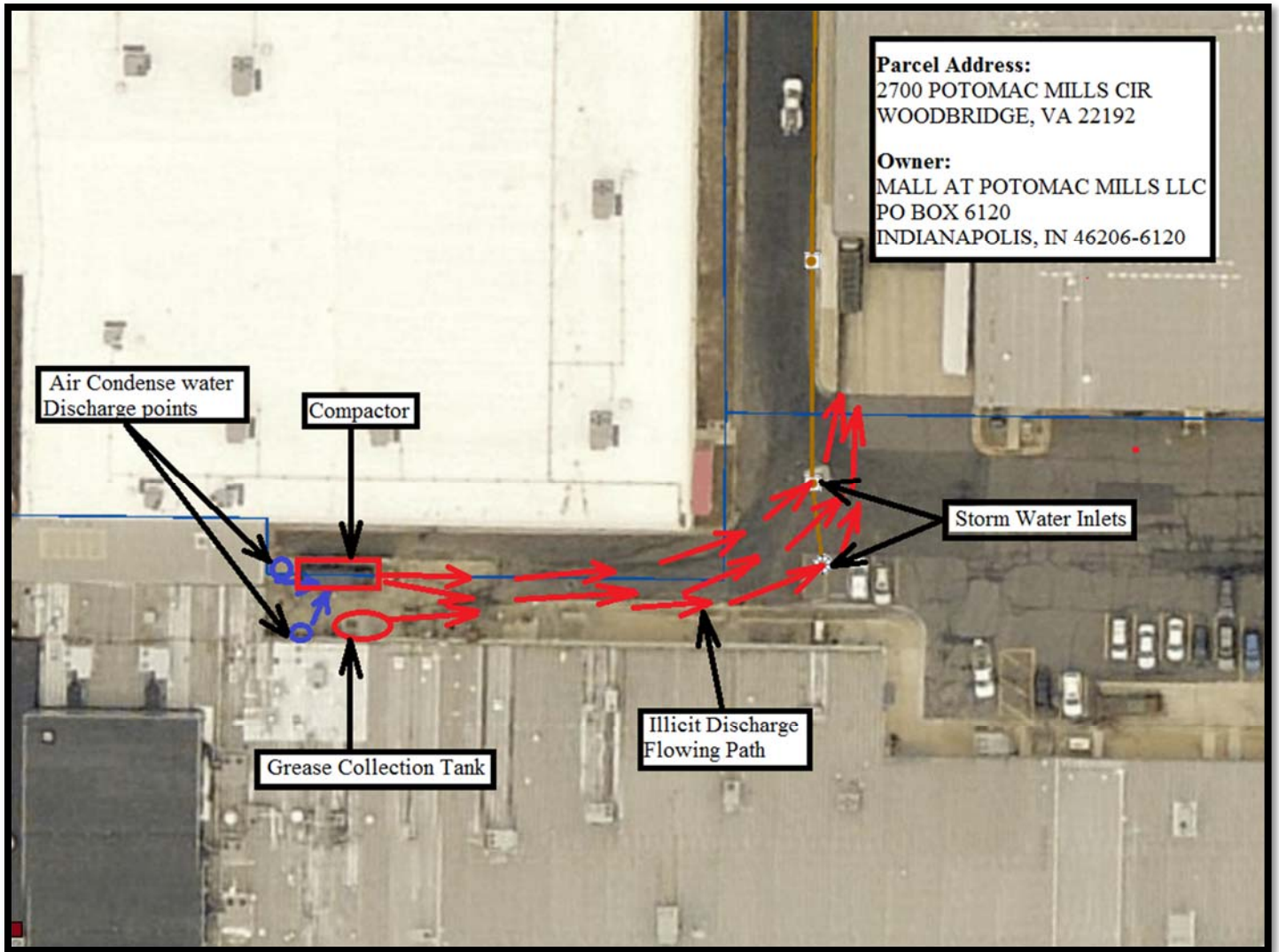
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

PH: NA	Limit NA	Conductivity (µS/cm): NA	Limit:NA	Temp.: °F	Limit: NA
Discharge related Indicators	Odor: Other	Color: Green	Turbidity: NA		
	Floatables: NA	Stains: Food Waste	Deposits: Debris		

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: Na	Name: Gerald Wright (Director of Operations)
Company: Mall at Potomac Mills LLC	Company: Simon.com
Address: PO Box 6120 Indianapolis, IN 46206-6120	Address: 2700 Potomac Mills Circle Suite 307 Woodbridge, VA 22192
Phone #: NA	Phone #: 703-496-9301
Note:	Note: NOV# 12-2017 handover onsite.
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

During periodic inspection, the site was messed with waste food debris, grease and waste cooking oil. Air condense water was left over the pavement and flowing towards waste collection container. Waste food debris and grease were spread out around grease collection tank and compactor. Waste food fluid was also leaking from compactor and intermingle with condense water. The waste food debris and grease finally reached out into storm sewer system. The discharge was green with bad odor.

Conclusion:

The discharge having color and odor is an illicit discharge and does not allow draining in storm sewer system. NOV # 12-2017 has issued to mitigate deficiencies. Following steps need to mitigate deficiencies.

- 1) Immediately cease dumping waste unless keeping compactor compatible to stop leakage.
- 2) Clean the food waste debris and stain from the pavement, potential for being washed away into storm sewer system.
- 3) Divert flow of air-condensed water away from waste collection containers.

Notifications:

Citation Code Section:23.2-4.1

Unlawful discharge to the storm water system and water of the county.

NOV Issued: Yes

NOV # : 12-2017

EnerGov Case # :

Photos:





Follow-up Inspection.

Follow up inspection made on 8/21/2016. The grease inceptor found to be cleaned and stopped flowing water from lid. Food stains and debris had been cleaned. The case has been closed for now but this site is listed a hot-spot and follow up inspection will be continued in future. Please see the picture posted below.



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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 32/9-28-2017	Date : 9/28/2017	Time : 4:00 PM
Business : Residential	Report Completed By : Prem Poudel	
Address: SW- Inlet (35033) nearby 2937 Stockholm Way	City : Woodbridge, VA	Zip Code: 22191
Case Detail: Cooking oil bottles (glass) being dumped into storm water inlet nearby 2937 Stockholm Way		

Photo of discharge:



Onsite Water Quality Test performed: Choose an item. If yes, observed results:

pH : NA Limit: NA	Conductivity : NA μ S/cm Limit:NA	Temp.: -°F Limit: NA
Discharge related Indicators	Odor: Other	Color: Other
	Floatables: Cooking Oil	Stains: Oily
		Turbidity: NA
		Other: NA

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: Not Identified (Under Investigation)	Name: Mary Russel
Company:	Company: CMCA, AMS
Address:	Address: 4840 Westfields Boulevard, Suite 300 Chantilly, VA 20151
Phone #:	Phone #: 703-230-8544
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:10/04/2017
Time:	Time: 8:30 AM
Name:	Name: Lieutenant Mr. Mikel K. Hubbel
Company/Agency:	Company/Agency: Department of Fire and Rescue
Notes:	Notes: Contact Ph-(703)792-6798

Comments/ Deficiencies:

The incident regarding dumping cooking oil bottles (glass) into storm sewer system was initially received on March 27 into storm water inlet across street at 2926 Stockholm Way. Same complaint again received on 09/27/2017. Site was re-inspected on 9/28/2017. Upon arrival, cooking oil bottles observed dumping into storm inlet, located near 2937 Stockholm Way. Black stains were covered with fresh oil. Pieces of bottles were found to be spread out inside the inlet structure. Prince William County Watershed staff received video footage from the complaint.

Conclusion:

The footage was forwarded to the Fire Marshal's Office for further investigation, and a PD case has been opened.

Notifications:

Citation Code Section: 23.2-4.1

Citation Narration: Unlawful discharge to the storm sewer system and water of the County.

NOV Issued: NA

NOV # :NA

EnerGov Case # : NA

Photos:





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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 24/2017-18	Date : 1/16/2018	Time : 2:45 PM
Business : Parking Lot besides Kohl's	Report Completed By : Prem Poudel	
Address: 6450 Trading Square	City : Haymarket, VA	Zip Code: 20169
Complain or Case Received From: Prince William County Watershed Staff received a salt dumping case at parking lot of 6450 Trading Square, Haymarket forwarded by the Department of Fire and Rescue Battalion Chief Mr. Doug A. McCabe on 01/16/2017.		

Photo of discharge:

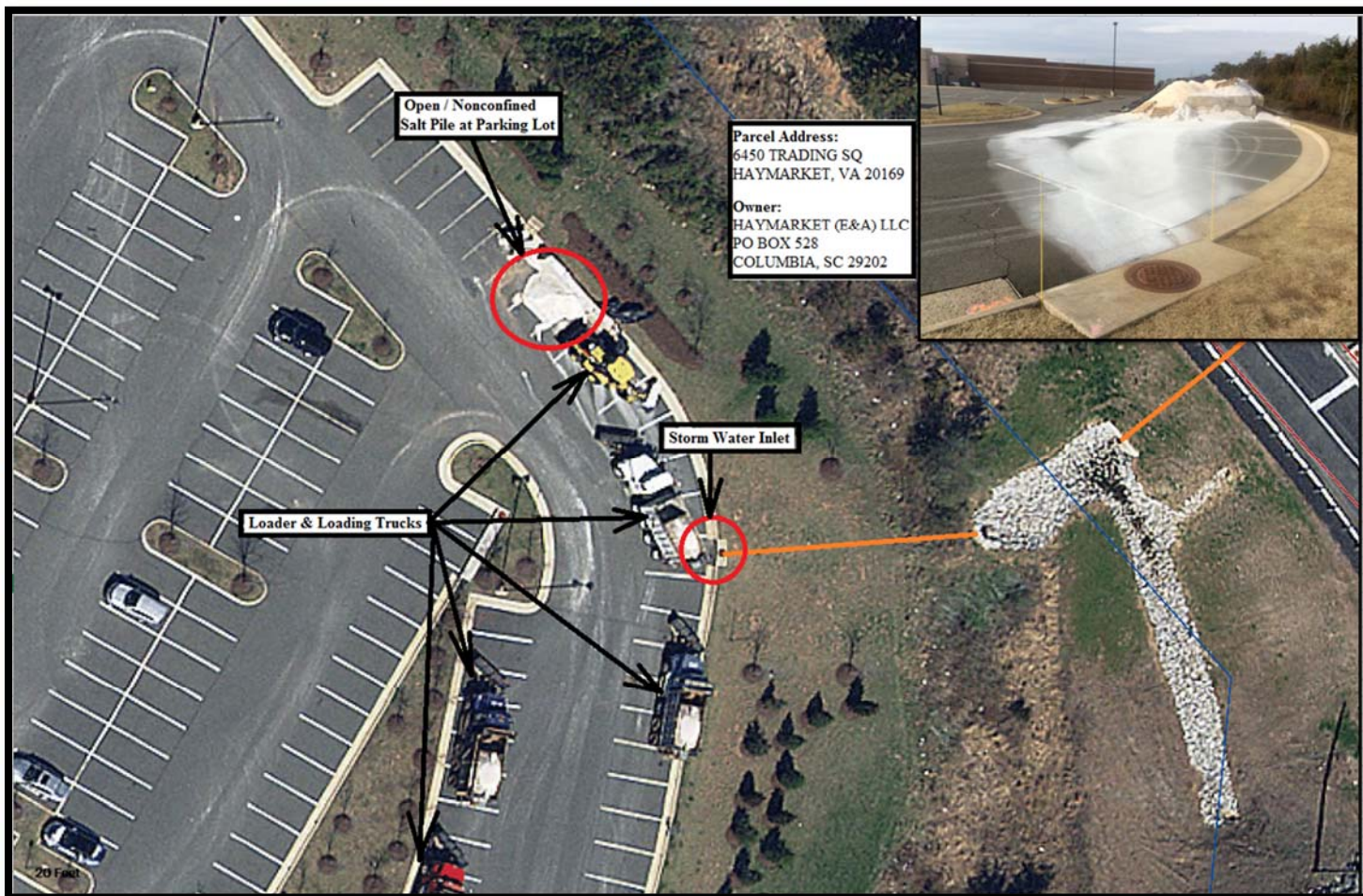


Onsite Water Quality Test performed: NA

If yes, observed results:

pH : NA	Limit: NA	Conductivity : - $\mu\text{S}/\text{cm}$ Limit: NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: Choose an item.	Color: Choose an item.	Turbidity: Choose an item.
	Floatables: Others	Stains: White	Other: Salt

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: NA	Name: Matt Pastor (Regional Property Manager)
Company: Haymarket (E&A) LLC	Company: EDENS
Address: PO BOX 528 Columbia, SC 29202	Address: 7200 Wisconsin Avenue, Suite 400 Bethesda, MD 20184
Phone #:	Phone #: (301) 347-3971 Fax: (301) 652-3588
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

Upon arrival, salt pile observed uncovered/non-confined on parking lot and white salt stain directed towards storm sewer system. By the evidence, the runoff with concentrated salt should have flown into storm sewer system in previous rainfall events.

The pile found to be influenced with previous rainfall to create a runoff with high concentrated salt, which ultimately entered into storm sewer system. The concentrated salt solution supposed to be a source of pollutant in storm water system, which affect the plant and aquatic life in a creek and river. The deficiency needs to be addressed by the property owner with following actions:

- 1) Immediately clean salt stain and residual debris from the pavement and dispose properly without allowing discharge into storm sewer system.
- 2) Control pollutant on site after notification.
- 3) Remove salt pile from the parking lot. The storage of salt for the use of property owner should keep under the roof or confined space if needed.

Conclusion:

The violator requested to address deficiency as mentioned above however due date of final mitigation mentioned in NOV within 30 days after getting violation letter.

Notifications:

Citation Code Section: 23.2-4.1

Citation Narration: Unlawful discharge to the stormwater system and water of the county.

NOV Issued: Y / N

NOV # : 1-2018

EnerGov Case # :

Photos:





Follow up Inspection:

Follow up inspection made on 01/29/2018. The deficiency has corrected by removing salt piles from parking lot and cleaning debris from the pavement. See the following pictures taken after mitigation.



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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #:	Date : 8/4/2017	Time :2:30 PM
Business : Residential Areas	Report Completed By : Prem Poudel	
Address: 7411 Bull Run Rd.	City : Manassas, VA	Zip Code: 20111
Complain or Case Received From: The case was forwarded after suspecting an illicit discharge by the staff of Mosquito and Forest Pest Management.		

Photo of discharge:



Onsite Water Quality Test performed: Choose an item. If yes, observed results:

pH : NA Limit: NA	Conductivity : NA μ S/cm Limit:NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: NA	Color: Orange
	Floatables: NA	Turbidity: NA
	Stains: NA	Other: Algae

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: NA	Name: NA
Company: NA	Company: NA
Address:	Address:
Phone #:	Phone #:
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

Upon arrival, the lid of storm water structure, located at the property 7144 Bull Run Road was found to be displaced from its original position. Displacement may have happened due to clogged storm sewer after the structure. The earthen swale found to be eroded with over flow from the top of the structure during rainfall. The outfall 16547, located at North-East of the property was flowing with trickle discharge which found to be percolated within 10 feet from outfall. Outfall was a rusted corrugated pipe. Significant amount of orange algae found to be developed at flow line.

At point A, non-measurable trickle flow was transferring to the next sewer. Two intermediate Manhole between outfall 35071 to Manhole B could not observe. One of them did not show up and next one was covered with the lid of sanitary manhole. The property 8721 Parkland Street was found poorly maintained with some fertilizer, mulch and equipment on their yard. The stockpiles were partly opened for runoff during rainfall but it is hard to predict a secondary source of algae since the runoff needs to travel long way through turf before entering into storm sewer system. That's why, those piles could not predict as a secondary source of algae growth. Manhole B was dry during inspection.

The corrugated metal pipe was rusted and released iron oxide with trickle flow. Bacteria got favorable condition to grow up with iron oxide.

Conclusion:

Algae significantly developed due to releasing iron oxide with trickle flow through outfall. It is a natural phenomenon and unavoidable. Following field inspection, telephone call made to the complainant (Karen Bailey) at 703-350-2066. The homeowner indicated she would still like the county to help regrade the ditch so it drains/place down riprap if possible.

Notifications:

Citation Code Section: NA		
Citation Narration: NA		
NOV Issued: Y / N	NOV # :	EnerGov Case # :

Photos:





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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 48/2017	Date : 5/19/2017	Time : 3:50 PM
Business : Residential	Report Completed By :	
Address: 7629 Chestnut St.	City : Manassas VA	Zip Code: 20111
Case Detail: Prince William County (PWC) Environmental Services got a citizen complaint regarding dumping large quantities of mud/dirt on the property adjacent to the property 8103 Levi Court.		

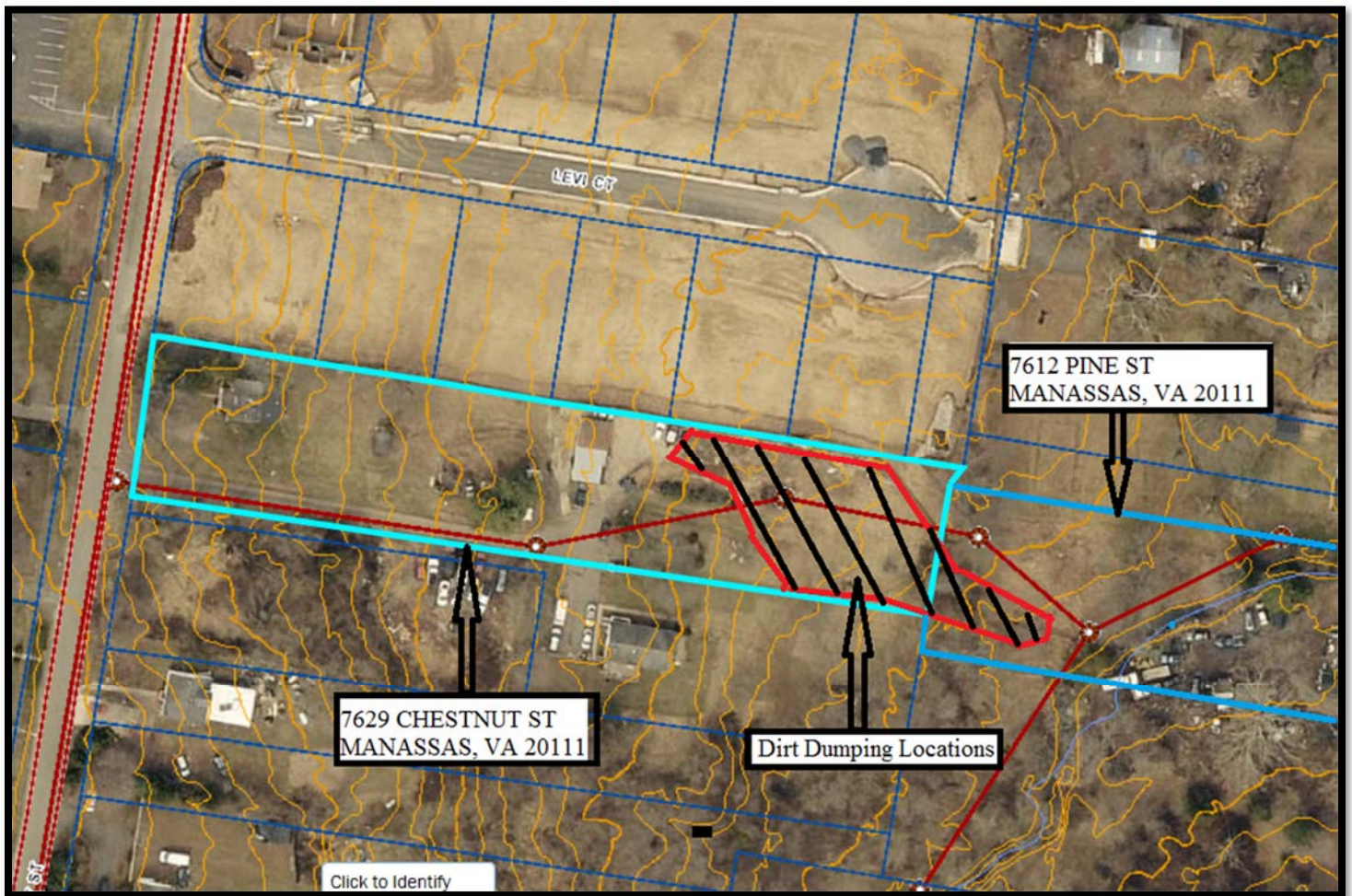
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

PH: NA Limit NA	Conductivity (µS/cm): NA Limit:NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: NA	Color: NA
	Floatables: NA	Stains: NA
		Turbidity: NA
		Deposits: Dirt

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: Owner	Name:
Company:	Company:
Address:7629 Chestnut Street/7612 Pine Street	Address:
Phone #: NA	Phone #:
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date: 5/22/2014	Date:
Time: 8:14 AM	Time:
Name: Chief Mr. Paul Lynch	Name:
Company/Agency: Neighborhood Service Division (NSD)	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

After getting complaint from a citizen regarding dumping large quantities of mud/dirt on the property adjacent to the property 8103 Levi Court, the site was inspected on 05/19/2017. Dirt found to be dumped into two different private properties 7629 Chestnut Street and 7612 Pine Street. Please see the attached map with highlighted dumping area for details. The entire dumping area was approximately 4' high from existing ground. After reviewing, It came to know that both property owner does not have land disturbance permit. Dumping area was nearly approaching to the creek without containment/silt fence. The case may attract to the scope of Neighborhood Services.

Conclusion:

The case has been decided to forward PWC, NSD for resolution.

Notifications:

Citation Code Section: Citation Code will be Identified by NSD.

Citation Narration: It belongs to NSD. NA

NOV Issued: NO

NOV # : NA

EnerGov Case # : NA

Photos:





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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 3-2017/18	Date : 7/17/2017	Time : 10:30 PM
Business : Great American Buffet	Report Completed By : Prem Poudel	
Address: 8356 Sudley Rd	City : Manassas, VA	Zip Code: 20109
Case Detail: Waste food fluid was leaking from compactor. Grease and waste food debris were observed spread out on pavement around container. Waste food fluid was stagnant at two different low points and potential for being wash away into neighboring property of Irongate HOA.		

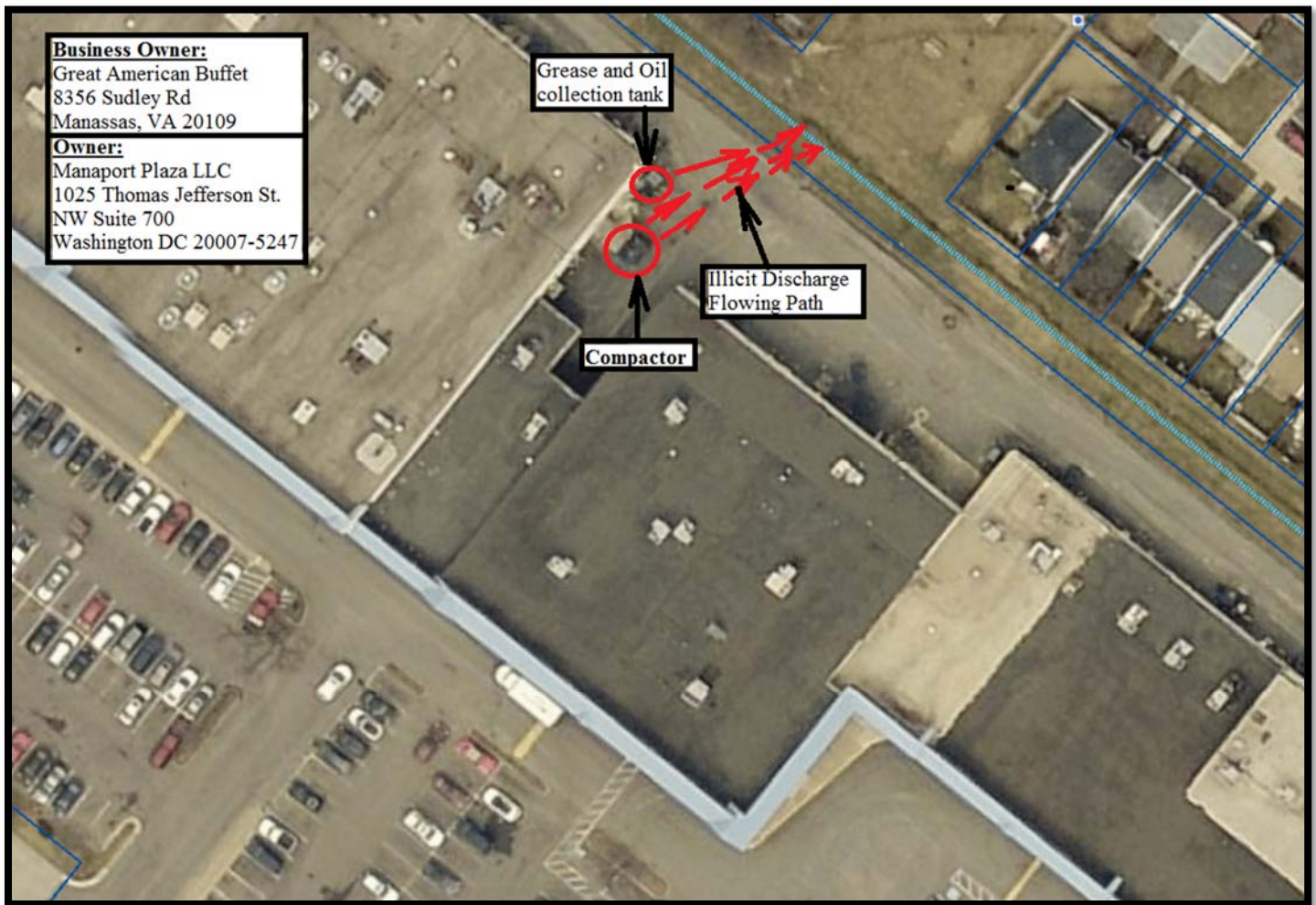
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

PH: NA Limit NA	Conductivity (μS/cm): NA Limit:NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: Other	Color: Gray
	Floatables: NA	Stains: Food Waste
		Turbidity: Opaque
		Deposits: Debris

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: Na	Name: Steve Matts (General Manager)
Company: Manaport Plaza LLC	Company: Great American Buffet
Address: 1025 Thomas Jefferson Street NW, Suite 700 Washington DC 20007-5247	Address: 8356 Sudley Rd Manassas, VA 20109
Phone #: NA	Phone #: 703-369-6791
Note:	Note: NOV# 11-2017 handover onsite.
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

During periodic inspection, the site 8365 Sudley Rd was inspected by the Illicit Discharge Detection and Elimination (IDDE) staff on 07/17/2017. Upon arrival, waste food debris, grease and waste cooking oil found to be stained and, was fresh on pavement around compactor and waste cooking oil collection tank. Those containers found to be used to collect food waste from the restaurant, Great American Buffet. The stagnant water observed on a couple of depression and, was a waste food fluid left over after cleaning with water hose. The cleaning water directly cross over the boundary to the neighboring property of Irongate HOA. We had a same complaint on 03/05/2012.

The interaction made with Mr. Steve Matts, the manager of the restaurant and revisit the location.

Conclusion:

Discharge of cleaning water or food waste fluid into neighboring property is a violation of County ordinance 23.2-4.1. Notice of Violation (NOV# 11-2017) issued to the restaurant manager to mitigate all deficiencies within 30 days from date of NOV.

The restaurant owner needs to handle food waste properly within the close container compatible to hold all inside without leaking. An unintentional spill or leakage need to be prudently captured with absorbent and put back into the container. If cleaning activities run with liquid like chemicals and water, fluid must be vacuumed and disposed properly. Following actions need to follow to mitigate all deficiencies.

- 1) Capture all potential illicit discharge onsite and maintain all containers (Compactor, Grease Inceptor, grease and waste cooking oil collection tank etc.) compatible to stop leakage.
- 2) Immediately clean waste food debris and stains from the pavement, potential for being washed away into HOA property during rainfall.
- 3) Adopt professional cleaning method and maintain cleaning log for grease inceptor.

Notifications:

Citation Code Section:23.2-4.1		
Unlawful discharge to the storm water system and water of the county.		
NOV Issued: Yes	NOV # : 11-2017	EnerGov Case # :

Photos:





Follow-up Inspection

Follow-up inspection made [08/30]. Dumpster found to be replaced with new ones. Oil stain and debris found removed but there were minor spill around container. The case has been closed now but the site was highly potential for releasing waste through container. Follow up inspection will continue in future.



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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 37/2017-18	Date : 12/7/2017	Time : 11:30AM
Business : Residential	Report Completed By : Prem Poudel	
Address: 9301 Byron St.	City : Manassas, VA	Zip Code: 20111
Complain or Case Received From: PWC, Watershed Staff received a complaint from PWC, Neighborhood Services staff regarding dumping clippings at Road Curbs and Gutters located near by 9301 Byron Street on 12/07/2017.		

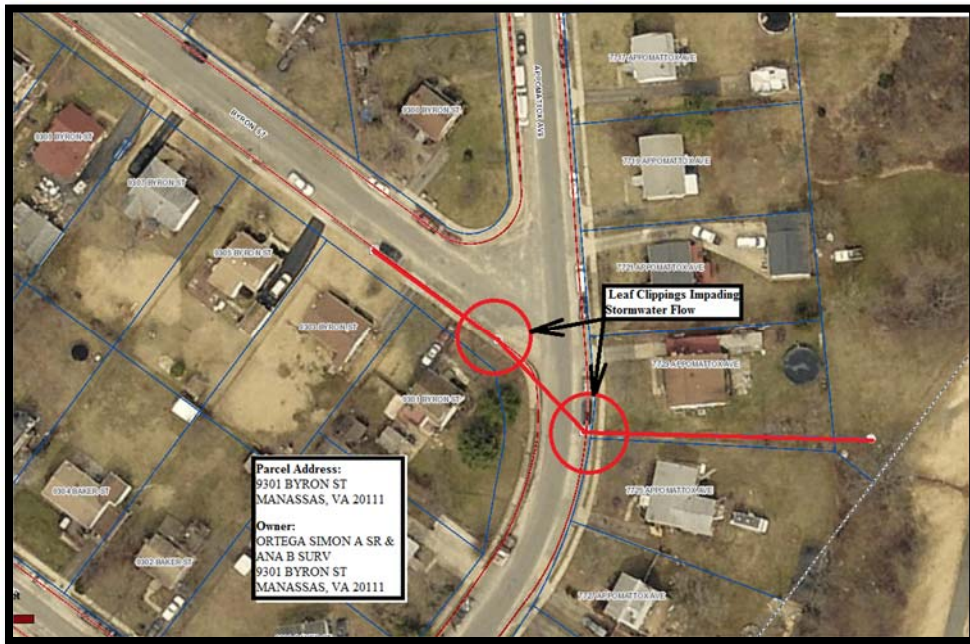
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

pH : NA Limit: NA	Conductivity : - μ S/cm Limit: NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: NA	Turbidity: NA
	Floatables: NA	Stains: NA Other: Dumping Clippings

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: NA	Name:
Company: NA	Company:
Address: 9301 Byron Street	Address:
Phone #: NA	Phone #:
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:
<p><u>Comments/ Deficiencies:</u></p> <p>Upon arrival, dead leaf clippings found dumping into road curb and gutter located in front of house 9301 Byron Street. Both inlet and outlet pipes covered with clippings at the manhole. Following inspection, interaction made with resident of 9301 Byron Street. He refused to accept the dumping of clippings into storm sewer system.</p>	
<p><u>Conclusion:</u></p> <p>Due to lack of sufficient evidences, NOV could not issue. The road structures belongs to VDOT, so the case has forwarded to VDOT to address the drainage problem, raised at road.</p>	

Notifications:

Citation Code Section: 23.2-4.1

Citation Narration: Unlawful discharge to the storm water system and water of the county.

NOV Issued: N

NOV # : NA

EnerGov Case # : NA

Photos:



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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #:	Date : 8/15/2017	Time : 2:30 PM
Business : Independent Business Center	Report Completed By : Prem Poudel	
Address: 11850 Livingston Rd 139	City : Manassas	Zip Code: 20109
Complain or Case Received From: Ralph Bloom called (703-201-6499) at 1:19 to report a diesel fuel spill along Livingston Road near Wellington Rd, starting at US Foods and ending at 11850 Livingston Rd Lot 38.		

Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

pH : NA Limit: NA	Conductivity : NA μ S/cm Limit:NA		Temp.: °F Limit: NA
Discharge related Indicators	Odor: Petroleum/Gas	Color: Colorful	Turbidity: Slight Cloudiness
	Floatables: Petroleum	Stains: Oily	Other: NA

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: Unidentified	Name:
Company:	Company:
Address:	Address:
Phone #:	Phone #:
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

Upon arrival, call made for Mr. Ralph Bloom, the complainant of spill onsite to identify exact location because Lot 38 near 11850 Livingston Rd couldn't identify. After conversation, site identified multiple spills; spill-1, spill-2 and spill-3 in three different locations. First and Second sites found with petroleum stains having colorful surface and 3rd one had paint spill. Paint spill found being dry before reach out into water bodies. Petroleum spill observed colorful and spread out due to rainwater. Impact of all of those three spills found local with minor impact on outfall discharge. Interaction made with Mr. Damien Gray, the Manager of Kingsmor Supply Inc. and Manager of Dal-Tile Show Room. Particular violator could not identified.

Spill 1 had immediately converted into dry due to evaporation. Mr. Gray talked with his crew about petroleum spill, happened in spill 2 where he used to park his car regularly even though the car was not leaking during inspection. The car was old and seemed to be potential for leaking at any time. Mechanics agreed to keep his car compatible to stop leakage and capture spill with Kitty Litters. At spill-3, Paint was found leaking through dumpster used for the business of Daltile Tile and Stone Showroom. According to manager, company doesn't sell paints from their showroom. Vendors used to replace dumpster themselves. The dumpster, full with waste was replaced with another dumpster having paint stuck on it. Due to high temperature, thick paint begun flowing after melting. Paint was flowing towards storm sewer system but did not reached out to the water bodies.

Conclusion:

All spills were small and particular violator could not identify due to lack of evidences, notice of violation did not issue.

Notifications:

Citation Code Section: NA

Citation Narration: NA

NOV Issued: Y / N

NOV # : NA

EnerGov Case # : NA

Photos:

Spill-1, before and after inspection



Spill-2,



Spill-3



Outfall Tracking



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WATERSHED BRANCH
ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM
5 COUNTY COMPLEX COURT, SUITE 170
PRINCE WILLIAM, VA 22192-5308
OFFICE: 703-792-7070 FAX: 703-792-6297**

INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 33/2017	Date : 10/17/2017	Time : 10:30 AM
Business : Residential / Owner – Wells Fargo Bank	Report Completed By : Prem Poudel	
Address: 12124 Paper Birch Ln	City : Gainesville VA	Zip Code: 20155
Complain or Case Received From: Miss Keila Navarro on 10/17/2017, the administrative staff of Property Management Company sequoiamanagement.com, forwarded Citizen complaint regarding dumping clippings into storm sewer system to PWC Environmental Services.		

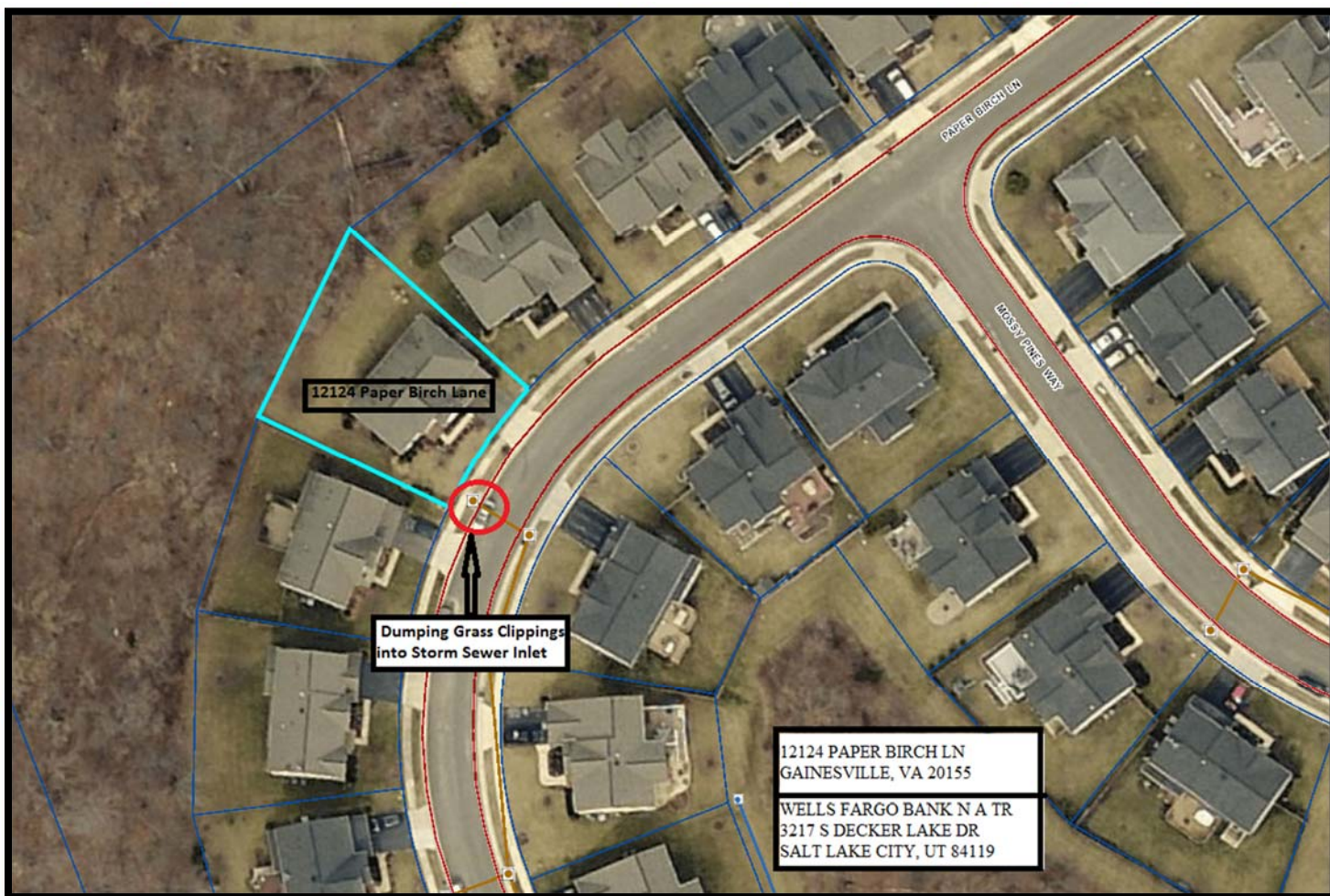
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

pH : Limit: NA	Conductivity : μ S/cm Limit:NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: NA	Color: NA
	Floatables: Sewage(Toilet Paper)	Stains: NA
		Turbidity: NA
		Other: Dumping Clippings

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: NA	Name:
Company: WELLS FARGO BANK	Company:
Address: 3217 S DECKER LAKE DR SALT LAKE CITY, UT 84119	Address:
Phone #:1-(800) 678-7986	Phone #:
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date: 10/17/2017	Date:
Time: 10:30	Time:
Name: Keila Navarro (Administrative Assistant)	Name:
Company/Agency: Sequoiamanagement.com	Company/Agency:
Notes: Ph- (703) 803 9641	Notes:

Comments/ Deficiencies:

Citizen complaint was forwarded to IDDE staff of Prince William County from Miss Keila Navarro, the staff of property management company sequoiamanagement.com . The site was visited on 10/17/2017.

Upon arrival, grass clippings found dumping into inlet of stormwater management system after mowing the yard of 12124 Paper Birch Lane. The volume of clippings is enough to block the drain. According to the complainant, the house has vacated since last two years. County record shows, the house is under the ownership of Wells Fargo Bank.

Conclusion:

Any grass clippings, mulch or yard waste that impedes or interferes with the free flow of stormwater is a violation of county code 23.2-4.1. Notice of Violation NOV#14-2017 is issued to the owner to remove clippings from stormwater inlet as soon as possible before 30 days of the date of violation issued.

Notifications:

Citation Code Section: Sec. 23.2-4.1

Citation Narration: Unlawful discharge to the stormwater system and waters of the county.

NOV Issued: Yes

NOV # :14-2017

EnerGov Case # : NA

Photos:







Follow up Inspection:

Follow up inspection made on 02/07/2018. The clippings removed and maintained drainage functional. The case has been closed.





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OFFICE: 703-792-7070 FAX: 703-792-6297**

INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 13/2017-18	Date : 9/21/2017	Time : 10:00 AM
Business : Lowe's Store	Report Completed By : Prem Poudel	
Address: 13720 Smoketown Rd.	City : Woodbridge, VA	Zip Code: 22192
Complain or Case Received From: PWC, Watershed Staff received a phone call from DEQ Staff regarding dumping fertilizer on the ground behind the Lowe's Store which is potential for being washed away into storm sewer system during rain events.		

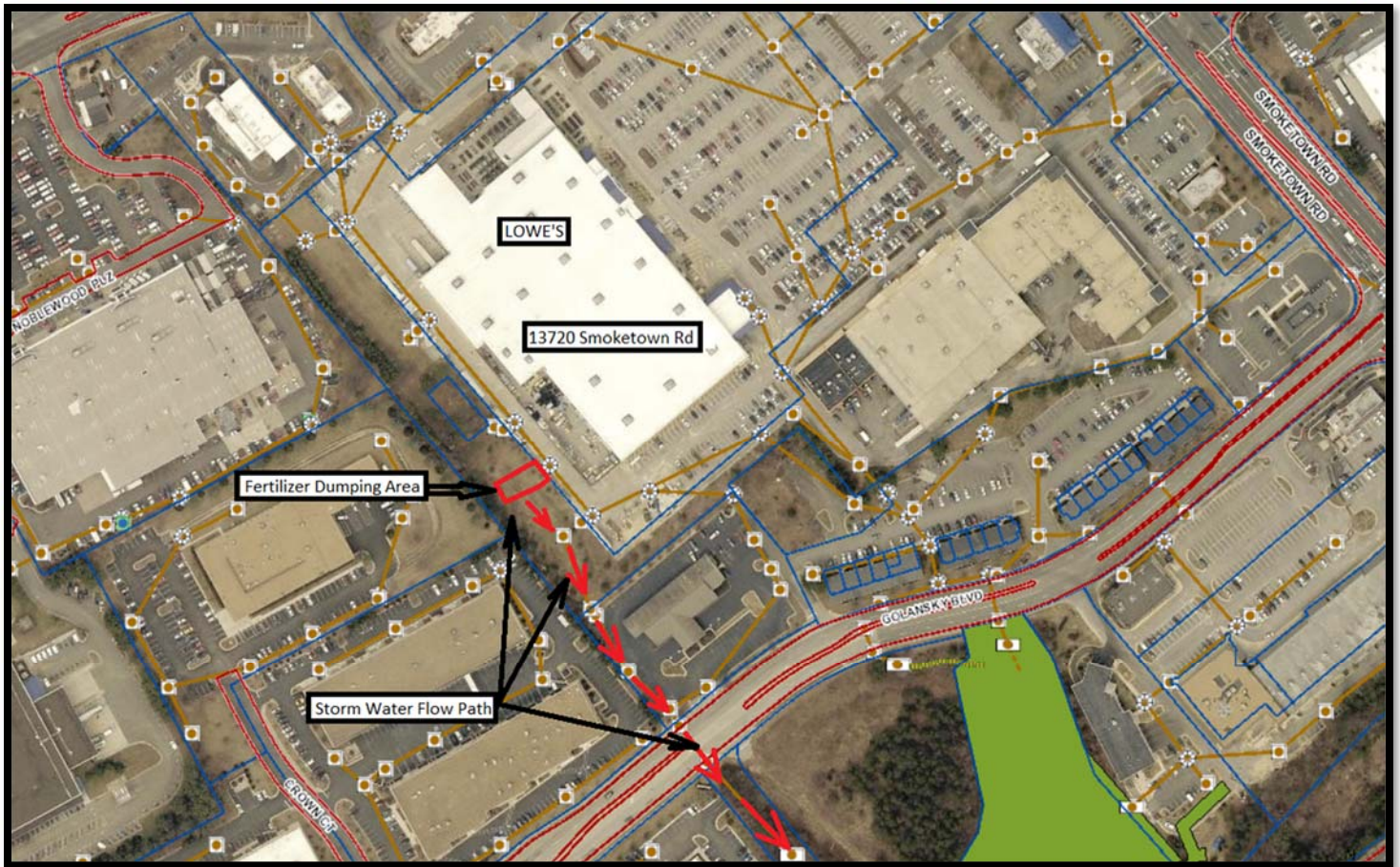
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

pH : NA Limit: NA	Conductivity : - μ S/cm Limit:NA		Temp.: °F Limit: NA
Discharge related Indicators	Odor: Choose an item.	Color: Choose an item.	Turbidity: Choose an item.
	Floatables: Sewage(Toilet Paper)	Stains: Choose an item.	Other: Fertilizer

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: NA	Name:
Company: Lowe's Store	Company:
Address: 13720 Smoketown Rd.	Address:
Phone #: 703-586-4000	Phone #:
Note: The Manager Mr. Anthony Johnston	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

The Lowe's Store located at 13720 Smoketown Road was inspected on 09/21/2017. The fertilizer found to be dumped over the ground behind the Lowe's store. The grass found to be dead with some residual fertilizer. Following inspection, meeting made with the Manager Mr. Anthony Johnston about the case. He agreed to correct deficiencies by removing residual fertilizer with establishment of grass on denuded areas.

Conclusion:

NOV was issued to correct deficiencies within 30 days after getting violation letter.

Notifications:

Citation Code Section: 23.2-4.1

Citation Narration: Unlawful discharge to the stormwater system and water of the county.

NOV Issued: Y / N	NOV # : 13-2017	EnerGov Case # :
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Photos:



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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 24/2017-18	Date : 1/16/2018	Time : 2:45 PM
Business : Parking Lot besides Kohl's	Report Completed By : Prem Poudel	
Address: 6450 Trading Square	City : Haymarket, VA	Zip Code: 20169
Complain or Case Received From: Prince William County Watershed Staff received a salt dumping case at parking lot of 6450 Trading Square, Haymarket forwarded by the Department of Fire and Rescue Battalion Chief Mr. Doug A. McCabe on 01/16/2017. Upon arrival, salt pile observed uncovered/non-confined on parking lot and white salt stain directed towards storm sewer system. By the evidence, the runoff with concentrated salt should have flown into storm sewer system in previous rainfall events.		

Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

pH : NA Limit: NA	Conductivity : - μ S/cm Limit:NA		Temp.: °F Limit: NA
Discharge related Indicators	Odor: Choose an item.	Color: Choose an item.	Turbidity: Choose an item.
	Floatables: Others	Stains: White	Other: Salt

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: NA	Name: Matt Pastor (Regional Property Manager)
Company: Haymarket (E&A) LLC	Company: EDENS
Address: PO BOX 528 Columbia, SC 29202	Address:7200 Wisconsin Avenue, Suite 400 Bethesda, MD 20184
Phone #:	Phone #: (301) 347-3971 Fax: (301) 652-3588
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

The pile found to be influenced with previous rainfall to create a runoff with high concentrated salt, which ultimately entered into storm sewer system. The concentrated salt solution supposed to be a source of pollutant in storm water system, which affect the plant and aquatic life in a creek and river. The deficiency needs to be addressed by the property owner with following actions:

- 1) Immediately clean salt stain and residual debris from the pavement and dispose properly without allowing discharge into storm sewer system.
- 2) Control pollutant on site after notification.
- 3) Remove salt pile from the parking lot. The storage of salt for the use of property owner should keep under the roof or confined space if needed.

Conclusion:

The violator requested to address deficiency as mentioned above however due date of final mitigation mentioned in NOV within 30 days after getting violation letter.

Notifications:

Citation Code Section: 23.2-4.1

Citation Narration: Unlawful discharge to the stormwater system and water of the county.

NOV Issued: Y / N

NOV # : 1-2018

EnerGov Case # :

Photos:





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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 37/2017-18	Date : 3/28/2018	Time : 11:48
Business : Neabsco Creek at Cloverdale Park	Report Completed By : Prem Poudel	
Address: 15150 Cloverdale Rd	City : Woodbridge VA	Zip Code: 22192
Complain or Case Received From: PWC Park and Recreation Staff Mr. D'Elia Tom noticed dead fish in Neabsco creek at cloverdale on 03/27/2018. The case was Forwarded by Mr. Kevin Flickinger, the Manager of Park and Recreation with two Pictures and received at Environmental Services on 03/28/2017.		

Photo of discharge:

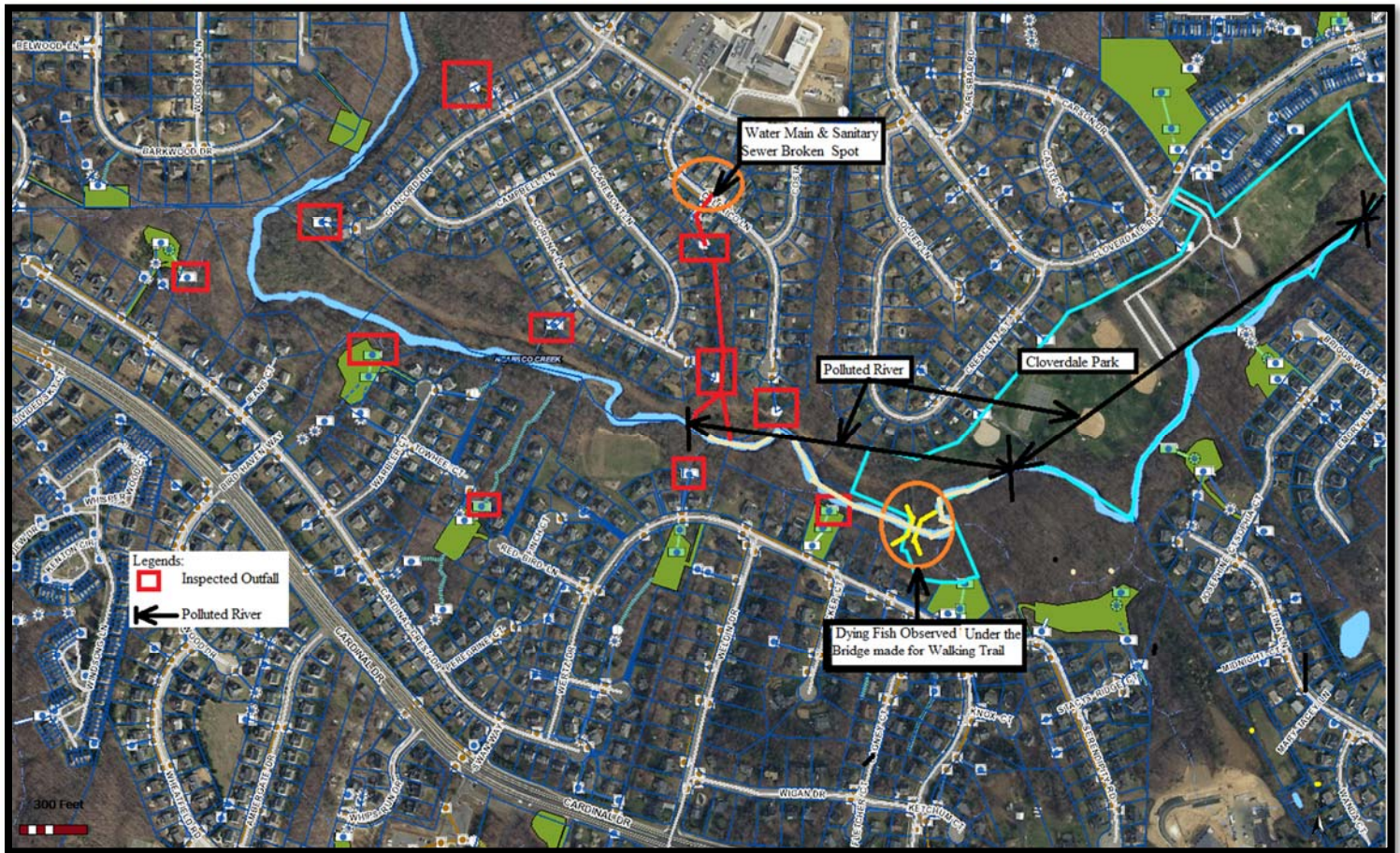


Onsite Water Quality Test performed: Choose an item.

If yes, observed results:

PH: 8.8 Limit: Std.	Conductivity : 1085 μ S/cm Limit: Exceed		Temp.: 62 °F Limit: Std.
Discharge related Indicators	Odor: Slightly Unusable	Color: Yellow	Turbidity: Slight Cloudiness
	Floatables: NA	Stains: NA	Other: Choose an item.

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name:	Name: NA
Company: Virginia American Water	Company:
Address:	Address:
Phone #: 703-670-8243	Phone #:
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?) - NA	
Date: 4/5/2018	Date:
Time: 1:30PM	Time:
Name: Danny Hill	Name:
Company/Agency: Virginia American Water	Company/Agency:
Notes: Will contact us in the future	Notes:

Comments/ Deficiencies:

After the notification of dying fish in a Neabsco Creek near Cloverdale Park, a field inspection was made on March, 28 and 29. The outfalls indicted with red rectangles were inspected to find out the possible source. During inspection, indicators of high water were observed at the creek located between Claremont and Calexico Ln. The water mark was clearly visible with gulley formation, and layer of down grass. Virginia American Water is suspected to have sanitary leakage at catchment drainage area.

Interview made with local residents was done. The first interview was resident at 3803 Corona Ln. She gave the information about flood happened in aforementioned creek on 3/19/2018 due to water main leakage at Calexico Ln. Second interview made with a resident of 15112 Calexico Ln. According to her, the water main leakage happened on 3/18/2017. Initially, they have a problem of water main leakage at Calexico Ln, nearby the house 15107. According to her, complaint made to VA American Water regarding water main leakage. The construction crews started to fix the problem but sanitary sewer had broken down while doing maintenance. Then combined effluent continued to flow into the storm sewer system for about 4 hours.

Conclusion:

The incident was found to happen unintentionally and was fixed as quickly as possible. Few dead fish retained at bed and some live fish observed during inspection. Virginia American Water was contacted and agreed to notify PWC Environmental Services in the future if similar incidents occur. Since the leak was repaired before it was reported to PWC, no further action is necessary at this time.

Notifications:

Citation Code Section:

Citation Narration:

NOV Issued: No

NOV # :NA

EnerGov Case # : Na

Photos:



Dying Fish observed at Creek under the Bridge





Dead Fish under
the Ripple Water



Dead Fish under
the Ripple
Water



Location of Maintenance of Unusual Discharge (15107 Calexico Ln)



Location of Maintenance of Unusual Discharge (15107 Calexico Ln)



Erosion made by flood at vehicular track and diverted towards river



Erosion made by flood at vehicular track and diverted towards river



Erosion at downstream channel



Erosion at downstream channel



Erosion at downstream channel

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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 21/2017	Date : 12/12/2017	Time : 02:00 PM
Business : Residential	Report Completed By : Prem Poudel	
Address: 16109 Olmstead Ln	City : Woodbridge, VA	Zip Code: 22191
Complain or Case Received From: PWC, Environment Services staff got a citizen complaint regarding discharge of yard clippings into storm sewer system by a landscapers after collecting and grinding at the property 16109 Olmstead Ln. The landscaper is also a resident of 16100 Kennedy Street.		

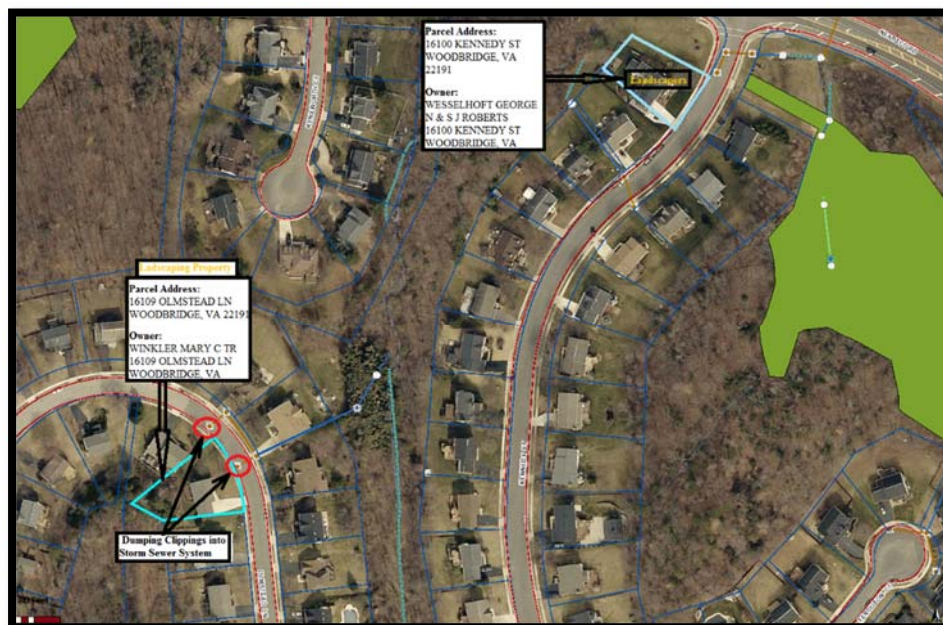
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

pH : Limit: NA	Conductivity : μ S/cm Limit: NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: NA	Color: NA
	Floatables: NA	Stains: NA
		Other: Dumping Clippings

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: Winkler Mary	Name: Wesselhoft, George N.
Company: Home Owner	Company: Landscapers
Address: 16109 Olmstead Ln	Address: 16100 Kennedy Street
Phone #: NA	Phone #: NA
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:
Comments/ Deficiencies:	
<p>A citizen complaint regarding dumping leaf clippings into storm sewer system from property 16109 Olmstead Lane had received on 12/12/2017. Inspection performed on same day.</p> <p>Upon arrival, grass clippings found dumping into storm sewer system through curb and gutter inlets located nearby the reported property. The landscaper Mr. George could not meet on site and met him at his house located at 16100 Kennedy Street. He took responsibility for dumping but he showed his ignorance about dumping dead leaf clippings is an illegal activities. Undersigned advised him to bring back all clippings from storm sewer system and dispose properly. Interaction made with Mr. George and education materials were hand over him to make aware for future.</p>	
Conclusion:	
<p>Dumping clippings into storm sewer system is a violation of county code 23.2-4.1. Notice of violation did not issue since the violator, Mr. George has accepted his fault and ready to mitigate the deficiencies. He promised to stop repetition.</p>	

Notifications:

Citation Code Section: Sec. 23.2-4.1 (a)(2)

Citation Narration: Any person dumping grass clippings, mulch, or yard waste, animal carcasses and other wastes into the storm sewer system shall be an unlawful activities cited county ordinance Sec. 23.2-4.1 (a)(2).

NOV Issued: NA

NOV # :NA

EnerGov Case # : NA

Photos:







PRINCE WILLIAM COUNTY DEPARTMENT OF PUBLIC WORKS
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 OFFICE: 703-792-7070 FAX: 703-792-6297

INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 21/2017-18	Date : 12/8/2017	Time : 3:00 PM
Business : Residential	Report Completed By : Prem Poudel	
Address: 18878 Pier Trail Drive	City : Triangle, VA	Zip Code: 22172
Case Detail: Prince William County (PWC) Environmental Services Staff Gillespie, Daniel observed a white stain at outfall on 12/8/2017.		

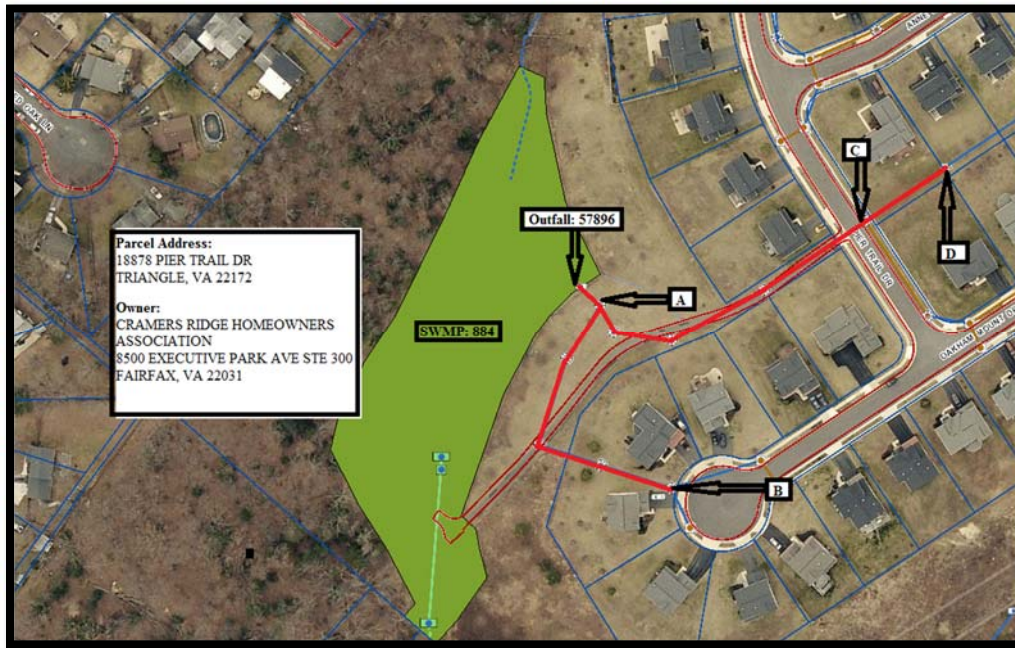
Photo of discharge:



Onsite Water Quality Test performed: NA If yes, observed results:

PH: NA Limit NA	Conductivity (µS/cm): NA Limit:NA	Temp.: °F Limit: NA
Discharge related Indicators	Odor: NA	Color: NA
	Floatables: NA	Stains: NA
		Deposits: White Stain

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: NA	Name:
Company:NA	Company:
Address:NA	Address:
Phone #: NA	Phone #:
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:
<u>Comments/ Deficiencies:</u>	
<p>Upon arrival, white stain observed at the bottom concave of outfall 57896 on 12/8/2017. The white stain was wet and possible to collect sample for laboratory test. Disperse white stain was observed on Riprap placed around outfall. Tracking had complited but there was no evidence of spill at upstream successive manhole located at 30 feet from the outfall. Tracking had complited upto upstream possible dumping points but signs of dumping did not find. There was no adverse effect on grass and pond.</p>	
<u>Conclusion:</u>	
Follow up inspection will continue for further investigations.	

Notifications:

Citation Code Section:		
Citation Narration:		
NOV Issued: NO	NOV # : NA	EnerGov Case # : NA

Photos:



**PRINCE WILLIAM COUNTY DEPARTMENT OF PUBLIC WORKS
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INCIDENT/TRACKDOWN FORM

INCIDENT INFORMATION		
Incident Report #: 28/2017-18	Date : 2/6/2018	Time : 9:45 AM
Business : Residential	Report Completed By : Prem Poudel	
Address: 15601 Forest Grove Drive	City : Woodbridge, VA	Zip Code: 22191
Complain or Case Received From: PWC Watershed staff got an anonymous complaint regarding dumping asphalt tar into storm water system in Armitage Court on 2/5/2018.		

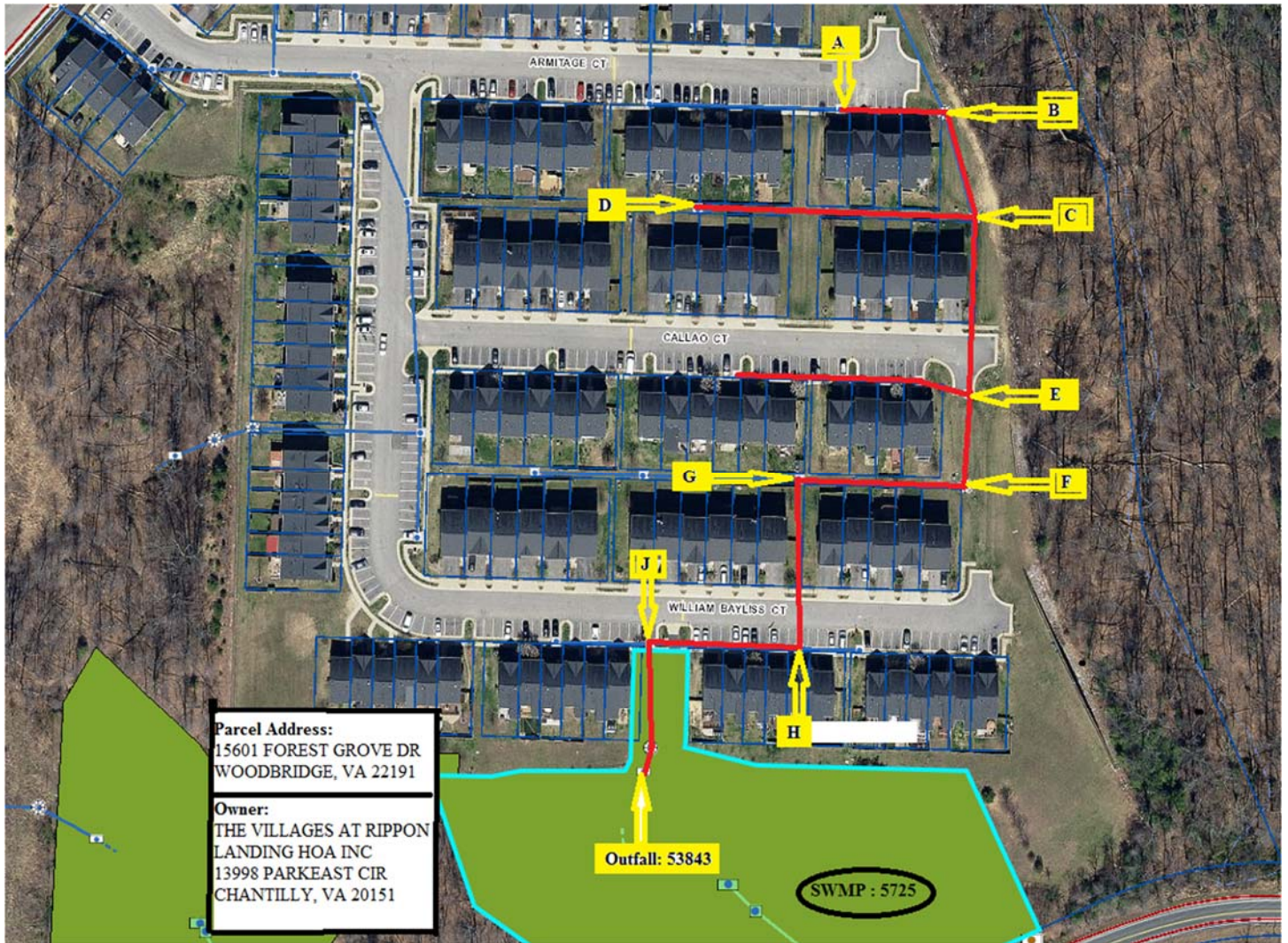
Photo of discharge:



Onsite Water Quality Test performed: Yes If yes, observed results:

pH: 7.4 Limit: Std.	Conductivity: 218 μ S/cm Limit: Std.	Temp.: 52°F Limit: Std.
Discharge related Indicators	Odor: NA	Color: NA
	Floatables: NA	Stains: NA
		Turbidity: No Color
		Other: NA

Map of Trackdown Path:



Responsible Party (Owner/ Institutions)	Other Party (Management Company)
Name: NA	Name: NA
Company:	Company:
Address:	Address:
Phone #:	Phone #:
Note:	Note:
Notification/Contact (Other agencies contacted (DEQ, NS, FMO?))	
Date:	Date:
Time:	Time:
Name:	Name:
Company/Agency:	Company/Agency:
Notes:	Notes:

Comments/ Deficiencies:

Upon arrival, reported asphalt tar discharge did not find into storm water system except a dry petroleum stains on parking lot in front of inlet. Storm sewer system had tracked from complaint points "A". Manhole lid could not open at A, since lid did not detached with frame. Very negligible flow observed at manhole "B". At Manhole "C", discharge observed from CB and CD branches but Manhole D was dry. In downstream sewer, flow observed along sewer CEF GHJ and released through outfall 53843 into SWMP 5725. The discharge was clear with no color and odor with standard pH and Conductivity. The ground was moist due to rainfall happened prior field investigations. Discharge supposed to generate due to ground seepage.

Follow up inspection will continue in dry weather for further investigations.

Conclusion:

Ground water is a natural and a non- illicit discharge resource.

Notifications:

Citation Code Section: NA

Citation Narration:

NOV Issued: NA

NOV # : NA

EnerGov Case # : NA

Photos:





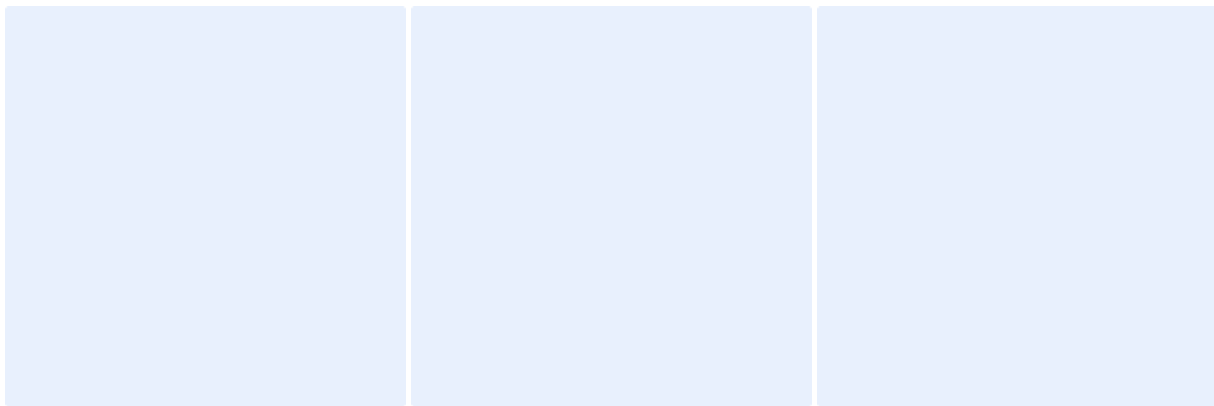
Appendix F – Spill Prevention and Response

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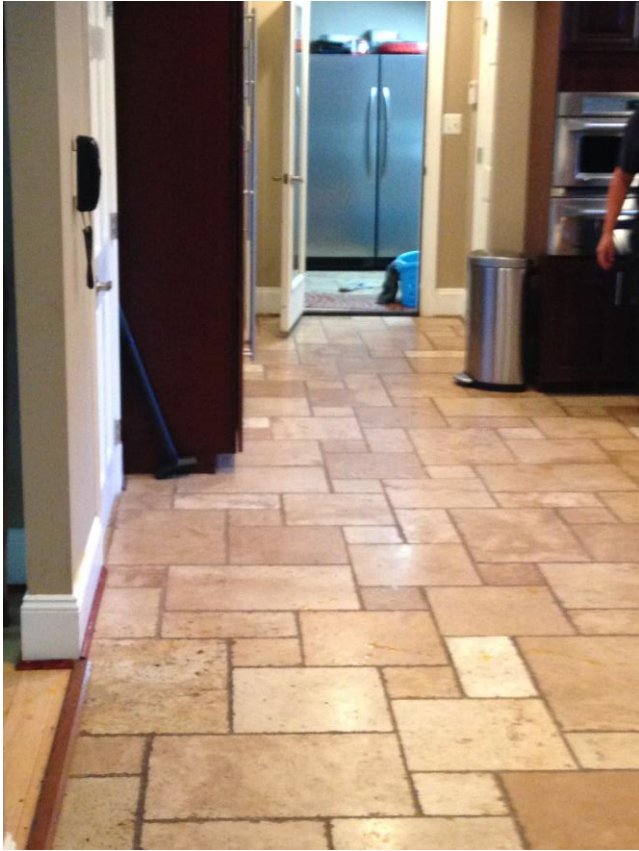
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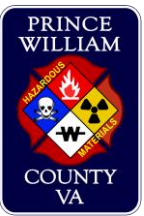
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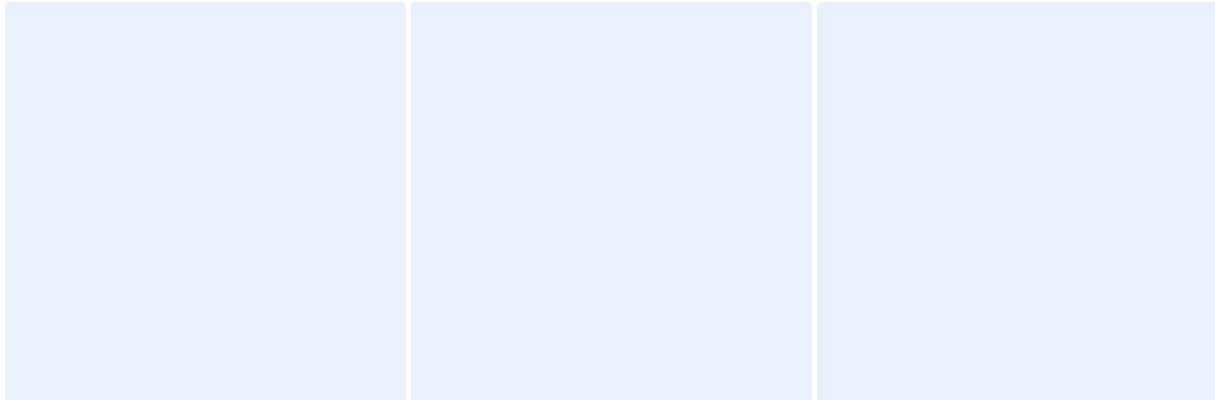
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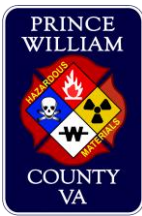
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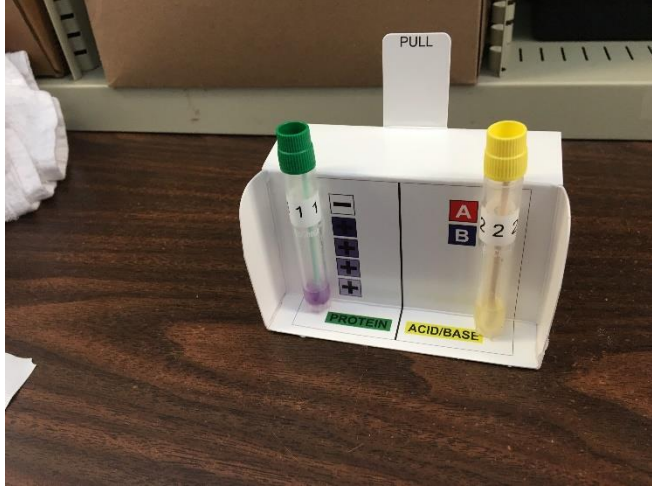
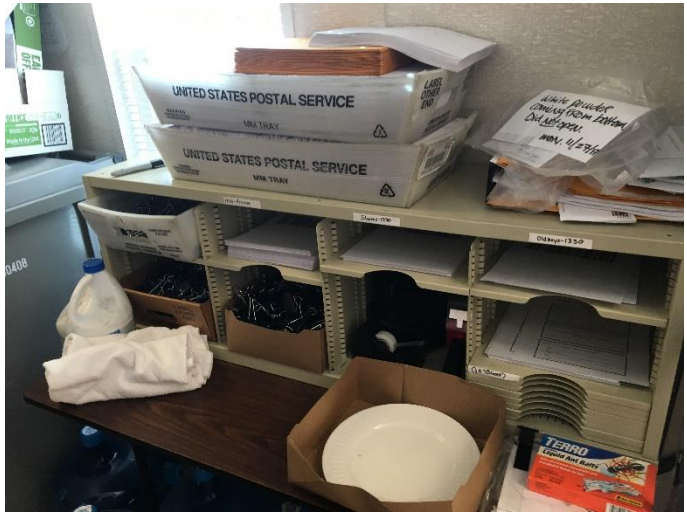


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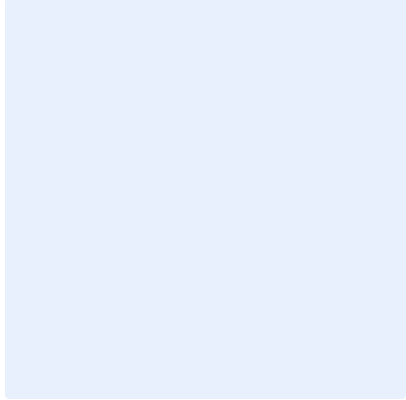
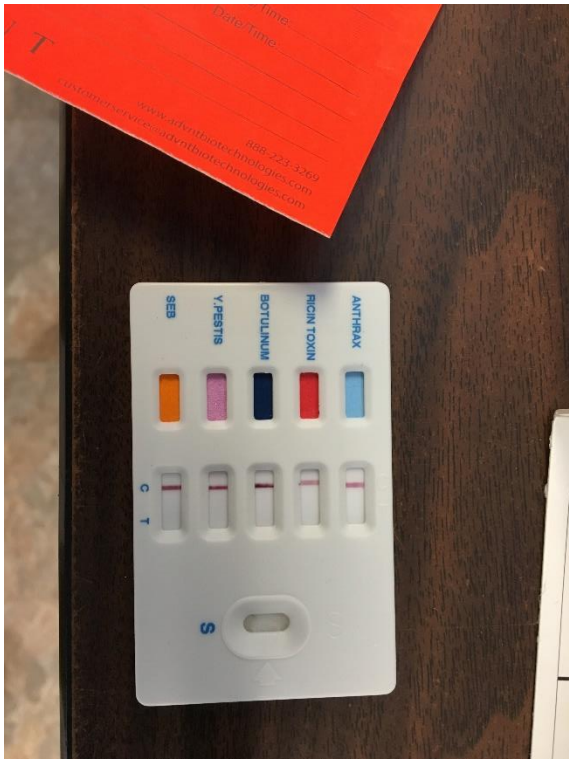
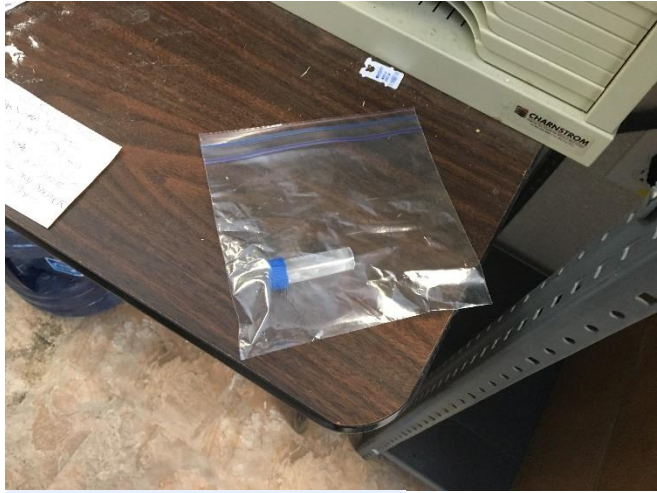
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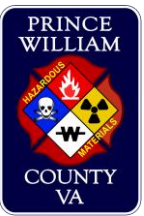


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<p> <input type="checkbox"/> Duty <input type="checkbox"/> at <input type="checkbox"/> on <input type="checkbox"/> received a <input type="checkbox"/> call from <input type="checkbox"/> Safety <input type="checkbox"/> from <input type="checkbox"/> saying a <input type="checkbox"/> owner received a <input type="checkbox"/> bag in <input type="checkbox"/> mail from an <input type="checkbox"/> party. <input type="checkbox"/> after <input type="checkbox"/> owner opened it they didn't realize that the <input type="checkbox"/> bag was sent to the wrong <input type="checkbox"/> room. <input type="checkbox"/> located <input type="checkbox"/> bag from <input type="checkbox"/> identifying it as <input type="checkbox"/> and <input type="checkbox"/> narcotic <input type="checkbox"/> officer took the <input type="checkbox"/> bag in <input type="checkbox"/> to the <input type="checkbox"/> Safety <input type="checkbox"/> cad <input type="checkbox"/> y <input type="checkbox"/> Safety <input type="checkbox"/> officer <input type="checkbox"/> M <input type="checkbox"/> it was <input type="checkbox"/> narcotic <input type="checkbox"/> officer at the <input type="checkbox"/> S <input type="checkbox"/> could confirm <input type="checkbox"/> on <input type="checkbox"/> our <input type="checkbox"/> instructions <input type="checkbox"/> identity of the <input type="checkbox"/> incident the <input type="checkbox"/> bag being the <input type="checkbox"/> and <input type="checkbox"/> RM <input type="checkbox"/> it had confirmed the <input type="checkbox"/> bag had contained <input type="checkbox"/> in <input type="checkbox"/> hydrochloride <input type="checkbox"/> maintained <input type="checkbox"/> of the <input type="checkbox"/> product. </p>	
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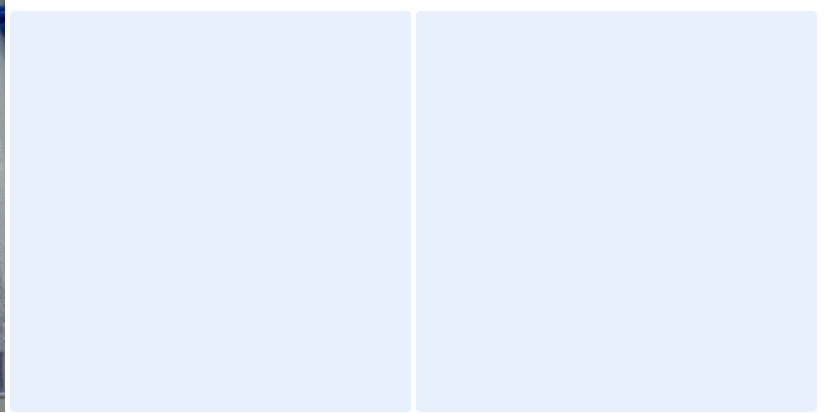
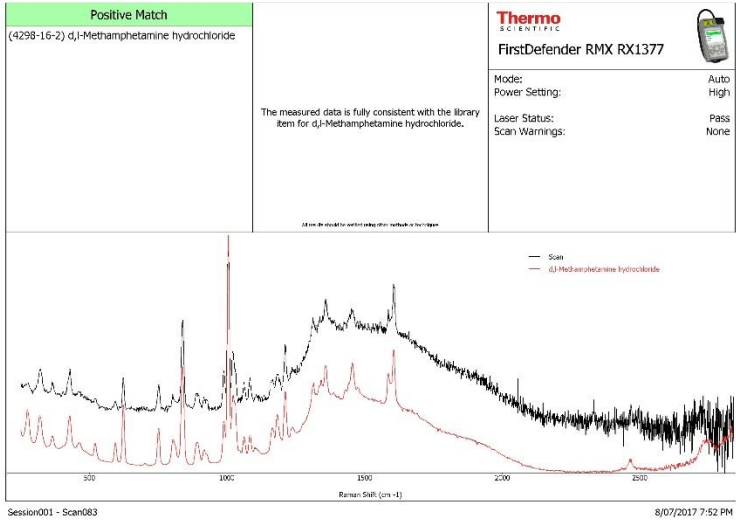
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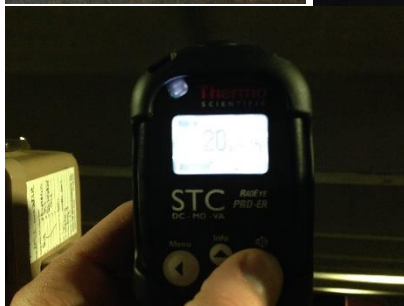
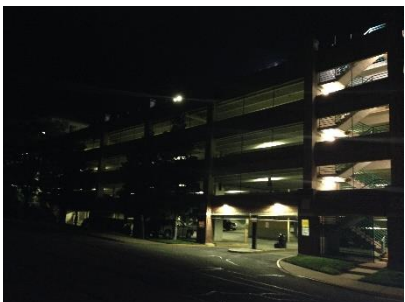
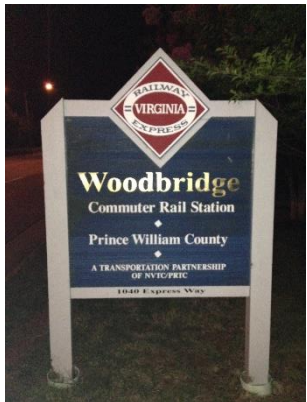


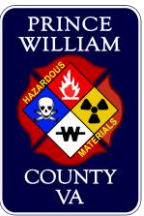
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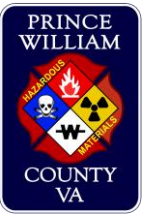


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Incident Report Form
 Date: _____
 Location: _____
 Incident Type: _____
 Reported By: _____
 Incident Number: _____

Incident Report Form	
Date of Incident: _____	Time: _____
Location: _____	City: _____
Reported By: _____	Incident Type: _____
Motor Vehicle Responding: _____ Fire Department Responding: _____ Other Agency Responding: _____	

Investigation Notes	
An investigation was conducted and a person was interviewed on _____. The person stated that they had heard out onto the ground at the location. She also stated that there were no actions taken and no one was injured and that they only wanted a consult to address their concern. The person responded as a courtesy and found no records of product and no action was needed. By your instructions, I am to add an owner of the unit to the address and a warrant.	
Name	Address
_____	_____
_____ Virginia Scrap Corporation	_____
_____	_____
_____	_____
_____	_____

Witness Information	
Name: _____	Address: _____
City: _____	City: _____
Area: _____	Area: _____
Agency: _____	Agency: _____
Other: _____	Other: _____
Name: _____	Address: _____
City: _____	City: _____
Area: _____	Area: _____
Agency: _____	Agency: _____
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**PRINCE WILLIAM COUNTY
DEPARTMENT OF FIRE AND RESCUE
HAZARDOUS MATERIALS RESPONSE PROGRAM
INCIDENT REPORT FORM**



INCIDENT INFORMATION	
Fire Dept. Incident #: 170028646	Date: 9/15/2017
Location: 7402 Sudley Rd Manassas VA	Time: 1124
Report Completed By: T.Forbes	Incident Commander: T.Forbes
HM 506 Personnel Responding: T. Forbes, D. Bell, L.Yanike, Z.Markley HS 516 Personnel Responding: Other HMT Personnel Responding:	

INCIDENT DESCRIPTION	
<p>I was notified by HMO502 of a fuel spill at 7402 Sudley Rd Manassas VA, she stated that earlier this morning a customer over filled their vehicle and spilled gasoline on the ground. Hazmat 506 responded to the above address and met with the manager of the Raceway gas station. He stated that a customer was overfilled their vehicle and spilled up to 33.89 gallons (total amount dispensed). The manager of the gas station contacted Raceway emergency help number that contracted with Atlas Environmental to clean up the spilled gasoline. Atlas Environmental representative stated that the gasoline ran down the parking lot and entered the storm drain on the south side the parking lot, and traveled in the storm drain to the other side of 7421 Sudley Rd (Dunkin Donut). The Atlas environmental representative stated that he believed that 5 to ten gallons of gas was spilled. Hazmat 506 personnel monitored the area and the storm sewer and obtained normal reading Race way parking lot, the storm sewer in the Dunkin Donuts parking lot had an LEL of 2% when it was first monitored. We continued to monitor the storm sewer and the reading quickly returned to normal readings. The gasoline odor dissipated the area as Atlas Environmental attempted to recover any product in the storm sewer. HM506 personnel spoke with employees at that gas station and the Dunkin Donuts.</p>	
RESPONSIBLE PARTY	OTHER PARTY
Name: Jaliya Weera	Name:
Company: Raceway Gas	Company:
Address: 7402 Sudley Rd	Address:
Phone#: (703) 330-4988	Phone#:
Notes: Called Race way emergency number when the spill happened.	Notes:

NOTIFICATIONS/CONTACTS	
Date: 09/15/2017	Date: 09/15/2017
Time:	Time:
Name: Race way Emergency Help	Name: Daniel
Comp/Agency:	Comp/Agency: VA EOC
Notes: (800) 688 6199	Notes:
Date:	Date:
Time:	Time:
Name:	Name:
Comp/Agency:	Comp/Agency:
Notes:	Notes:

**PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT**

NOTIFICATIONS/CONTACTS	
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Time:	Time:
Name:	Name:
Comp/Agency:	Comp/Agency:
Notes:	Notes:

Additional Notes/Information:
HAZMAT Officer Comments:
Fire Marshal requested/on scene: <input checked="" type="checkbox"/> Lead Investigator: Lt. Greenfield

PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT



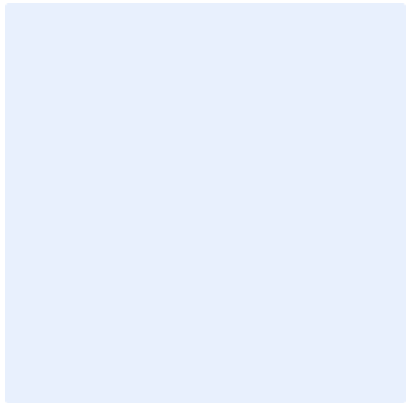
PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT



PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT



**PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT**



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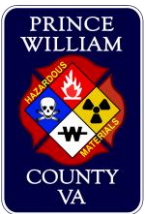


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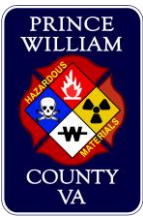
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SECTION 2 - ADDITIONAL INFORMATION

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PRINCE WILLIAM COUNTY FIRE RESCUE
 INCIDENT REPORT
 PRINCE WILLIAM COUNTY FIRE RESCUE
 INCIDENT REPORT

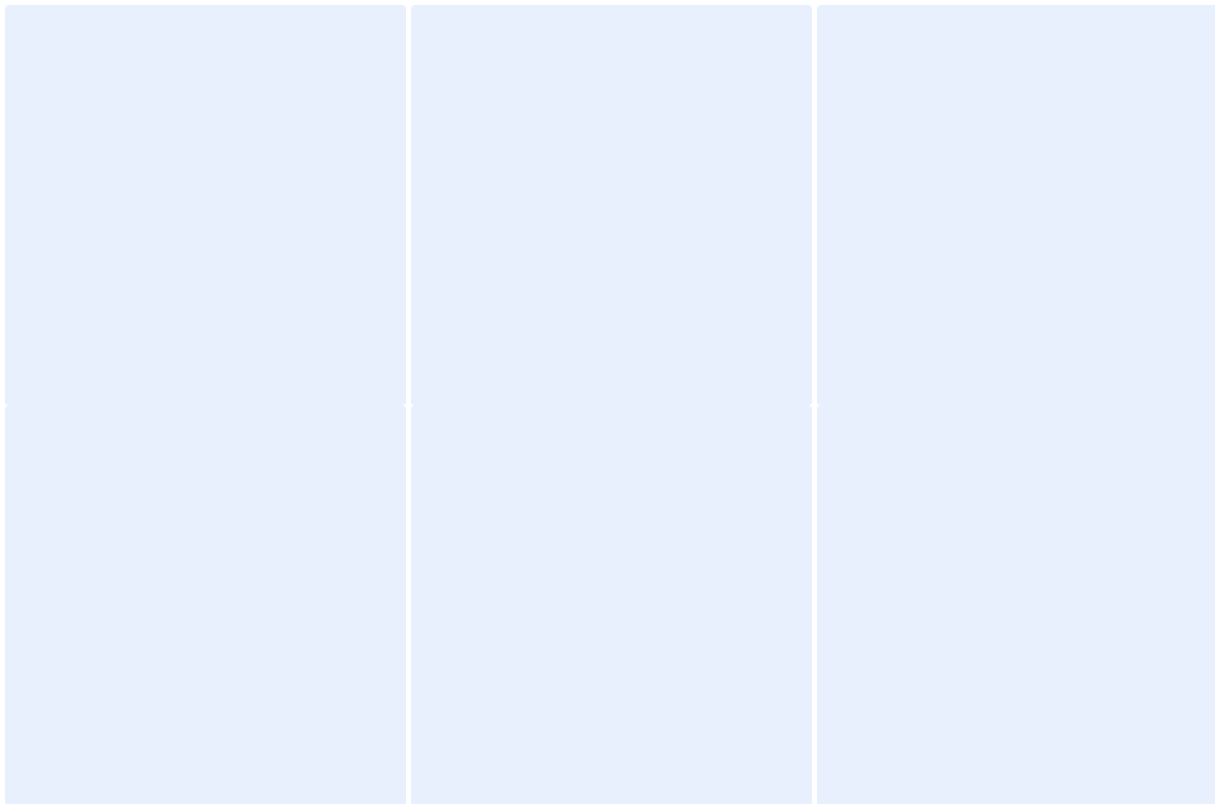
PRINCE WILLIAM COUNTY FIRE RESCUE	
Incident Date	Time of Incident
Location	City/Town
Reported by	Incident Type and Description
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PRINCE WILLIAM COUNTY FIRE RESCUE	
<p>Motor vehicle involved in an accident on the road. Driver lost control of vehicle and struck a tree. Driver was injured. Fire department responded to the scene. Firefighters performed extrication on the driver. Driver was transported to the hospital. Fire department advised that no other vehicles were involved in the accident. Fire department advised that the driver was not wearing a seatbelt. Fire department advised that the driver was not wearing a seatbelt. Fire department advised that the driver was not wearing a seatbelt.</p>	
Driver Information	Vehicle Information
Name	Name
Address	Address
City	City
State	State

PRINCE WILLIAM COUNTY FIRE RESCUE	
Name	Name
Address	Address
City	City
State	State
Zip	Zip
Phone	Phone
Insurance	Insurance
Other	Other
Name	Name
Address	Address
City	City
State	State
Zip	Zip
Phone	Phone
Insurance	Insurance
Other	Other
Name	Name
Address	Address
City	City
State	State
Zip	Zip
Phone	Phone
Insurance	Insurance
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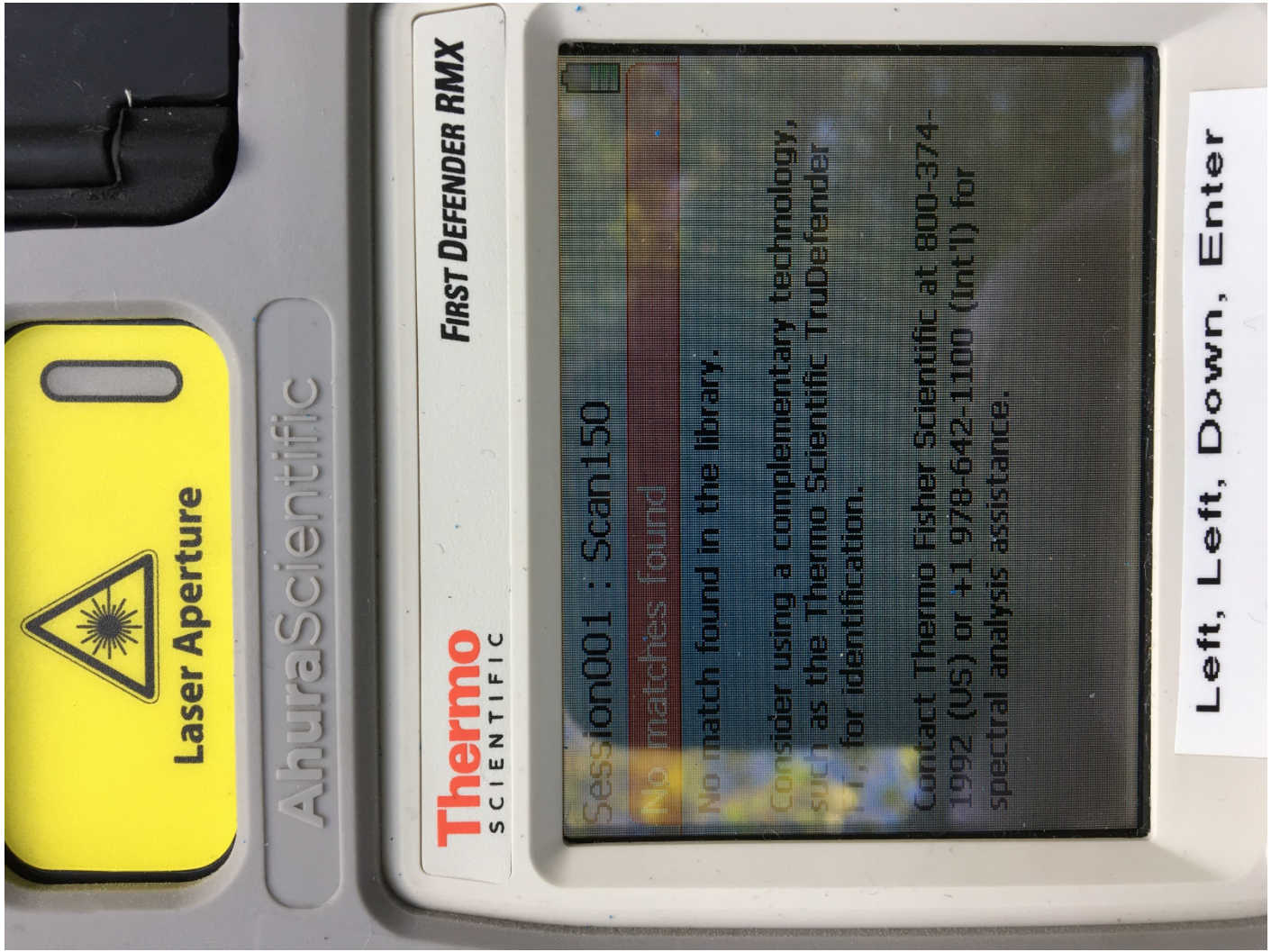
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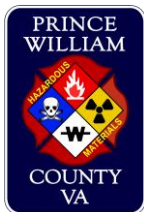


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PRINCIPLE OF SAFE MAINTENANCE
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PRINCIPLE OF SAFE MAINTENANCE	
Date of Incident: []	At: []
Location: Sudley Rd Magland Ln	City: []
Reported by: []	Incident type: []
<p><input type="checkbox"/> M [] Personnel Responding []</p> <p><input type="checkbox"/> S [] Personnel Responding []</p> <p><input type="checkbox"/> Other M [] Personnel Responding []</p>	

PRINCIPLE OF SAFE MAINTENANCE	
<p>The driver of the truck involved in the accident reported that on 10/15/11 he was driving a 2011 Freightliner truck with a 30-gallon spill of liquid. The driver stated that he was driving on Sudley Rd near Magland Ln. He stated that he noticed a spill of liquid on the road. He stated that he stopped the truck and used a tarp to try to catch the spill. He stated that the spill was a clear liquid. He stated that he used a tarp to try to catch the spill. He stated that the spill was a clear liquid. He stated that he used a tarp to try to catch the spill. He stated that the spill was a clear liquid.</p>	
SAFETY SUB	
Case # 2011-1111	Case #
Is there a driver's license?	Is there a driver's license?
Is there a driver's license?	Is there a driver's license?
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PRINCIPLE OF SAFE MAINTENANCE	
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City: []	City: []
Area: []	Area: []
Agency/Department: []	Agency/Department: []
Reported by: []	Reported by: []
At: []	At: []
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Area: []	Area: []
Agency: []	Agency: []
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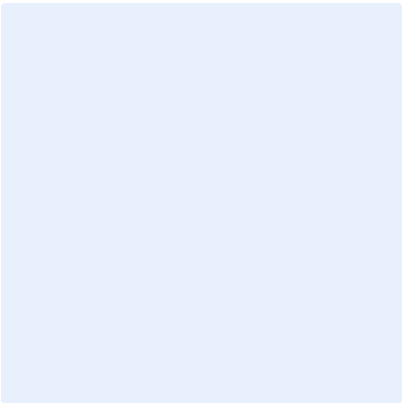
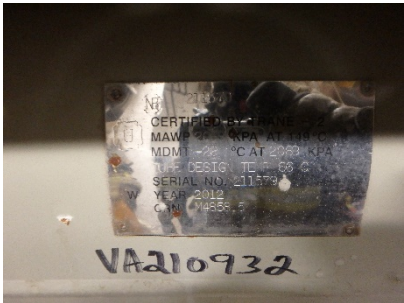
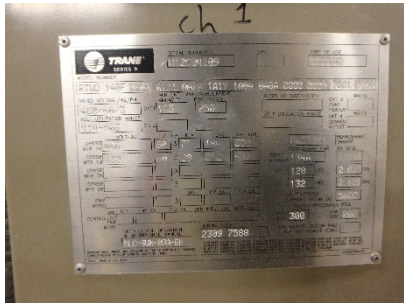
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Date of Incident: _____	Date: _____
Location: _____	City: _____
Report Date: _____	Incident Date: _____
Personnel Responding: M: _____ S: _____ M: _____	

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<p> On _____ at _____ and _____ M _____ reported to _____ Middle School for a report of a leak of an unknown gas in a mechanical room upon arrival and setting initial unit detection earlier for a fire alarm. _____ officer advised that they received a report of an odor of natural gas. _____ reported a _____ at the school to utilize a manual pull station to activate the fire alarm. _____ also received information that a refrigerant alarm had activated but it was unknown if it was a leak or if it went into alarm. _____ the fire alarm activation. _____ entered the mechanical room a reading of _____ was noted on their four gas monitor but all other readings were normal. _____ also noted an alarm of refrigerant monitoring system. _____ a unit in _____ on a refrigerant monitoring system. _____ at unit arrival _____ requested initial unit test _____ investigating to identify _____ emergency _____ a precaution _____ at _____ and _____ established the entry team to monitor the room. _____ on the refrigerant monitoring system and a natural gas was found to occur. _____ at entry _____ and _____ advised _____ Malon _____ Mat _____ and _____ at entry _____ and _____ advised _____ Sa _____ and _____ St _____ filled the four _____ Supervisor _____ R _____ filled chemical references and mechanical safety. Incident _____ and _____ had _____ on the hydrant to provide for a safety coil line and to provide _____ in _____ area _____ at entry _____ entered the school room _____ at _____ entry _____ staying out _____ _____ R _____ entry _____ _____ monitored the hallway with all normal readings on the four gas monitor. _____ M _____ _____ S _____ and no change on all other monitors. _____ at entry _____ and _____ had normal readings in _____ mechanical room on all _____ and confirmed that there was no active alarm of refrigerant monitoring system. _____ R _____ at _____ in _____ that there was no hazardous material. _____ incident was turned back over to the school. </p>	
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_____ _____ Rd _____	_____
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Date: _____	Date: _____
City: _____	City: _____
Name: Brian Miller	Name: _____
Agency: _____	Agency: _____
Contact: _____	Contact: _____

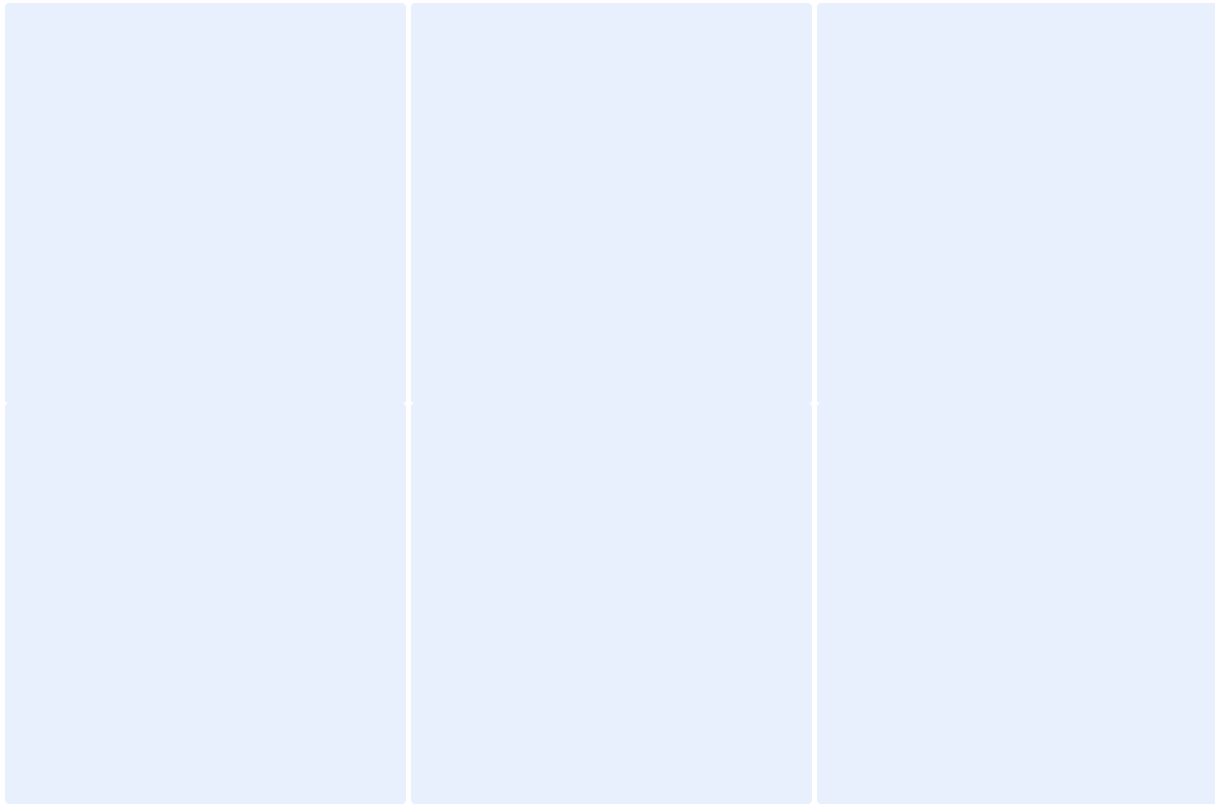
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<p>M received a phone call from [redacted] that a person could find a loading dock area with a container that could hold approximately 500 gallons of liquid. The person reported that approximately 500 gallons had leaked onto the ground. The person had been injured and was no longer breathing. The person had leaked into the building through the rear door and out the front door. The person had placed a container on the ground inside the building and monitored the area. The person stated that they got an oxygen in one of the corners of the building and no one had advised that they were ventilating the structure and had advised to give the property owner information. The person had no card or ID to the building. M decided that there was no need to go to the scene. M advised that a container being placed on a loading dock area or than likely not properly placed to contact the duty fire marshal. M was placed on the call.</p>	
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Phone	Phone
Address	Address
Occupation	Occupation
Notes	Notes

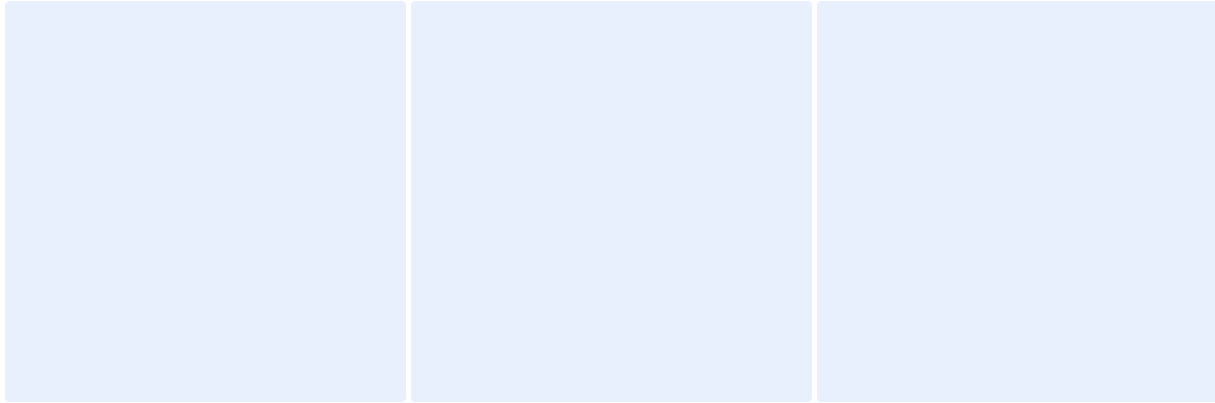
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Date of Incident	Date
Location	City
Reported by	Incident number and name
M Responding S Responding M Responding	

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<p>Responding to a call of a gallon propane tank that was leaking. Responding to a home consult. Responding to the call. Responding arrived on scene to find a gallon tank venting. Responding investigated and found the residential propane tank was leaking. Responding monitored around the tank and got normal readings. Construction company had a meter on the third floor that was connected to the propane tank. Meter was turned on to turn off the product so that it could do down the leak. Once the meter was running the venting stopped. Responding waited on scene until Curran arrived on scene. Scene was turned over to the</p>	
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Name	Name
Company	Company
Address	Address
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SAFETY DATA SHEET



1. Identification

Covestro LLC
1 Covestro Circle
Pittsburgh, PA 15205
USA

TRANSPORTATION EMERGENCY

CALL CHEMTREC: (800) 424-9300
INTERNATIONAL: (703) 527-3887

NON-TRANSPORTATION

Emergency Phone: Call Chemtrec
Information Phone: (844) 646-0545

Product Name: MONDUR MR LIGHT
Material Number: 83186292
Chemical Family: Aromatic Isocyanate
Use: Di-/polyisocyanate components for the production of polyurethanes

2. Hazards Identification

GHS Classification

Acute toxicity (Inhalation): Category 4
Specific target organ toxicity - single exposure: Category 3 (Respiratory system)
Respiratory sensitisation: Category 1
Specific target organ toxicity - repeated exposure: Category 1 (Respiratory Tract)
Skin irritation: Category 2
Skin sensitisation: Category 1
Eye irritation: Category 2B

GHS Label Elements

Hazard pictograms:



Signal word: Danger

Hazard statements: Harmful if inhaled.
May cause respiratory irritation.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Causes skin irritation.
May cause an allergic skin reaction.
Causes eye irritation.
Causes damage to organs (Respiratory Tract) through prolonged or

Material Name: MONDUR MR LIGHT

83186292

repeated exposure if inhaled.

Precautionary statements:

Prevention:

Avoid breathing dust, mist, gas, vapors or spray.
Do not eat, drink or smoke when using this product.
Wash skin and face thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Contaminated work clothing must not be allowed out of the workplace.
Wear protective gloves.
In case of inadequate ventilation wear respiratory protection. The type of respiratory protection selected must comply with the requirements set forth in OSHA's Respiratory Protection Standard (29 CFR 1910.134) or regional standards. For additional details, see section 8 of the SDS.

Response:

Get medical attention if you feel unwell.
IF ON SKIN: Wash with plenty of soap and water.
If skin irritation or rash occurs: Get medical attention.
Wash contaminated clothing before reuse.
IF IN EYES: Rinse cautiously with water for several minutes.
Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists: Get medical attention.
IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.
If experiencing respiratory symptoms: Call a doctor or emergency medical facility (i.e. 911).

Storage:

Store locked up.
Store in a well-ventilated place. Keep container tightly closed.

Disposal:

Dispose of contents and container in accordance with existing federal, state, and local environmental control laws.

3. Composition/Information on Ingredients

Hazardous Components

<u>Weight Percent</u>	<u>Components</u>	<u>CAS-No.</u>	<u>Classification</u>
58%	Polymeric Diphenylmethane Diisocyanate (pMDI)	9016-87-9	Acute toxicity Category 4 Inhalation. Skin irritation Category 2. Eye irritation Category 2B. Respiratory sensitisation Category 1. Skin sensitisation Category 1. Specific target organ toxicity - single exposure Category 3 Respiratory system. Specific target organ toxicity - repeated exposure Category 1 Respiratory Tract.

Material Name: MONDUR MR LIGHT

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38%	4,4'-Diphenylmethane Diisocyanate (MDI)	101-68-8	Acute toxicity Category 4 Inhalation. Skin irritation Category 2. Eye irritation Category 2B. Respiratory sensitisation Category 1. Skin sensitisation Category 1. Specific target organ toxicity - single exposure Category 3 Respiratory system. Specific target organ toxicity - repeated exposure Category 1 Respiratory Tract.
3.8%	2,4'-Diphenylmethane Diisocyanate (MDI)	5873-54-1	Acute toxicity Category 4 Inhalation. Skin irritation Category 2. Eye irritation Category 2B. Respiratory sensitisation Category 1. Skin sensitisation Category 1. Specific target organ toxicity - single exposure Category 3 Respiratory system. Specific target organ toxicity - repeated exposure Category 1 Inhalation Respiratory Tract.
0.2%	2,2'-Diphenylmethane Diisocyanate	2536-05-2	Acute toxicity Category 4 Inhalation. Skin irritation Category 2. Eye irritation Category 2B. Respiratory sensitisation Category 1. Skin sensitisation Category 1. Specific target organ toxicity - single exposure Category 3 Respiratory system. Specific target organ toxicity - repeated exposure Category 1 Inhalation Respiratory Tract.

4. First Aid Measures

Most Important Symptom(s)/Effect(s)

Acute: Diisocyanate vapors or mist at concentrations above the TLV or PEL can irritate (burning sensation) the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Persons with a preexisting, nonspecific bronchial hyperreactivity can respond to concentrations below the TLV or PEL with similar symptoms as well as asthma attack or asthma-like symptoms. Exposure well above the TLV or PEL may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). Chemical or hypersensitivity pneumonitis, with flu-like symptoms (e.g., fever, chills), has also been reported. These symptoms can be delayed up to several hours after exposure. These effects are usually reversible.

Causes skin irritation with symptoms of reddening, itching, and swelling. Persons previously sensitized can experience allergic skin reaction with symptoms of reddening, itching, swelling, and rash. Cured material is difficult to remove. Contact with MDI can cause discoloration.

Causes eye irritation with symptoms of reddening, tearing, stinging, and swelling. May cause temporary corneal injury. Vapor or aerosol may cause irritation with symptoms of burning and tearing.

May cause irritation of the digestive tract. Symptoms may include abdominal pain, nausea, vomiting, and diarrhea.

Delayed: Symptoms affecting the respiratory tract can also occur several hours after overexposure.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Use lukewarm water if possible. Use fingers to ensure that eyelids are separated and that the eye is being irrigated. Get medical attention.

Skin Contact

If direct skin contact with isocyanates occurs, immediately remove contaminated clothing and shoes. Wipe off the isocyanate product from the skin using dry towels or other similar absorbent fabric. If readily available, apply a polyglycol-based cleanser (e.g. Colorimetric Laboratories, Inc. (CLI) D-TAM™ Skin Cleanser) or corn oil. Wash with soap and warm water and pat dry. If a polyglycol-based cleanser is not available, wash with soap and warm water for 15 minutes. If available, use a wipe test pad to verify decontamination is complete (e.g. CLI SWYPE™). Get medical attention if irritation develops. Discard or wash contaminated clothing before reuse.

Inhalation

Move to an area free from further exposure. Extreme asthmatic reactions that may occur in sensitized persons can be life threatening. Get medical attention immediately. Administer oxygen or artificial respiration as needed. Asthmatic symptoms may develop and may be immediate or delayed up to several hours.

Ingestion

Do NOT induce vomiting. Wash mouth out with water. Do not give anything by mouth to an unconscious person. Get medical attention.

Notes to Physician

Eyes: Stain for evidence of corneal injury. If cornea is burned, instill antibiotic/steroid preparation as needed. Workplace vapors could produce reversible corneal epithelial edema impairing vision. Skin: This compound is a skin sensitizer. Treat symptomatically as for contact dermatitis or thermal burn. Ingestion: Treat symptomatically. There is no specific antidote. Inducing vomiting is contraindicated because of the irritating nature of the compound. Inhalation: Treatment is essentially symptomatic. An individual having a dermal or pulmonary sensitization reaction to this material should be removed from further exposure to any diisocyanate.

5. Firefighting Measures

Suitable Extinguishing Media: Dry chemical, Carbon dioxide (CO₂), Foam, water spray for large fires.

Unsuitable Extinguishing Media: High volume water jet

Fire Fighting Procedure

Firefighters should wear NFPA compliant structural firefighting protective equipment, including self-contained breathing apparatus and NFPA compliant helmet, hood, boots and gloves. Avoid contact with product. Decontaminate equipment and protective clothing prior to reuse. During a fire, isocyanate vapors and other irritating, highly toxic gases may be generated by thermal decomposition or combustion. Exposure to heated diisocyanate can be extremely dangerous.

Hazardous Decomposition Products

Material Name: MONDUR MR LIGHT

83186292

By Fire and High Heat: Carbon dioxide (CO₂), carbon monoxide (CO), oxides of nitrogen (NO_x), dense black smoke., Isocyanate, Isocyanic Acid, Other undetermined compounds

Unusual Fire/Explosion Hazards

Closed container may forcibly rupture under extreme heat or when contents are contaminated with water (CO₂ formed). Use cold-water spray to cool fire-exposed containers to minimize the risk of rupture. Large fires can be extinguished with large volumes of water applied from a safe distance, since reaction between water and hot diisocyanate can be vigorous.

6. Accidental Release Measures

Spill and Leak Procedures

Implement site emergency response plan. Evacuate non-emergency personnel. The magnitude of the evacuation depends upon the quantity released, site conditions, and the ambient temperature. Isolate the area and prevent access of unauthorized personnel. Notify management. Call CHEMTREC at 1-800-424-9300 for assistance and advice.

Wear necessary personal protective equipment (PPE) as specified in the SDS or the site emergency response plan. Ventilate and remove ignition sources. Control the source of the leak. Contain the released material by damming, diking, retaining, or diverting into an appropriate containment area. Absorb or pump off as much of the spilled material as possible. When using absorbent, completely cover the spill area with suitable absorbent material (e.g., vermiculite, kitty litter, Oil-Dri®, etc.). Allow for the absorbent material to absorb the spilled liquid. Shovel the absorbent material into an approved metal container (i.e., 55-gallon salvage drum). Do not fill the container more than 2/3 full to allow for expansion, and do not tighten the lid on the container. Repeat application of absorbent material until all liquid has been removed from the surface. For spills involving a solid product, remove mechanically (sweep up, vacuum, shovel etc.) and collect and place into an approved metal container.

Decontaminate the spill surface area using a neutralization solution (see list of solutions on the SDS); scrubbing the surface with a broom or brush helps the decontamination solution to penetrate into porous surfaces. Wait at least 15 minutes after first application of the neutralization solution. Cover the area with absorbent material and shovel this into an approved metal container. Residual surface contamination can be checked using a wipe test pad to verify decontamination is complete (e.g. CLI Surface Swype™). If the wipe test pad demonstrates that isocyanate remains on the surface (red color on pad), repeat applications of neutralization solution, with scrubbing, followed by absorbent until the surface is decontaminated (no color change on wipe pad). Apply lid loosely to metal waste container (do not tighten the lid because carbon dioxide gas and heat can be generated from the neutralization process). With the lid still loosely in place, move the container to an isolated, well-ventilated area to allow release of carbon dioxide. After 72 hours, seal the container, and properly dispose of the waste material and any contaminated equipment (i.e., broom or brush) in accordance with existing federal, state and local regulations.

Additional Spill Procedures/Neutralization

Products or product mixtures that have been shown to be effective neutralization solutions for decontaminating surfaces, tools, or equipment that have been in contact with an isocyanate include, but are not limited to:

- Colorimetric Laboratories, Inc. (CLI): 1-847-803-3737
 - o Isocyanate Decontamination Solution
- Spartan Chemical Company: 1-800-537-8990
 - o Spartan® ShineLine Emulsifier Plus (stripping solution)
 - o Spartan® SC-200 Heavy Duty Cleaner
- ZEP Commercial Heavy Duty Floor Stripper
- A mixture of 90% water, 10% non-ionic surfactant (e.g. Plurafac SL-62, Tergitol TMN-10)

Material Name: MONDUR MR LIGHT

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- A mixture of 75% water, 20% non-ionic surfactant, and 5% n-propanol
- A mixture of 80% water, 10% non-ionic surfactant, 5% isopropanol, 5% ammonium hydroxide (household ammonia)

For more information about neutralization solutions, please refer to spill cleanup and neutralization information available on Covestro's Product Safety First website. www.productsafetyfirst.covestro.com
Note: Always wear proper PPE when cleaning up an isocyanate spill or when decontaminating surfaces, tools, or equipment using a neutralization solution. It may take two or more applications of the neutralization solution to decontaminate the surface. Residual surface contamination can be checked using a surface wipe method such as the CLI Swype™ pad.

7. Handling and Storage

Handling/Storage Precautions

Do not breathe vapors, mists, or dusts. Use adequate ventilation to keep airborne isocyanate levels below the exposure limits. Wear respiratory protection if material is heated, sprayed, used in a confined space, or if the exposure limit is exceeded. Warning properties (irritation of the eyes, nose and throat or odor) are not adequate to prevent overexposure from inhalation. This material can produce asthmatic sensitization upon either single inhalation exposure to a relatively high concentration or upon repeated inhalation exposures to lower concentrations. Individuals with lung or breathing problems or prior allergic reactions to isocyanates must not be exposed to vapor or spray mist. Avoid contact with skin and eyes. Wear appropriate eye and skin protection. Wash thoroughly after handling. Do not breathe smoke and gases created by overheating or burning this material. Decomposition products can be highly toxic and irritating. Store in tightly closed containers to prevent moisture contamination. Do not reseal if contamination is suspected.

Storage Period:

6 Months: after receipt of material by customer

Storage Temperature

Minimum: 10 °C (50 °F)
Maximum: 30 °C (86 °F)

Storage Conditions

Store separate from food products.

Employee education and training in the safe use and handling of this product are required under the OSHA Hazard Communication Standard 29 CFR 1910.1200.

Substances to Avoid

Water, Amines, Strong bases, Alcohols, Copper alloys

8. Exposure Controls/Personal Protection

The recommendations in this section should not be a substitute for a personal protective equipment (PPE) assessment performed by the employer as required by 29 CFR 1910 Subpart I.

Exposure Limits

4,4'-Diphenylmethane Diisocyanate (MDI) (101-68-8)

US. ACGIH Threshold Limit Values
Time weighted average 0.005 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Ceiling Limit Value 0.02 ppm, 0.2 mg/m³

Any component which is listed in section 3 and is not listed in this section does not have a known ACGIH TLV, OSHA PEL or supplier recommended occupational exposure limit.

Industrial Hygiene/Ventilation Measures

Local exhaust should be used to maintain levels below the TLV whenever MDI is heated, sprayed, or aerosolized. Standard reference sources regarding industrial ventilation (e.g., ACGIH Industrial Ventilation Manual) should be consulted for guidance about adequate ventilation. To ensure that published exposure limits have not been exceeded, monitoring for airborne diisocyanate should become part of the overall employee exposure characterization program. NIOSH, OSHA, Covestro, and others have developed sampling and analytical methods. Covestro methods can be made available, upon request.

Respiratory Protection

Airborne MDI concentrations greater than the ACGIH TLV-TWA (TLV) or OSHA PEL-C (PEL) can occur in inadequately ventilated environments when MDI is sprayed, aerosolized, or heated. In such cases, respiratory protection must be worn. The type of respiratory protection selected must comply with the requirements set forth in OSHA's Respiratory Protection Standard (29 CFR 1910.134). The type of respiratory protection available includes (1) an atmosphere-supplying respirator such as a self-contained breathing apparatus (SCBA) or a supplied air respirator (SAR) in the positive pressure or continuous flow mode, or (2) an air-purifying respirator (APR). If an APR is selected then a change out schedule, based on objective information or data that will ensure that the cartridges are changed out before the end of their service life, must be developed and implemented. The basis for the change out schedule must be described in the written respirator program. Further, if an APR is selected, the airborne diisocyanate concentration must be no greater than 10 times the TLV or PEL. The recommended APR cartridge is an organic vapor/particulate filter combination cartridge (OV/P100).

Hand Protection

Ensure gloves remain in good condition during use and replace if any deterioration is observed.

Gloves should be worn., Nitrile rubber showed excellent resistance., Butyl rubber, neoprene and PVC are also effective.

Eye Protection

When directly handling liquid product, eye protection is required. Examples of eye protection include a chemical safety goggle, or chemical safety goggle in combination with a full face shield when there is a greater risk of splash.

Skin Protection

Avoid all skin contact. Depending on the conditions of use, cover as much of the exposed skin area as possible with appropriate clothing to prevent skin contact., Animal tests and other research indicate that skin contact with MDI can play a role in causing isocyanate sensitization and respiratory reaction., This data reinforces the need to prevent direct skin contact with isocyanates.

Medical Surveillance

All applicants who are assigned to an isocyanate work area should undergo a pre-placement medical evaluation. A history of eczema or respiratory allergies such as hay fever, are possible reasons for medical exclusion from isocyanate areas. Applicants who have a history of adult asthma should be restricted from work with isocyanates. Applicants with a history of prior isocyanate sensitization should be excluded from further work with isocyanates. A comprehensive annual medical surveillance program should be instituted for all employees who are potentially exposed to diisocyanates. Once a worker has been diagnosed as sensitized to any isocyanate, no further exposure can be permitted. Refer to the Covestro pamphlet (Medical Surveillance Program for Isocyanate Workers) for additional guidance.

Additional Protective Measures

Emergency showers and eye wash stations should be available. Educate and train employees in the safe use and handling of this product. Follow all label instructions.

9. Physical and Chemical Properties

State of Matter:	liquid
Appearance:	liquid
Color:	Brown
Odor:	musty
Odor Threshold:	No Data Available
pH:	No Data Available
Boiling Point:	Approximately 208 °C (406.4 °F)
Flash Point:	198 °C (388.4 °F) (ASTM D 93)
Evaporation Rate:	No Data Available
Lower explosion limit:	No Data Available
Upper Explosion Limit:	No Data Available
Vapor Pressure:	< 0.0001 mmHg @ 25 °C (77 °F)
Vapor Density:	No Data Available
Density:	1.234 g/cm ³ @ 20 °C (68 °F)
Relative Vapor Density:	No Data Available
Specific Gravity:	1.24 @ 25 °C (77 °F)
Solubility in Water:	Insoluble - Reacts slowly with water to liberate CO ₂ gas
Partition Coefficient: n-octanol/water:	No Data Available
Auto-ignition Temperature:	No Data Available
Decomposition Temperature:	Not established
Dynamic Viscosity:	150 - 250 mPa.s @ 25 °C (77 °F)
Kinematic Viscosity:	No Data Available
Bulk Density:	1,234 kg/m ³
Self Ignition:	not applicable

10. Stability and Reactivity

Hazardous Reactions

Contact with moisture, other materials that react with isocyanates, or temperatures above 350 F (177 C), may cause polymerization

Stability

Stable under normal conditions of use and storage.

Materials to Avoid

Water, Amines, Strong bases, Alcohols, Copper alloys

Hazardous Decomposition Products

By Fire and High Heat: Carbon dioxide (CO₂), carbon monoxide (CO), oxides of nitrogen (NO_x), dense black smoke., Isocyanate, Isocyanic Acid, Other undetermined compounds

11. Toxicological Information

Likely Routes of Exposure: Skin Contact

Material Name: MONDUR MR LIGHT

83186292

Inhalation
Eye Contact

Health Effects and Symptoms

Acute: Diisocyanate vapors or mist at concentrations above the TLV or PEL can irritate (burning sensation) the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Persons with a preexisting, nonspecific bronchial hyperreactivity can respond to concentrations below the TLV or PEL with similar symptoms as well as asthma attack or asthma-like symptoms. Exposure well above the TLV or PEL may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). Chemical or hypersensitivity pneumonitis, with flu-like symptoms (e.g., fever, chills), has also been reported. These symptoms can be delayed up to several hours after exposure. These effects are usually reversible.

Causes skin irritation with symptoms of reddening, itching, and swelling. Persons previously sensitized can experience allergic skin reaction with symptoms of reddening, itching, swelling, and rash. Cured material is difficult to remove. Contact with MDI can cause discoloration.

Causes eye irritation with symptoms of reddening, tearing, stinging, and swelling. May cause temporary corneal injury. Vapor or aerosol may cause irritation with symptoms of burning and tearing.

May cause irritation of the digestive tract. Symptoms may include abdominal pain, nausea, vomiting, and diarrhea.

Chronic: As a result of previous repeated overexposures or a single large dose, certain individuals may develop sensitization to isocyanates (asthma or asthma-like symptoms) that may cause them to react to a later exposure to isocyanates at levels well below the TLV or PEL. These symptoms, which can include chest tightness, wheezing, cough, shortness of breath or asthmatic attack, could be immediate or delayed up to several hours after exposure. Extreme asthmatic reactions can be life threatening. Similar to many non-specific asthmatic responses, there are reports that once sensitized an individual can experience these symptoms upon exposure to dust, cold air or other irritants. This increased lung sensitivity can persist for weeks and in severe cases for several years. Sensitization can be permanent. Chronic overexposure to isocyanates has also been reported to cause lung damage (including fibrosis, decrease in lung function) that may be permanent.,

Prolonged contact with skin can cause reddening, swelling, rash, and, in some cases, skin sensitization. Animal tests and other research indicate that skin contact with MDI can play a role in causing isocyanate sensitization and respiratory reaction. This data reinforces the need to prevent direct skin contact with isocyanates.

Prolonged vapor contact with the eyes may cause conjunctivitis.

Delayed: Symptoms affecting the respiratory tract can also occur several hours after overexposure.

Toxicity Data for: MONDUR MR LIGHT

Toxicity data based on polymeric MDI (a mixture of monomers and higher molecular weight oligomers).

Acute Oral Toxicity

LD50: > 2,000 mg/kg (rat, male/female)

Acute Inhalation Toxicity

LC50: 0.49 mg/l, 490 mg/m³, 4 h, aerosol (rat)

The test atmosphere generated in the animal study is not representative of workplace environments, how the substance is placed on the market, and how it can reasonably be expected to be used. Therefore the test result cannot be directly applied for the purpose of assessing hazard. Based on expert judgment and the weight of the evidence, a modified classification for acute inhalation toxicity is justified.

Acute Dermal Toxicity

LD50: > 9,400 mg/kg (rabbit, male/female) (OECD Test Guideline 402)

Skin Irritation

rabbit, Slightly irritating

Repeated Dose Toxicity

90 Days, inhalation: NOAEL: 1 mg/m³, (rat, Male/Female, 6 hrs/day 5 days/week)
Irritation to lungs and nasal cavity.

2 years, inhalation: NOAEL: 0.2, (rat, Male/Female, 6 hrs/day 5 days/week)
Irritation to lungs and nasal cavity.

Mutagenicity

Genetic Toxicity in Vitro:

Bacterial - gene mutation assay: negative (Salmonella typhimurium, Metabolic Activation: with/without)

Carcinogenicity

rat, Male/Female, inhalation, 2 Years, 6 hrs/day 5 days/week
LOAEL: 6mg/l

Polymeric MDI has been classified as IARC Group 3 (“Not classifiable as to its carcinogenicity to humans”) (1999) indicating there is inadequate evidence available to describe the carcinogenic potential. Epidemiological studies found no association between isocyanates and cancer. In chronic exposure studies in rodents, pMDI produced tumors only at the highest exposure level of 6 mg/m³. This exposure level is significantly above the TLV for MDI (0.051 mg/m³). Based on the weight of the evidence, a determination of not classified for carcinogenicity is justified.

Developmental Toxicity/Teratogenicity

rat, female, inhalation, gestation days 6-15, 6 hrs/day, NOAEL (teratogenicity): 12 mg/m³, NOAEL (maternal): 4 mg/m³

No Teratogenic effects observed at doses tested., Fetotoxicity seen only with maternal toxicity.

Toxicity Data for: Polymeric Diphenylmethane Diisocyanate (pMDI)**Toxicity Note**

See data above for polymeric MDI.

Toxicity Data for: 4,4'-Diphenylmethane Diisocyanate (MDI)**Acute Oral Toxicity**

LD50: > 7,616 mg/kg (rat) (OECD Test Guideline 401)

Acute Inhalation Toxicity

LC50: 0.368 mg/l, 4 h, dust/mist (rat, male) (OECD Test Guideline 403)

The test atmosphere generated in the animal study is not representative of workplace environments, how the substance is placed on the market, and how it can reasonably be expected to be used. Therefore the test result cannot be directly applied for the purpose of assessing hazard. Based on expert judgment and the weight of the evidence, a modified classification for acute inhalation toxicity is justified.

Acute Dermal Toxicity

LD50: > 9,400 mg/kg (rabbit, male/female) (OECD Test Guideline 402)

Studies of a comparable product.

Skin Irritation

rabbit, Draize Test, Slightly irritating

Human, irritating

Eye Irritation

rabbit, Draize, Moderately irritating

Human, irritating

Sensitization

Skin sensitization (local lymph node assay (LLNA)):: positive (Mouse, OECD Test Guideline 429)

Respiratory sensitization: positive (Guinea pig)

Repeated Dose Toxicity

90 Days, inhalation: NOAEL: 0.3 mg/m³, (rat, Male/Female, 18 hrs/day, 5 days/week)

Irritation to lungs and nasal cavity.

(Human)

Irritation to lungs and nasal cavity.

Mutagenicity

Genetic Toxicity in Vitro:

Ames: (Salmonella typhimurium, Metabolic Activation: with/without)

Positive and negative results were reported. The use of certain solvents which rapidly hydrolyze diisocyanates is suspected of producing the positive mutagenicity results.

Genetic Toxicity in Vivo:

Micronucleus Assay: (Mouse)

negative

Micronucleus test: negative (rat, male, Inhalative (exposure period: 3x1h/day over 3 weeks))

negative

Carcinogenicity

rat, Female, inhalation, 2 Years, 17 hrs/day, 5 days/week negative

Other Relevant Toxicity Information

May cause irritation of respiratory tract.

Toxicity Data for: 2,4'-Diphenylmethane Diisocyanate (MDI)**Toxicity Note**

See data above for polymeric MDI.

Toxicity Data for: 2,2'-Diphenylmethane Diisocyanate**Toxicity Note**

See data above for polymeric MDI.

Carcinogenicity:

No carcinogenic substances as defined by IARC, NTP and/or OSHA

12. Ecological Information

Ecological Data for: MONDUR MR LIGHT

Ecotoxicity data based on polymeric MDI (a mixture of monomers and higher molecular weight oligomers).

Biodegradation

0 %, Exposure time: 28 d, i.e. not degradable

Bioaccumulation

Oncorhynchus mykiss (rainbow trout), Exposure time: 112 d, < 1 BCF
Does not bioaccumulate.

Acute and Prolonged Toxicity to Fish

LC0: > 1,000 mg/l (Danio rerio (zebra fish), 96 h)

LC0: > 3,000 mg/l (Oryzias latipes (Orange-red killifish), 96 h)

Acute Toxicity to Aquatic Invertebrates

EC50: > 1,000 mg/l (Water flea (Daphnia magna), 24 h)

Toxicity to Aquatic Plants

NOEC: 1,640 mg/l, End Point: growth (Green algae (Scenedesmus subspicatus), 72 h)

Toxicity to Microorganisms

EC50: > 100 mg/l, (activated sludge, 3 h)

Ecological Data for Polymeric Diphenylmethane Diisocyanate (pMDI)

Additional Ecotoxicological Remarks

See data above for polymeric MDI.

Ecological Data for 4,4'-Diphenylmethane Diisocyanate (MDI)

Acute and Prolonged Toxicity to Fish

LC50: > 500 mg/l (Zebra fish (Brachydanio rerio), 24 h)

Acute Toxicity to Aquatic Invertebrates

EC50: > 500 mg/l (Water flea (Daphnia magna), 24 h)

Ecological Data for 2,4'-Diphenylmethane Diisocyanate (MDI)

Additional Ecotoxicological Remarks

See data above for polymeric MDI.

Ecological Data for 2,2'-Diphenylmethane Diisocyanate

Additional Ecotoxicological Remarks

See data above for polymeric MDI.

13. Disposal Considerations

Waste Disposal Method

Waste disposal should be in accordance with existing federal, state and local environmental control laws.
Incineration is the preferred method.

Empty Container Precautions

Material Name: MONDUR MR LIGHT

83186292

Empty containers retain product residue; observe all precautions for product. Do not heat or cut empty container with electric or gas torch because highly toxic vapors and gases are formed. Do not reuse without thorough commercial cleaning and reconditioning. If container is to be disposed, ensure all product residues are removed prior to disposal.

14. Transportation Information

Land transport (DOT)

Proper Shipping Name: Other regulated substances, liquid, n.o.s. (contains 4,4'-Diphenylmethane Diisocyanate (MDI))
Hazard Class or Division: 9
UN/NA Number: NA3082
Packaging Group: III
Hazard Label(s): CLASS 9

RSPA/DOT Regulated Components:

4,4'-Diphenylmethane Diisocyanate (MDI)

Reportable Quantity: 5040 kg (11111 lb)

Sea transport (IMDG)

Non-Regulated

Air transport (ICAO/IATA)

Non-Regulated

Additional Transportation Information

When in individual containers of less than the Product RQ, this material ships as non-regulated.

MARPOL/IBC

PRODUCT NAME: Diphenylmethane Diisocyanate

POLLUTION CATEGORY: Y

SHIP TYPE: 2

FLASH POINT: 390°F

15. Regulatory Information

United States Federal Regulations

US. Toxic Substances Control Act: Listed on the TSCA Inventory.

No substances are subject to TSCA 12(b) export notification requirements.

US. EPA CERCLA Hazardous Substances (40 CFR 302) Components:

4,4'-Diphenylmethane Diisocyanate Reportable quantity: 5000 lbs
(MDI)

SARA Section 311/312 Hazard Categories:

Acute Health Hazard

Chronic Health Hazard

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A) Components:

Material Name: MONDUR MR LIGHT

83186292

None

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required Components:

Polymeric Diphenylmethane Diisocyanate (pMDI)
4,4'-Diphenylmethane Diisocyanate (MDI)

US. EPA Resource Conservation and Recovery Act (RCRA) Composite List of Hazardous Wastes and Appendix VIII Hazardous Constituents (40 CFR 261):

Under RCRA, it is the responsibility of the person who generates a solid waste, as defined in 40 CFR 261.2, to determine if that waste is a hazardous waste.

State Right-To-Know Information

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the SDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

This product contains a trace (ppm) amount of phenyl isocyanate (CAS# 103-71-9) and monochlorobenzene (CAS# 108-90-7) as impurities.

Massachusetts, New Jersey or Pennsylvania Right to Know Substance Lists:

<u>Weight percent</u>	<u>Components</u>	<u>CAS-No.</u>
58%	Polymeric Diphenylmethane Diisocyanate (pMDI)	9016-87-9
38%	4,4'-Diphenylmethane Diisocyanate (MDI)	101-68-8
3.8%	2,4'-Diphenylmethane Diisocyanate (MDI)	5873-54-1

New Jersey Environmental Hazardous Substances List and/or New Jersey RTK Special Hazardous Substances Lists:

<u>Weight percent</u>	<u>Components</u>	<u>CAS-No.</u>
58%	Polymeric Diphenylmethane Diisocyanate (pMDI)	9016-87-9
38%	4,4'-Diphenylmethane Diisocyanate (MDI)	101-68-8

California Prop. 65:

To the best of our knowledge, this product does not contain any of the listed chemicals, which the state of California has found to cause cancer, birth defects or other reproductive harm.

CFATS (Chemical Facility Anti-Terrorism Standards) Chemicals

To the best of our knowledge, this product does not contain Appendix A Chemicals of Interest (COI), at or above the Screening Threshold Quantity (STQ), as defined by the Department of Homeland Security Chemical Facility Anti-terrorism Standard (CFATS, 6 CFR Part 27.

Based on information provided by our suppliers, this product is considered "DRC Conflict Free" as defined by the SEC Conflict Minerals Final Rule (Release No. 34-67716; File No. S7-40-10; Date: 2012-08-22).

16. Other Information

The method of hazard communication for Covestro LLC is comprised of product labels and safety data sheets. Safety data sheets for all of our products and general product declarations are available for download at www.productsafetyfirst.covestro.com.

Material Name: MONDUR MR LIGHT

83186292

Contact: Product Safety Department
Telephone: (412) 413-2835
SDS Number: 112000021929
Version Date: 09/26/2017
SDS Version: 2.9

Information contained in this SDS is believed to be accurate but is furnished without warranty, express or implied, including warranties of merchantability or fitness for a particular purpose. The information relates only to the specific material designated herein. Covestro LLC. assumes no legal responsibility for use of or reliance upon the information in this SDS and such information shall in no case be considered a part of our terms and conditions of sale. The user is responsible for determining whether the Covestro product is suitable for user's method of use or application. Covestro is not liable for any failure to observe the precautionary measures described in this SDS or for any misuse of the product.

|| Changes since the last version are highlighted in the margin. This version replaces all previous versions.



Covestro LLC
1 Covestro Circle
Pittsburgh PA 15205

Page: 1
Date Printed: 2018-02-09
Straight Bill of Lading-
Original- Not Negotiable

Ship To: Stonhard 7 Esterbrook Ln Cherry Hill NJ 08003-4034 US	Bill of Lading No: 292148 For prepaid shipment, show bill of lading no. on freight acc. to the given Incoterm, please issue your invoice to Covestro c/o Cass Information Systems PO Box 67 St.Louis, MO 63166-0067	24 Hour Number Emergency Contact Covestro (CCN2472) via CHEMTREC 1-800-424-9300 International +1-703-527-3887
Shipper: Covestro LLC 8406 FM 1405 Baytown TX 77523-9913 ORH5	Delivery Number: 4003339118 Shipping Date: 12.02.2018 Delivery Date: 16.02.2018 08:00:00 Carrier: FV: Customer Requested Carrier Trailer/Container:	Payment/Invoice Instructions Customer: Please reference Delivery Number with Payment: 4003339118 Customer POs: 299197 Carrier: Please reference Bill of Lading Number 292148 with Freight Invoice

RECEIVED, subject to the Contract Carrier Master Agreement for Trucking Service, if applicable, between Carrier and Shipper in effect on the date, the shipment is tendered to Carrier, the property described below in apparent good order, except as noted (contents and conditions of packages unknown), marked consigned and destined as shown below. This Bill of Lading is not subject to any rates, rules, tariffs or classifications, whether individually determined or filed with any federal or state regulatory agency, except as specifically agreed to in writing by Carrier or Shipper.

No. of Packages	Container Type Material and Description	Quantity	Weight	HM	
16	TOTE Material Number: 01668998		40036 LB 18160 KG		2 55920
		Weight Totals:	NET: 40036 LB 18160 KG	TARE: 1975 LB 896 KG	GROSS: 42011 LB 19056 KG

Special Instructions for Delivery:

Tanker Endorsement Needed

SHIPPER'S INTERMODAL CERTIFICATION

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked, and labeled/ placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. This certification includes IMDG 5.4.2.1.

Date: _____
Shipper Per: Jennifer Kaswita
FEB 12 2018

DRIVER'S CERTIFICATION AND RECEIPT

Driver hereby certifies that the above Special Instructions have been read and understood that:
1. Emergency response information in accordance with 49 CFR, part 172, Subpart G is present on board the vehicle.
2. The required placards have been offered and the required placards are properly affixed to the vehicle.

Received _____ pallets _____ pieces
Carrier: VALUED TRANSPORT
Trailer: 181169
[Signature]
Driver's Signature

SECTION 7

If this shipment is to be delivered to the Consignee without recourse on the Shipper/Consignor for any charges that are not prepaid or agreed to be prepaid, the Shipper/Consignor shall sign the following statement:

Carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Covestro LLC
FREIGHT CHARGE TERMS
Line Haul charges will be paid as Follows:
COLLECT

FMCSA Motor Carrier

USDOT Number: **2474595**
Docket Number: **MC855868**
Legal Name: **VALUED TRANSPORT LLC**
DBA (Doing-Business-As) Name



Addresses

Business Address: **5050 POPLAR AVE SUITE 900
MEMPHIS, TN 38157**
Business Phone: **(901) 312-3316** Business Fax: **Fax: (901) 259-0565**
Mail Address:
Mail Phone: Mail Fax: Undeliverable Mail: **NO**

Authorities:

Common Authority:	ACTIVE	Application Pending:	NO	
Contract Authority:	ACTIVE	Application Pending:	NO	
Broker Authority:	NONE	Application Pending:	NO	
Property:	YES	Passenger:	NO	Household Goods: NO
Private:	NO	Enterprise:	NO	

Insurance Requirements:

BIPD Exempt:	NO	BIPD Waiver:	NO	BIPD Required:	\$750,000	BIPD on File:	\$1,000,000
Cargo Exempt:	NO			Cargo Required:	NO	Cargo on File:	NO
BOC-3:	YES			Bond Required:	NO	Bond on File:	NO

Blanket Company: **PROCESS AGENT SERVICE COMPANY, INC.**

Comments:

Active/Pending Insurance:

Form: 91X	Type: BIPD/Primary	Posted Date: 03/17/2017
Policy/Surety Number: CA170065	Coverage From: \$0	To: \$1,000,000
Effective Date: 03/19/2017	Cancellation Date:	

Insurance Carrier: **CHEROKEE INSURANCE COMPANY**
Attn: **MARK J. DADABBO, PRES.**
Address: **34200 MOUND RD.
STERLING HEIGHTS, MI 48310 US**
Telephone: **(800) 201 - 0450** Fax: **(810) 795 - 3130**

Rejected Insurances:

Form:	Type:	Coverage From:	\$0	To:	\$0
Policy/Surety Number:		Received:	Rejected:		
Rejected Reason:					

FMCSA Motor Carrier

USDOT Number: **2474595**
 Docket Number: **MC855868**
 Legal Name: **VALUED TRANSPORT LLC**
 DBA (Doing-Business-As) Name



Insurance History:

Form: 91X	Type: BIPD/Primary		
Policy/Surety Number: CA 1434825	Coverage From	\$0	To: \$750,000
Effective Date From: 03/19/2014	To: 08/22/2014	Disposition: Replaced	

Insurance Carrier: PROGRESSIVE HAWAII INSURANCE CORP
 Attn: CUSTOMER SERVICE
 Address: P. O. BOX 94739
 CLEVELAND, OH 44101 US
 Telephone: (800) 444 - 4487 Fax: (440) 603 - 4555

Form: 91X	Type: BIPD/Primary		
Policy/Surety Number: CA 1434825	Coverage From	\$0	To: \$750,000
Effective Date From: 08/22/2014	To: 03/19/2016	Disposition: Cancelled	

Insurance Carrier: PROGRESSIVE HAWAII INSURANCE CORP
 Attn: CUSTOMER SERVICE
 Address: P. O. BOX 94739
 CLEVELAND, OH 44101 US
 Telephone: (800) 444 - 4487 Fax: (440) 603 - 4555

Form: 91X	Type: BIPD/Primary		
Policy/Surety Number: ATR0047275	Coverage From	\$0	To: \$750,000
Effective Date From: 03/19/2016	To: 03/19/2017	Disposition: Cancelled	

Insurance Carrier: GREENWICH INSURANCE COMPANY
 Attn: RECECCA CLARK
 Address: 505 EAGLEVIEW BLVD
 EXTON, PA 19341 US
 Telephone: (800) 327 - 1414 Fax: (610) 458 - 8667

Authority History:

Sub No.	Authority Type	Original Action	Disposition Action
	MOTOR PROPERTY CONTRACT CARRIER	GRANTED	03/25/2014
	MOTOR PROPERTY COMMON CARRIER	GRANTED	03/25/2014

Pending Application:

Authority Type	Filed	Status	Insurance	BOC-3

FMCSA Motor Carrier

USDOT Number: **2474595**

Docket Number: **MC855868**

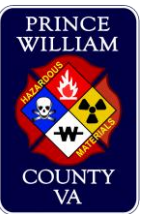
Legal Name: **VALUED TRANSPORT LLC**

DBA (Doing-Business-As) Name



Revocation History:

Authority Type	1st Serve Date	2nd Serve Date	Reason



M
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M	
Date of Incident	Date
Location: Sudley Rd Manassas	City: Manassas
Reported by: Marshall Scott	Incident Type: Bombing
Mission: Responding to SA of Bombs in Residential Area Status: Responding to SA of Unexploded Ordnance Unit: M-1 Responding, Squad 1A, Squad 1B, Squad 1C, Squad 1D	

S	
<p>Mission: Responding to SA of Bombing at a Court Office. Initial investigation and report of a reading in the Court Office led to a search of the building. The Court Office is located at the intersection of Sudley Road and Manassas Avenue. The building is a three-story structure. The incident occurred on the first floor. The reading was detected by a sensor located in the hallway. The sensor is a handheld device used by the team. The sensor is currently in the possession of the team. The sensor is a handheld device used by the team. The sensor is currently in the possession of the team.</p>	
SB	SB
Name:	Name:
Address: Sudley Road Manassas	Address:
Contact:	Contact:
Notes:	Notes:

SS	
Date:	Date:
City: Manassas	City: Manassas
Name: Bryan Corrion	Name:
Agency: Fire	Agency:
Notes:	Notes:

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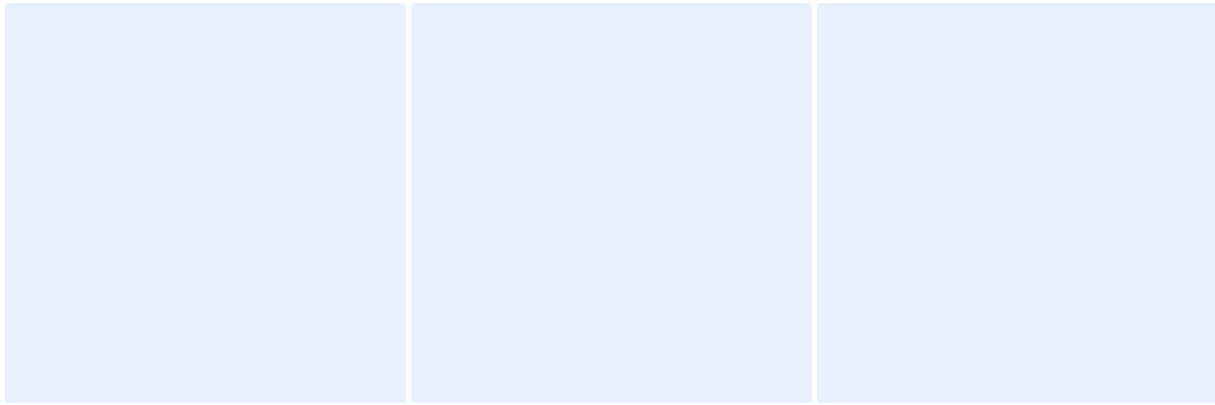
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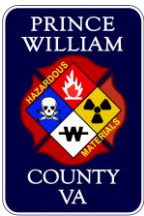


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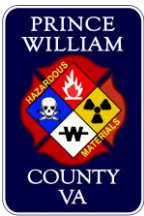


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PRINCIPLE OF LIABILITY
 MARRIAGE PARTNERSHIP
 S M S S S M

PROPERTY DAMAGE

Date of Incident	At
Location Photo	City
Reported by	Incident type and nature
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SAFETY

Person consulted to site for drydock or a "out of site" incident or contractor working along side of road had all ditch digging cuiled out turn over and lead build galloil off site at 2 gallon or 1000 gallon spill onto the ground for person and to the contractor by person site consult dit to person M to a sure that the only requir ent a to find the person party duty M in or ed person to gat contact in or ation for the person party for the report discussion about other or not the area a along road ay and coorily near person right to ay M could follo up and in or the person

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SAFETY

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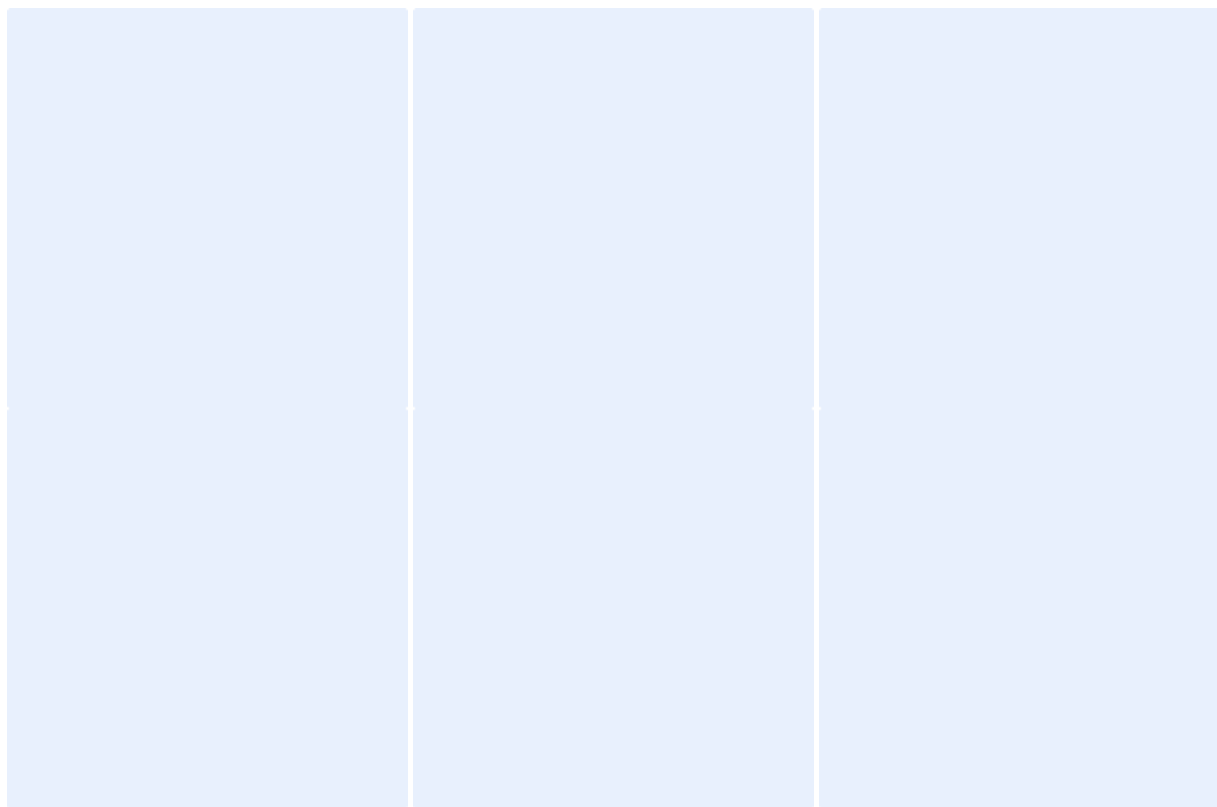
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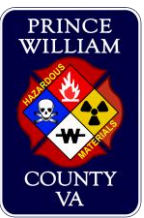
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Additional information
Member of the
Chief Executive
Lead investigator





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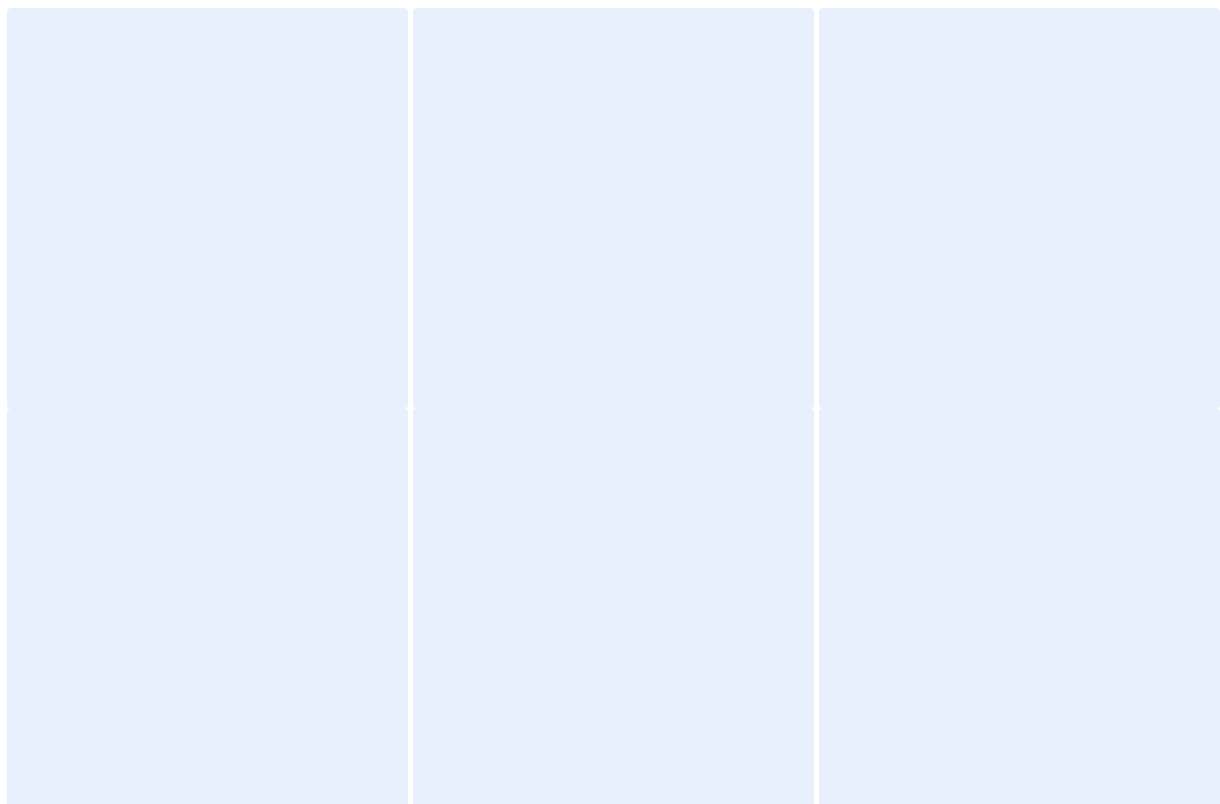
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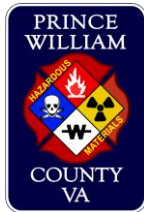
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Additional Information
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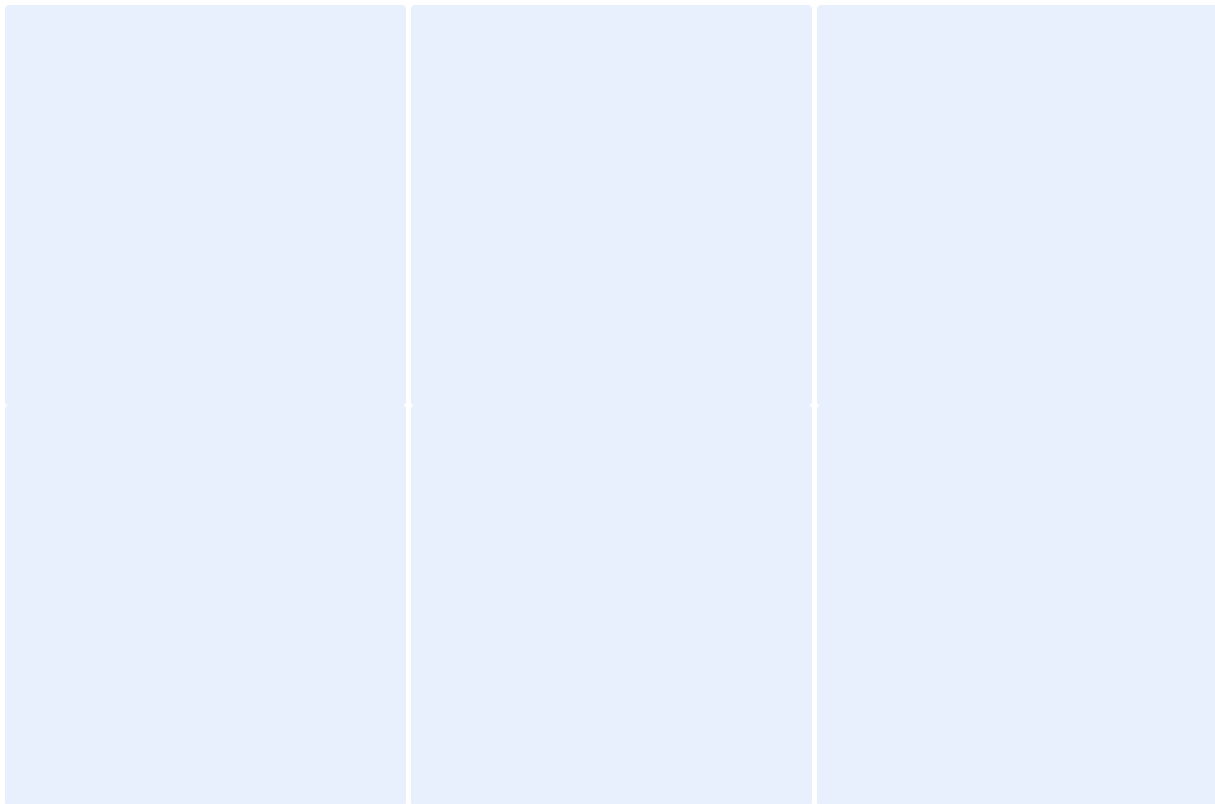
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Reported By: <input style="width: 90%;" type="text"/>	Incident # and <input style="width: 90%;" type="text"/>
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I was at home with a tractor trailer that had a leaking motor oil pan on the engine at it was a total of 100 gallons of motor oil added that a tow company took away that day and that all of the oil was on the road way but no threat to any water way they also added that they used absorbent on the spill to contain it and that the tow company is required to have the ability to contain it but they did not call me back I did not receive a return call	
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Additional information
Form M
Form M



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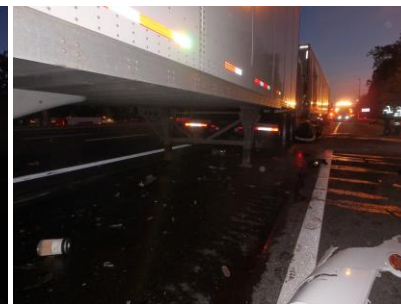
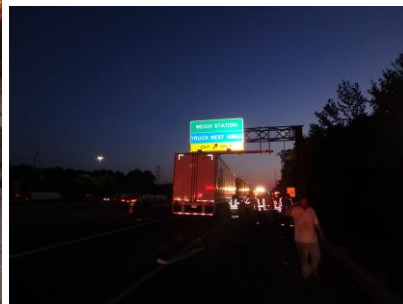
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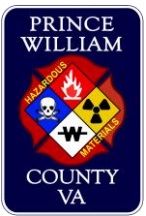


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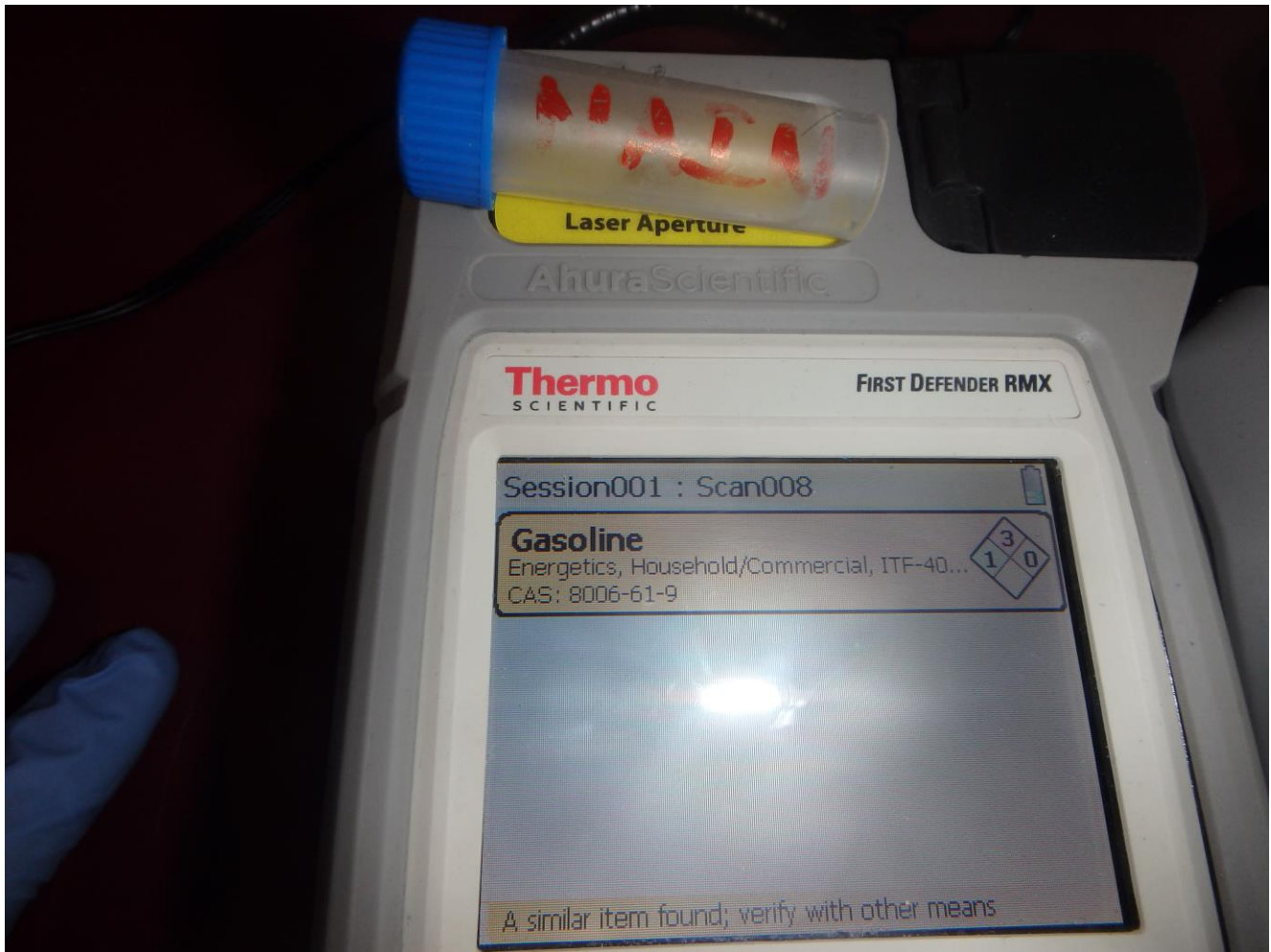
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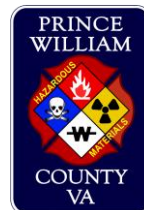


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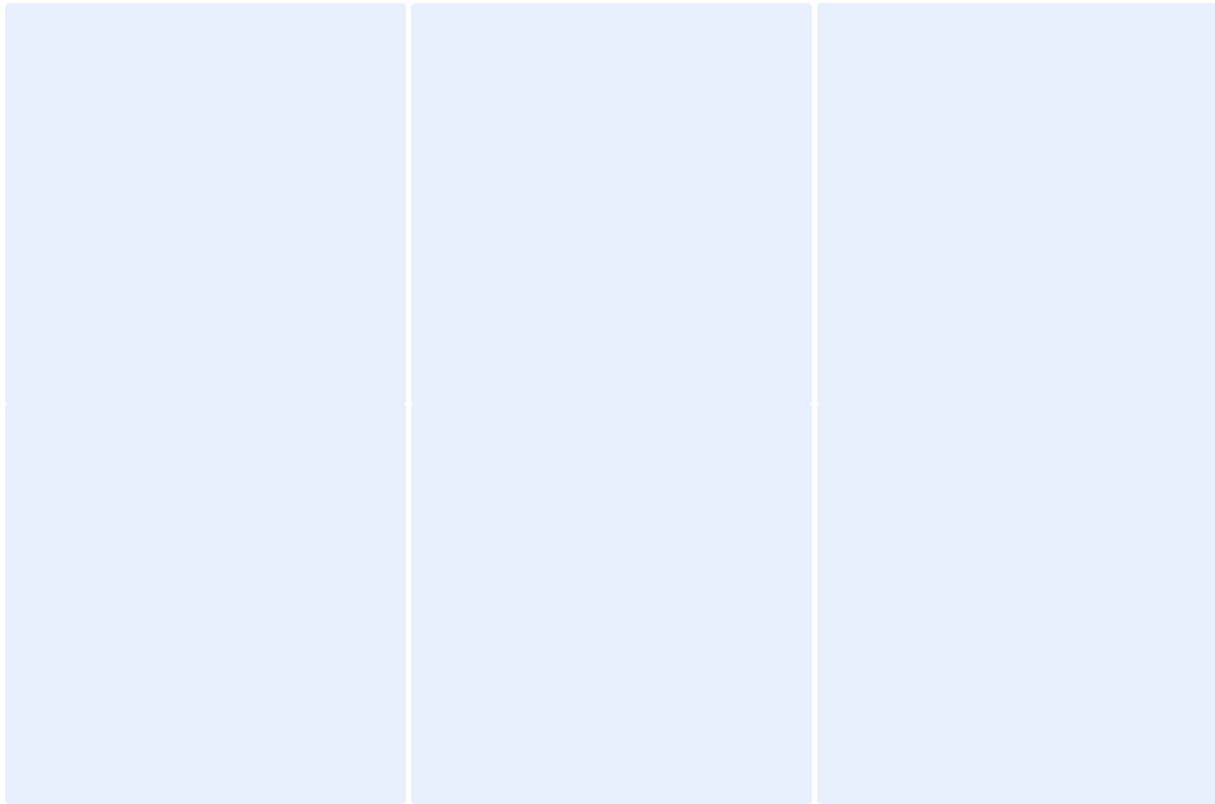
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E504 called a phone consult about a smell of gasoline at the dispatched address, the same place as yesterday's Hazmat call. Occupants claim that the smell had become stronger, E504's crew investigated and all readings were within normal limits. No occupants reported any pain or anything that identifies a hazard at the property. A additional to explain to the occupants that the all may take a while to dissipate and that there is no hazard present other than a nuisance.	
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Additional information
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Marital status or lead investigator



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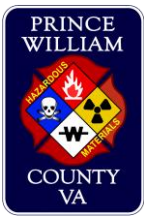


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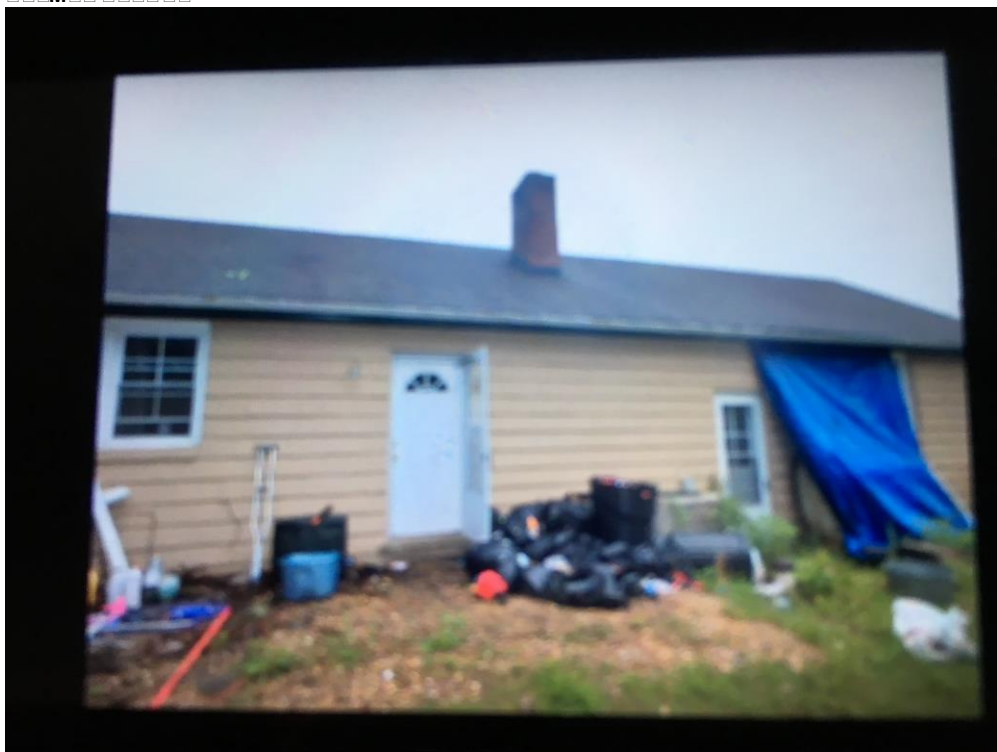
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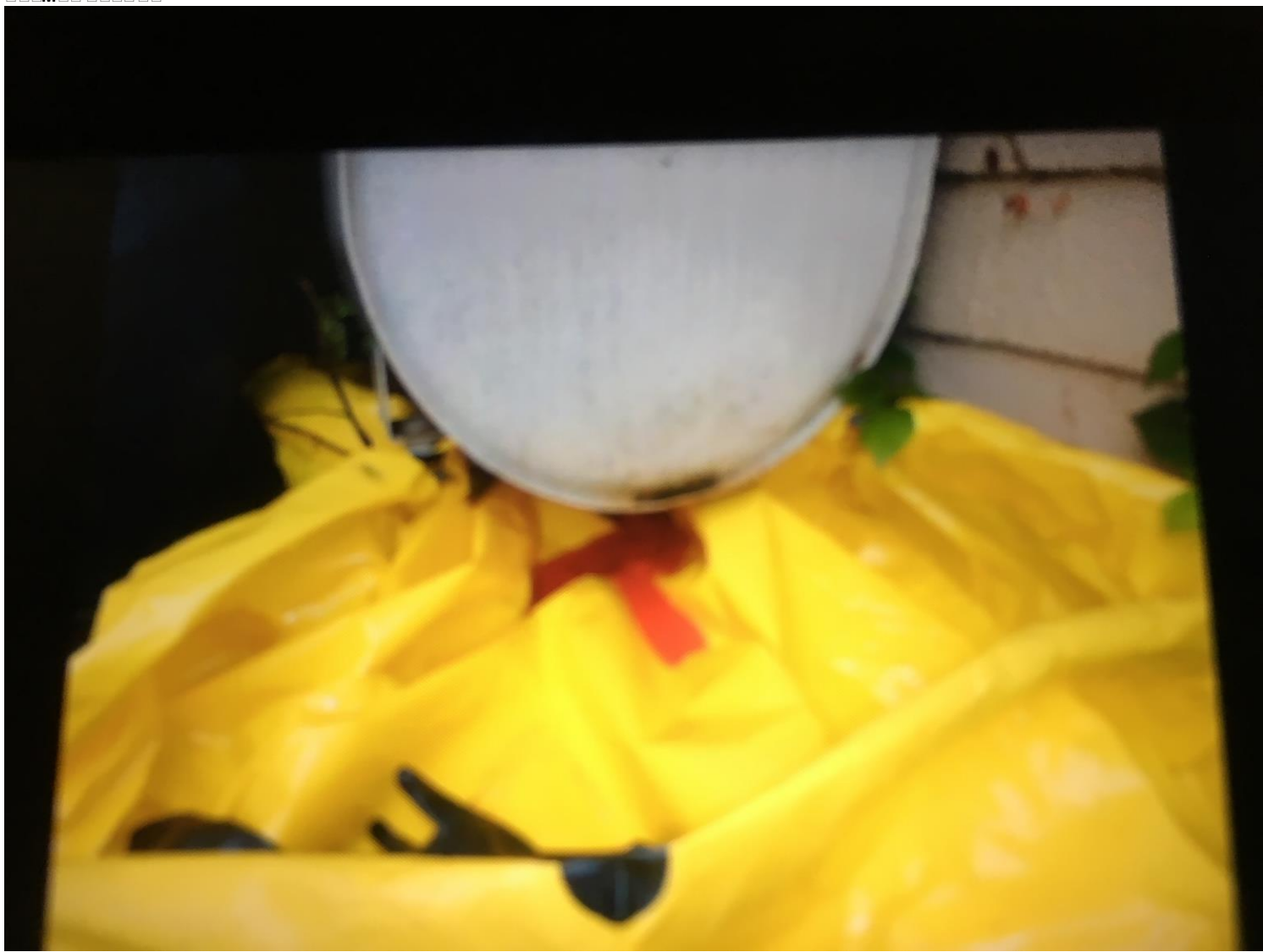
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www.pearsoncmg.com

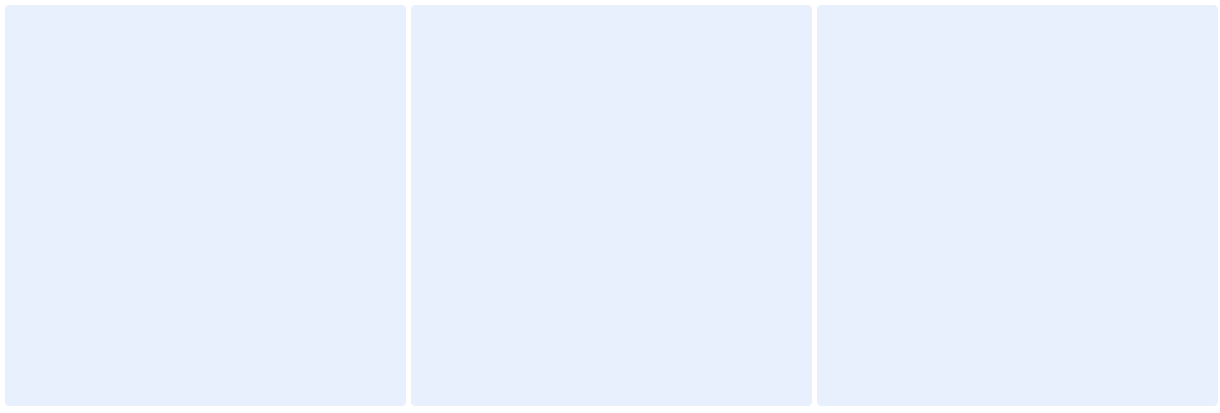


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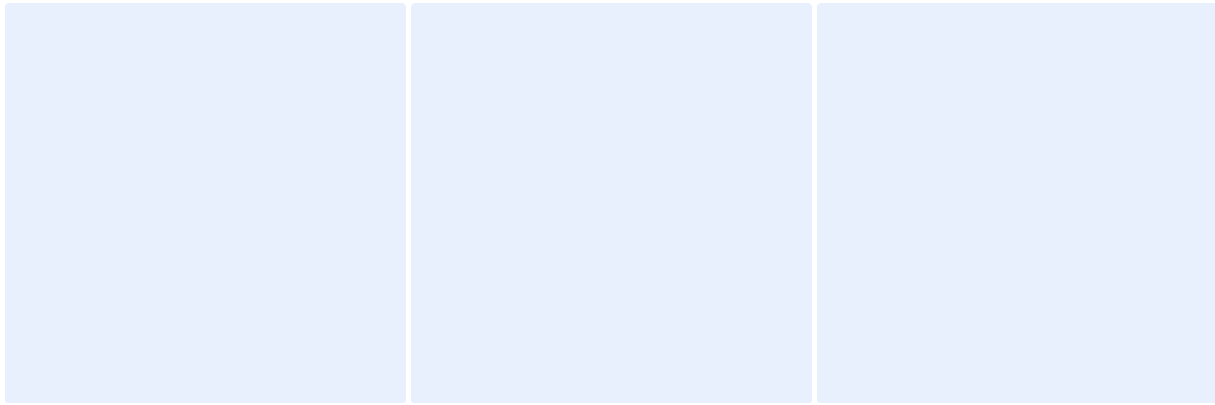


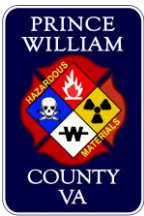
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Name	Name
Address	Address
Company Name	Company Name
Agency Name	Agency Name
Service Description	Service Description
Name	Name
Address	Address
Company Name	Company Name
Agency Name	Agency Name
Service Description	Service Description
Name	Name
Address	Address
Company Name	Company Name
Agency Name	Agency Name
Service Description	Service Description
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Address	Address
Company Name	Company Name
Agency Name	Agency Name
Service Description	Service Description

Additional Information
Miscellaneous
Remarks



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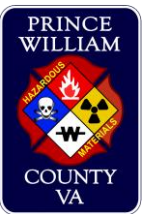
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Date of Incident	Date
Location	City
Reported by	Incident type and priority
M Responding C Millia Con Stat S Responding C Mat ray Mo M M Responding na	

S

M and S responded to the dispatch address for the report of a diesel fuel spill behind fire station on arrival on ground by S personnel and directed to area in and behind the building for the fuel spill. The incident fuel spill was not a large container but at a 500 gallon oil drum that was overturned at 12:30 PM. The drum was lying on its side and contained approximately 500 gallons of diesel fuel. The fuel was spilled out of the container and in the direction of the fuel spill. The spill was contained by the fire personnel and the fuel was disposed of properly. The spill was not a hazardous material spill and no personnel were injured. The spill was caused by a falling drum and the fire personnel were notified of the spill. The spill was contained and the fuel was disposed of properly. The spill was not a hazardous material spill and no personnel were injured. The spill was caused by a falling drum and the fire personnel were notified of the spill.

In addition to the fuel spill, the fire personnel did not notice any other damage to the incident area. The area was dry and there was no rain. The fire personnel did not notice any other damage to the incident area. The area was dry and there was no rain. The fire personnel did not notice any other damage to the incident area. The area was dry and there was no rain.

Due to recent rain, all personnel did not notice any significant amount of rain on the ground in the affected area. The area was dry and there was no rain. The fire personnel did not notice any other damage to the incident area. The area was dry and there was no rain.

M was notified of our findings and actions and took the appropriate actions. The spill was contained and the fuel was disposed of properly. The spill was not a hazardous material spill and no personnel were injured. The spill was caused by a falling drum and the fire personnel were notified of the spill.

S	B
Name	Name
Phone	Phone
Address	Address
City	City
State	State
Zip	Zip

S

Date	Date
City	City
Name	Name
Agency	Agency
Notes	Notes

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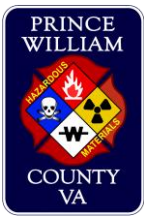


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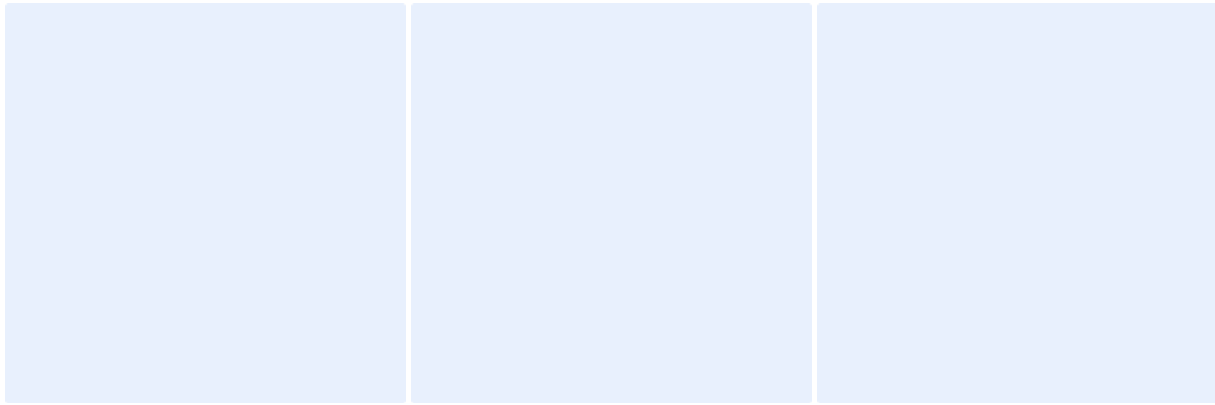
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Date of Incident	Date
Location Intersection of Minnie Hill Rd and Cal Blvd	City
Report made by Captain Brigg	Incident type and/or description
<input type="checkbox"/> Motorist Responding <input type="checkbox"/> Spill Responding <input type="checkbox"/> Other Responding	

S	
<p> Officer B advised that a "leak" at the intersection of Minnie Hill Rd and Cal Blvd only arrived to find two gallon gas cans sitting on the side of the road near the intersection. One of the cans contained a product on the road. Officer did not enter any storm drains or other areas. No need to place a barrier on roadway. One product had dried already. It is apparent that the two gas cans had fallen off a vehicle and struck the roadway only on can had leaked its contents. Officer advised that in the gas station and a 20 gallon in a 2000 B notified duty officer at the station for consultation. Officer at the station in or of B officer that the responsibility for retrieval of the gas cans. Officer notified through R and arrived on scene to collect the gas cans. B cleared the scene. Officer notified a court. </p>	
S	S
Name	Name
Company	Company
Address	Address
Phone	Phone
Notes	Notes

S	
Date	Date
City	City
Name	Name
Agency	Agency
Other	Other
Date	Date
City	City
Name	Name
Agency	Agency
Other	Other

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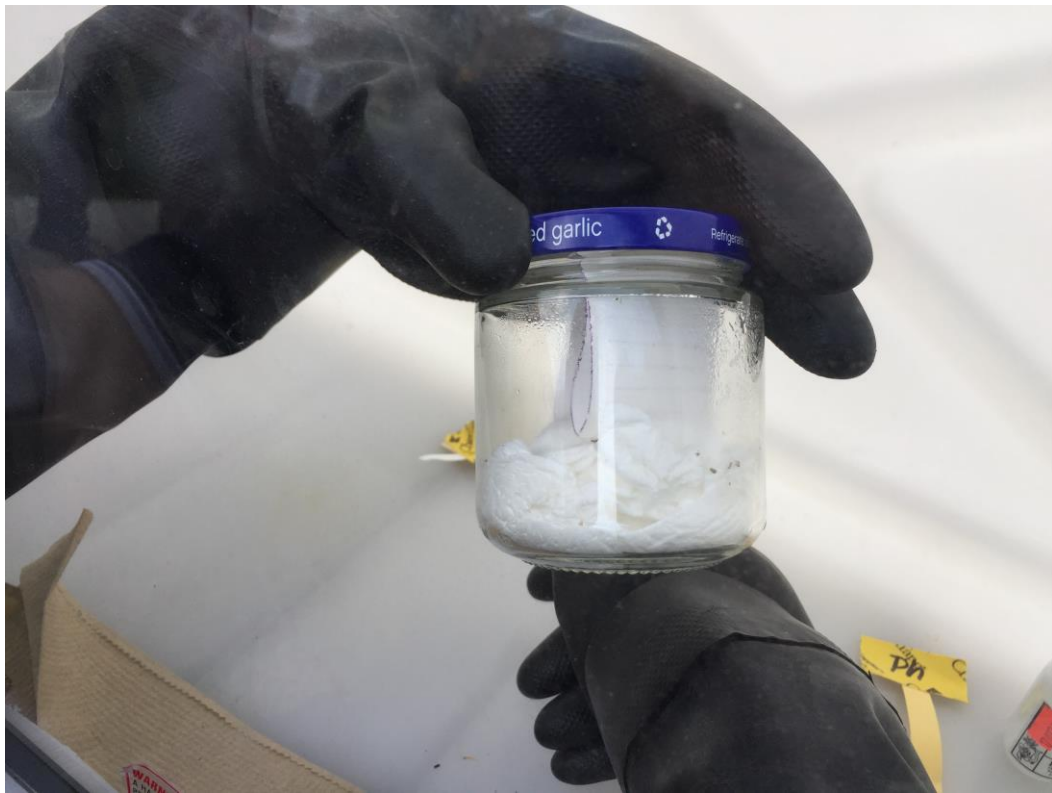


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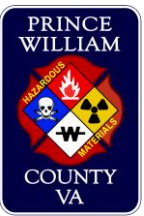
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M	
Incident #	Date
Location	City
Reported by	Incident # and Respondant #
M Responding S Responding M Responding	

S	
<p> at a hazardous material incident on at the ill ar tractor trailer had a mechanical breakdown and crossed a utility line that was connected to the driver side add tank had 500 gallons of fuel and the driver reported the tank to be full 500 gallons of fuel that leaked from the driver side fuel tank and plugged the hole with a bucket to contain the spill and to the roadway and ground could not drain the spill by the time the driver arrived at the scene and after clean up could not be a timely response contracted out to an ironment to handle the cleanup </p>	
SIB	
Barona	Lloyd
Mclan	
Address	Address
Phone	Phone
Notes	Notes

S	
Date	Date
City	City
Name: Brian	Name
Agency	Agency
Notes	Notes
Date	Date
City	City
Name	Name
Agency	Agency
Notes	Notes

Section 1: M, S, M, S

Table with 2 columns and 15 rows of text boxes for data entry.

Additional information section with three rows of text boxes.



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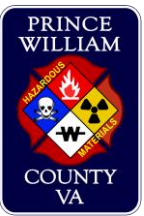


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M	
Date of Incident	Date
Location	City
Reported by	Incident type and/or
M Responding S Responding M Responding	

S	
<p> Station called reporting that a large total outage of station loading and loading to station condition and that station personnel took product going into retention condition. Recu at point of station along with safety arrived at station and already out of the area and turned the area after the station. Recu at station confirmed that the area had reached the retention condition and are attached to the report station is filling out the report for the area attached to the did not need to be contacted for this incident. </p>	
S	SIB
Station	Station
City	City
Address	Address
Phone	Phone
Notes	Notes

S	
Date	Date
City	City
Address	Address
Agency	Agency
Notes	Notes
Date	Date
City	City
Address	Address
Agency	Agency
Notes	Notes

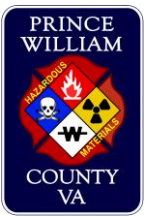
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M	
Date of Incident	Date
Location (London Blvd / Horn Rd)	City
Reported by / Origin	Incident Type and/or Classification
M Personnel Responding (Team/Bill) S Personnel Responding Other M Personnel Responding	

S	
<p>Conducted a site consult via phone with contractor regarding the above incident. A 5-gallon quart oil container laying on the side of Horn Rd hit a ditch water run off and spilled. The spill ran along Horn Rd and a storm drain. S arrived and constructed a wall dam to prevent runoff from going into the storm drain. Upon S arrival to the scene, the condition was ill and we found and did a back-to-back site visit with the contractor and reiterated that a discharge during the above consult. S crew conducted a survey and recon of the runoff. Deployed tools and a flashlight to open the storm drain cover to verify the presence of runoff. In addition, the first storm drain structure and the subsequent storm drain structure were noticed on the water run off. The runoff on the surface of Horn Rd. S personnel proceeded to backload and a permit was obtained to lift the water into oil. A consult was negative and documented by taking pictures. R Brad Miller was contacted via phone and an agreement was reached regarding the incident and next steps. Shortly after a truck arrived on the scene. The personnel completed the clean up. Proceeding according to the standard procedure, incident was cleared and the site was cleared.</p>	
S SB	S
Name	Name
Phone (any)	Phone
Address (Residency Rd / Manassas)	Address
Company	Company
Other Contacted (R Brad Miller)	Other

S	
Date	Date
City	City
Name (R Bart)	Name
Company	Company
Other Reason for a discharge (noting surfer)	Other
Date	Date
City	City
Name	Name
Company	Company
Other	Other

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Date of Incident	Date
Location	City
Reported by Technician Name and Title	Incident Type and Technician Name
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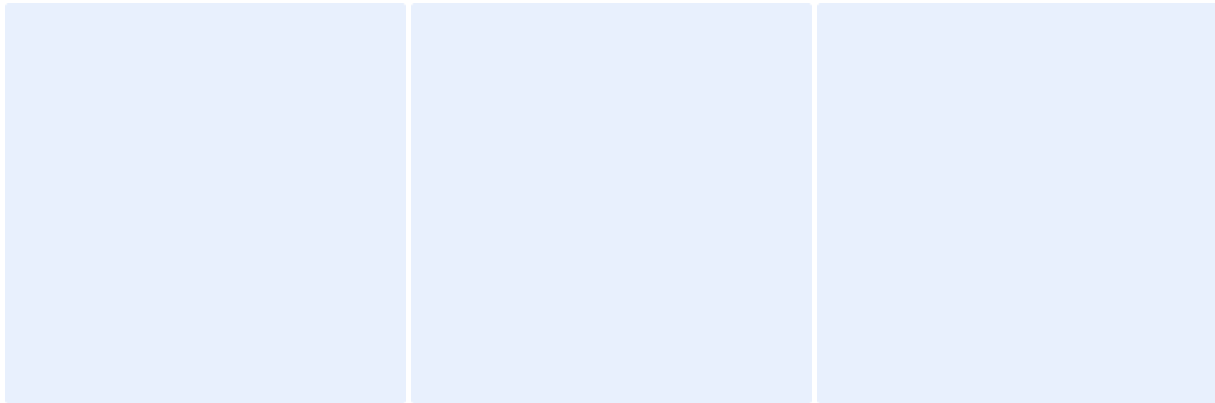
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<p>Truck driven by John Wilson on Douglas Road while driving in the portbound lane on the northbound side of the road, causing a significant oil leak. An incident occurred at the oil area and extended for roughly a quarter of a mile in the road of oil in the area down lane it a total of 1000 gallons of oil being collected and being taken to the oil in the area and no damage was done.</p> <p>Arrived on scene to find it and described above and consulted with M... M... advised that there was no further report that could be given and turned control of the scene over to Eric Mc... for ... and Officer ...</p>	
S B	S
Area of concern	Area
Other any	Other any
Address	Address
Personnel	Personnel
Notes	Notes

S	
Date	Date
City	City
Name Eric Mc...	Name
Agency	Agency
Notes	Notes
Date	Date
City	City
Name ... Blair	Name
Agency	Agency
Notes	Notes

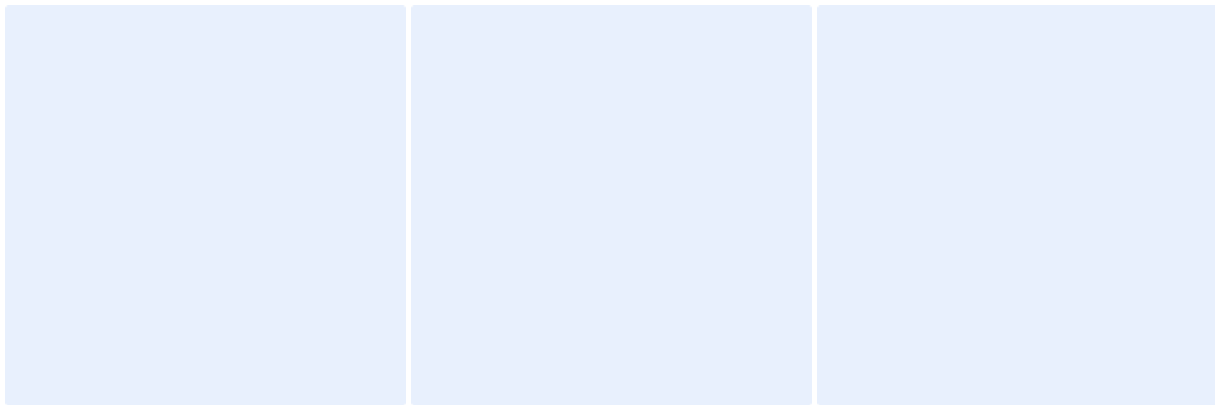
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Additional information
Metric
Marital record on card investigator



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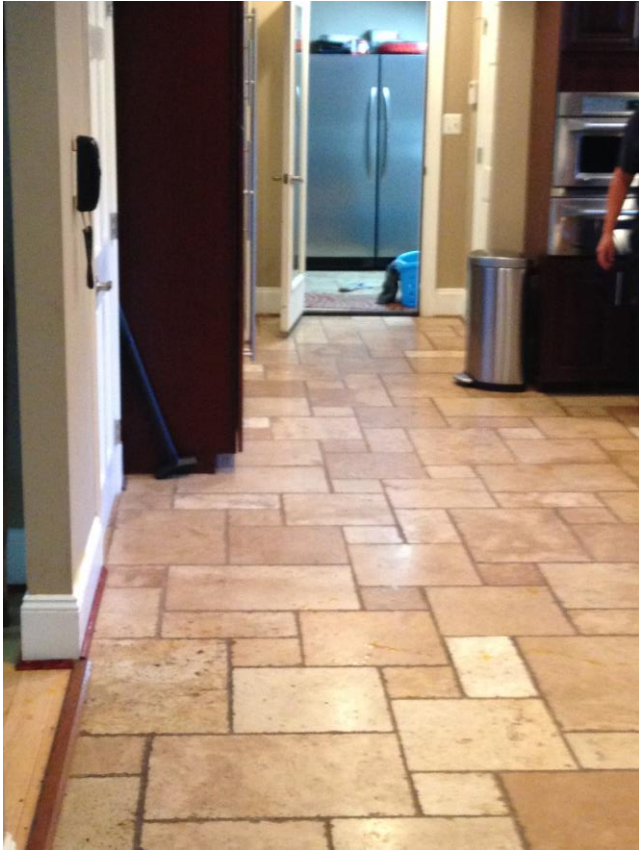
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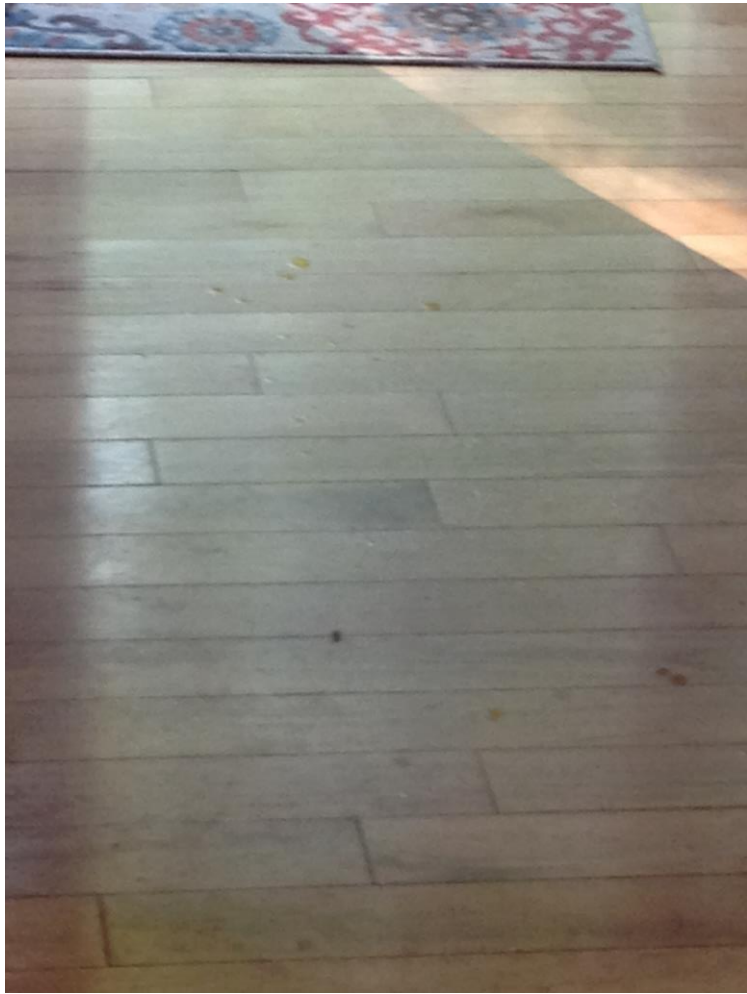
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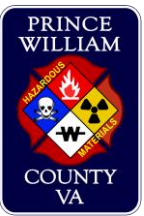


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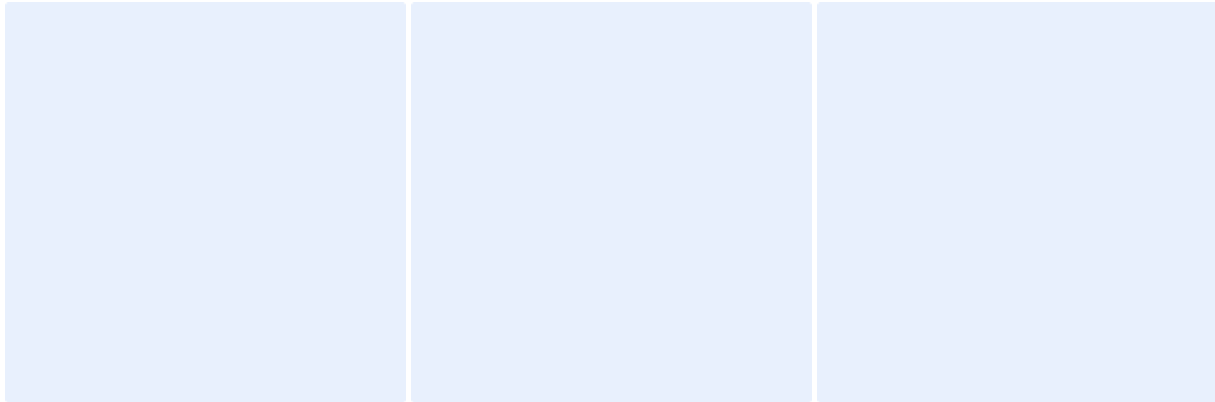
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Date of Incident	Date
Location: Banberry Dr	City
Reported by: Snitong	Incident type and description
<p>M: Responding: Snitong, Main Mc, Shannon, Rin</p> <p>S: Responding: Miral, Sa</p> <p>Other M: Responding: Miller</p>	

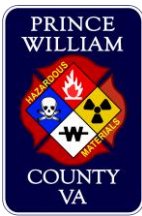
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<p>Responded to an outdoor natural gas leak at Banberry Dr upon arrival. Officer upgraded to call type to include a leak at contact due to a parent of the outdoor gas line early on. Also being affected due to high concentration in and around the structure.</p> <p>Upon arrival, officer advised that a "natural gas leak" was detected during an excavation by a construction company. A notification was given to the contractor upon arrival.</p> <p>Investigation by a contractor was conducted, bearing full structural firefighting and utilizing gas monitor. High accuracy readings were directly downwind of the excavation site. A leak was detected in the front and backyard of a vacant lot. Gas readings were at no point any higher than the maximum safe precautionary level for the contractor and all dealings reported negative for gas readings.</p> <p>An aid to monitor gas readings near the gas leak area was deployed and monitored routinely from the contact and contact during the repair. The gas company (any) at the contact continued to provide an order and on the monitoring a condition changed.</p> <p>A notification was given to fully occur the gas leak by</p>	
S SB	S
Name	Name
Company	Company
Address	Address
Phone	Phone
Notes	Notes

S S	
Date	Date
City	City
Name: Bartol	Name
Agency	Agency
Other court/agency notification	Other

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Additional information
Micro-int



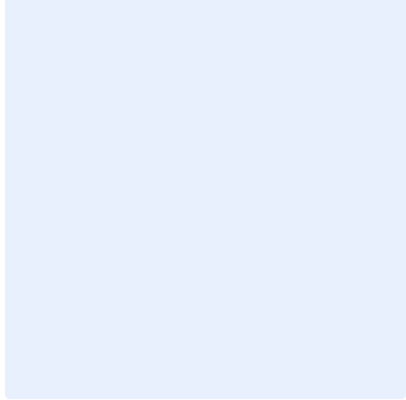
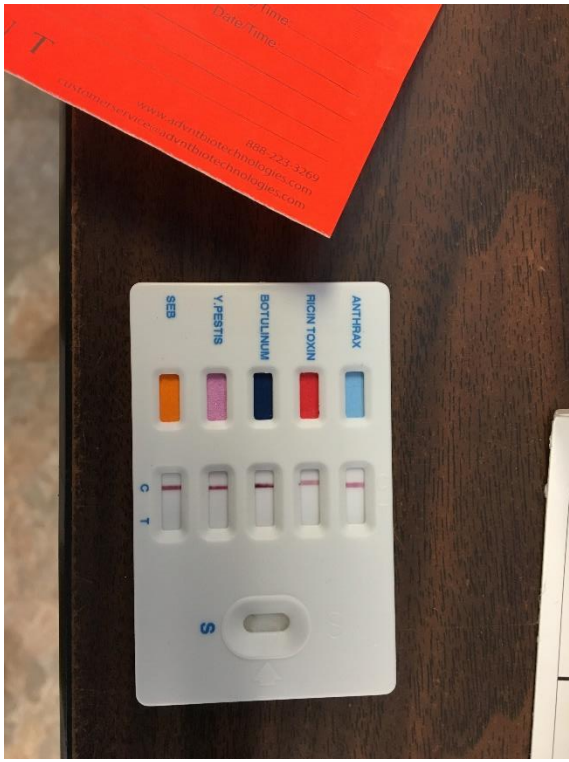
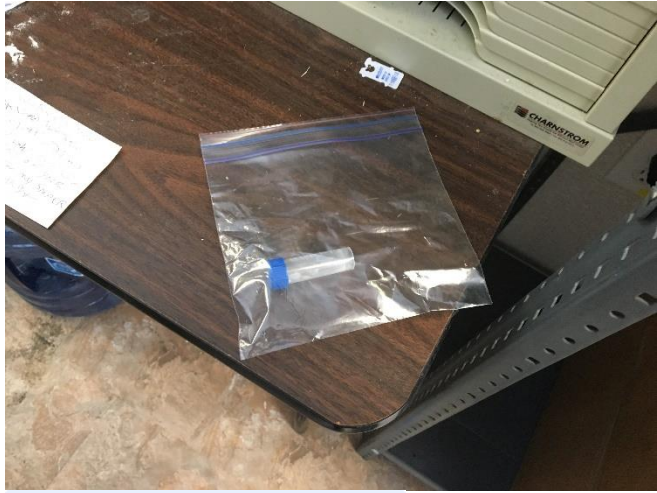


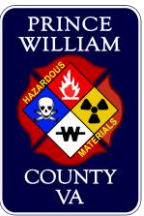
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Date of Incident	Date
Location (Address, City, State, Zip)	City
Reported by	Incident No. and
<input type="checkbox"/> M Personnel Responding <input type="checkbox"/> S Personnel Responding <input type="checkbox"/> Other Personnel Responding	

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<p> Duty Officer at the scene received a phone call from Detective S... reporting a... package in the mail from an unknown party. After the... owner opened it... package was sent to the... room... located... on narcotic... officer took the... in... to the... Safety... S... Safety... M... our... our... our... our... our... </p>	
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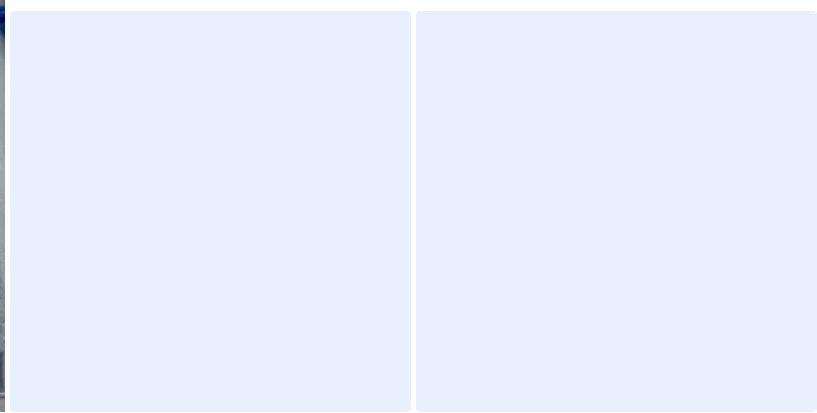
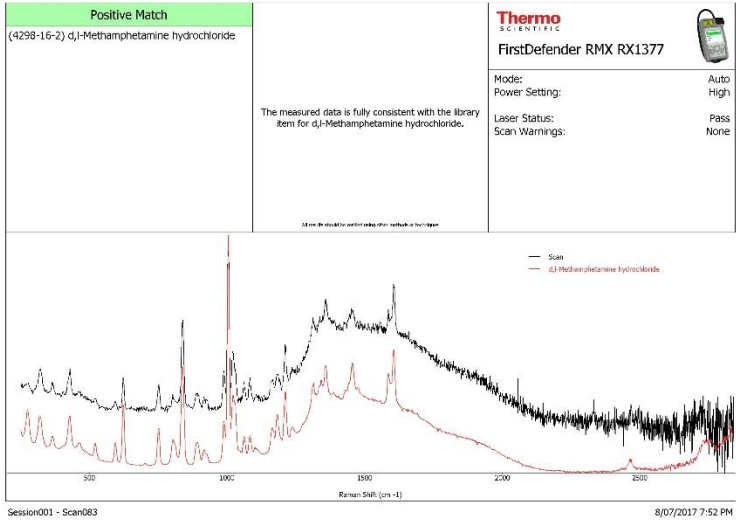
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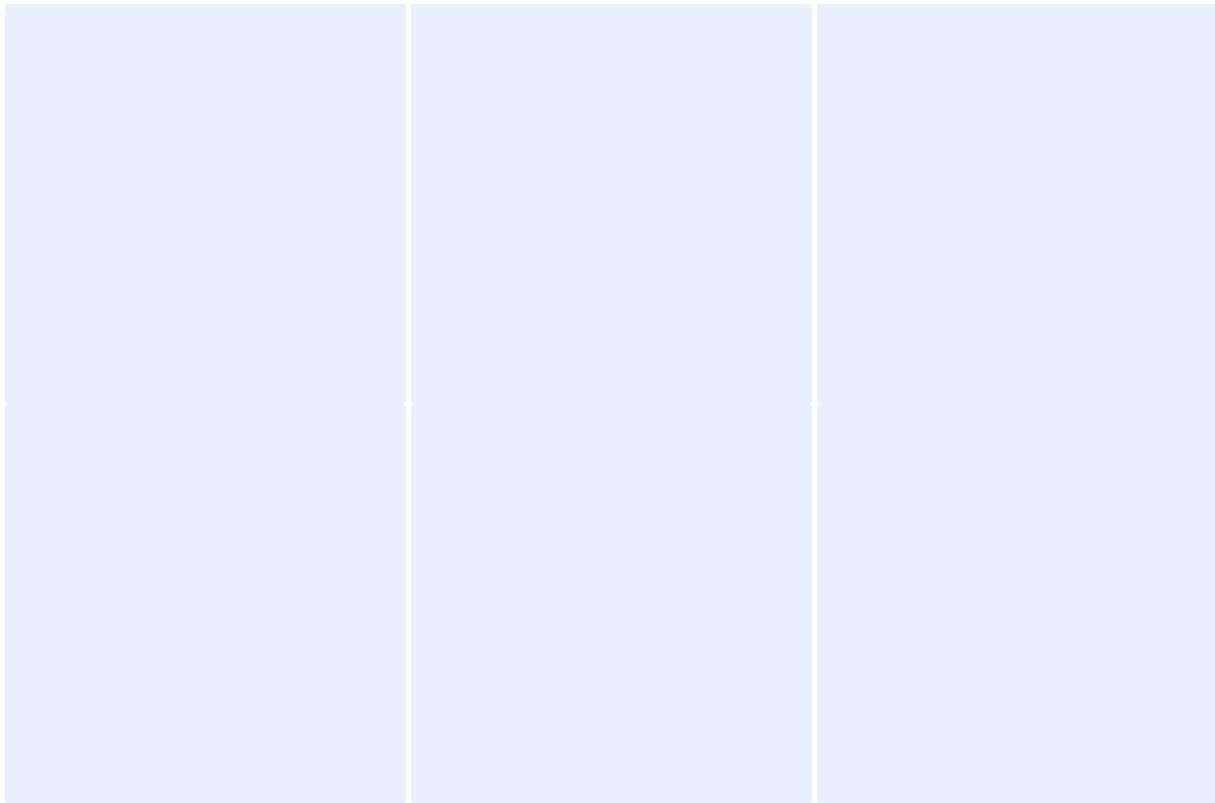
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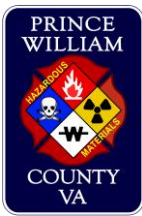
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<input type="checkbox"/> Reported by	<input type="checkbox"/> Incident # and
<input type="checkbox"/> M Responding <input type="checkbox"/> S Responding <input type="checkbox"/> M Responding	

S	
<p>M received a request for consultation re: a Radon detector and secondary screening. M performed a radon reading in the living room and confirmed reading. M advised that the radon level was not a "hot spot" and that the radon level was within normal background radiation levels. M advised that the radon level was not a "hot spot" and that the radon level was within normal background radiation levels.</p>	
SIB	
<input type="checkbox"/> Address	<input type="checkbox"/> Address
<input type="checkbox"/> Virginia Rail	<input type="checkbox"/> Virginia Rail
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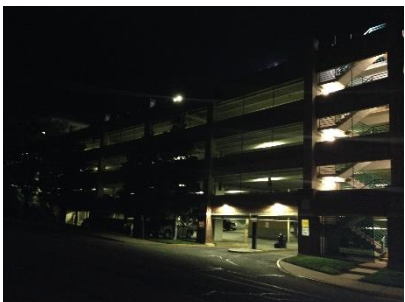
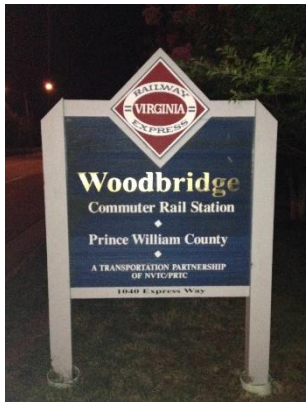
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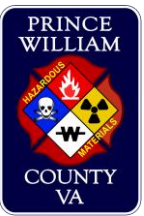
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INCIDENT REPORT
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INCIDENT REPORT	
Date of Incident: _____	Time: _____
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Reported by: _____	Incident by: _____ and _____
<input type="checkbox"/> M _____ Responding <input type="checkbox"/> S _____ Responding <input type="checkbox"/> Other _____ Responding	

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<p> M _____ advised for a _____ consult by _____ advised that they _____ on _____ tractor trailer that had ruptured on _____ and had an active _____ around _____ gallon _____ out of the _____ M _____ advised _____ to _____ down _____ to contain the _____ M _____ responded to the call M _____ arrived on _____ and found a _____ leaking _____ the _____ had _____ a _____ around the product that _____ out to contain it. M _____ placed a _____ cool under the _____ to collect the _____ M _____ isolated the _____ by _____ the _____ M _____ used _____ to _____ the _____ M _____ and _____ the _____ or _____ to _____ a _____ contractor _____ or _____ the _____ _____ any _____ M _____ remained on _____ until _____ arrived. M _____ turned the _____ over to _____ </p>	
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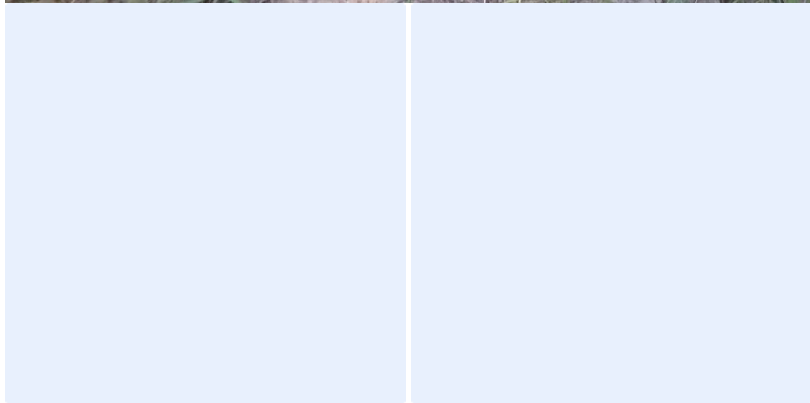
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Additional information

Major ticket

Administrative Control Investigator

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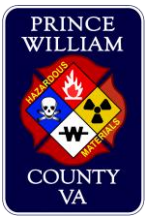


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**PRINCE WILLIAM COUNTY
DEPARTMENT OF FIRE AND RESCUE
HAZARDOUS MATERIALS RESPONSE PROGRAM
INCIDENT REPORT FORM**



INCIDENT INFORMATION	
Fire Dept. Incident #: 170028646	Date: 9/15/2017
Location: 7402 Sudley Rd Manassas VA	Time: 1124
Report Completed By: T.Forbes	Incident Commander: T.Forbes
HM 506 Personnel Responding: T. Forbes, D. Bell, L.Yanike, Z.Markley HS 516 Personnel Responding: Other HMT Personnel Responding:	

INCIDENT DESCRIPTION	
<p>I was notified by HMO502 of a fuel spill at 7402 Sudley Rd Manassas VA, she stated that earlier this morning a customer over filled their vehicle and spilled gasoline on the ground. Hazmat 506 responded to the above address and met with the manager of the Raceway gas station. He stated that a customer was overfilled their vehicle and spilled up to 33.89 gallons (total amount dispensed). The manager of the gas station contacted Raceway emergency help number that contracted with Atlas Environmental to clean up the spilled gasoline. Atlas Environmental representative stated that the gasoline ran down the parking lot and entered the storm drain on the south side the parking lot, and traveled in the storm drain to the other side of 7421 Sudley Rd (Dunkin Donut). The Atlas environmental representative stated that he believed that 5 to ten gallons of gas was spilled. Hazmat 506 personnel monitored the area and the storm sewer and obtained normal reading Race way parking lot, the storm sewer in the Dunkin Donuts parking lot had an LEL of 2% when it was first monitored. We continued to monitor the storm sewer and the reading quickly returned to normal readings. The gasoline odor dissipated the area as Atlas Environmental attempted to recover any product in the storm sewer. HM506 personnel spoke with employees at that gas station and the Dunkin Donuts.</p>	
RESPONSIBLE PARTY	OTHER PARTY
Name: Jaliya Weera	Name:
Company: Raceway Gas	Company:
Address: 7402 Sudley Rd	Address:
Phone#: (703) 330-4988	Phone#:
Notes: Called Race way emergency number when the spill happened.	Notes:

NOTIFICATIONS/CONTACTS	
Date: 09/15/2017	Date: 09/15/2017
Time:	Time:
Name: Race way Emergency Help	Name: Daniel
Comp/Agency:	Comp/Agency: VA EOC
Notes: (800) 688 6199	Notes:
Date:	Date:
Time:	Time:
Name:	Name:
Comp/Agency:	Comp/Agency:
Notes:	Notes:

**PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT**

NOTIFICATIONS/CONTACTS	
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Time:	Time:
Name:	Name:
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Additional Notes/Information:
HAZMAT Officer Comments:
Fire Marshal requested/on scene: <input checked="" type="checkbox"/> Lead Investigator: Lt. Greenfield

PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT



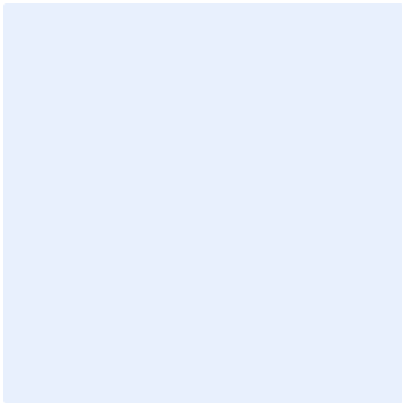
PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT



PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT



**PRINCE WILLIAM COUNTY DEPARTMENT OF FIRE AND RESCUE
HAZMAT REPORT**

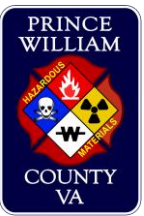


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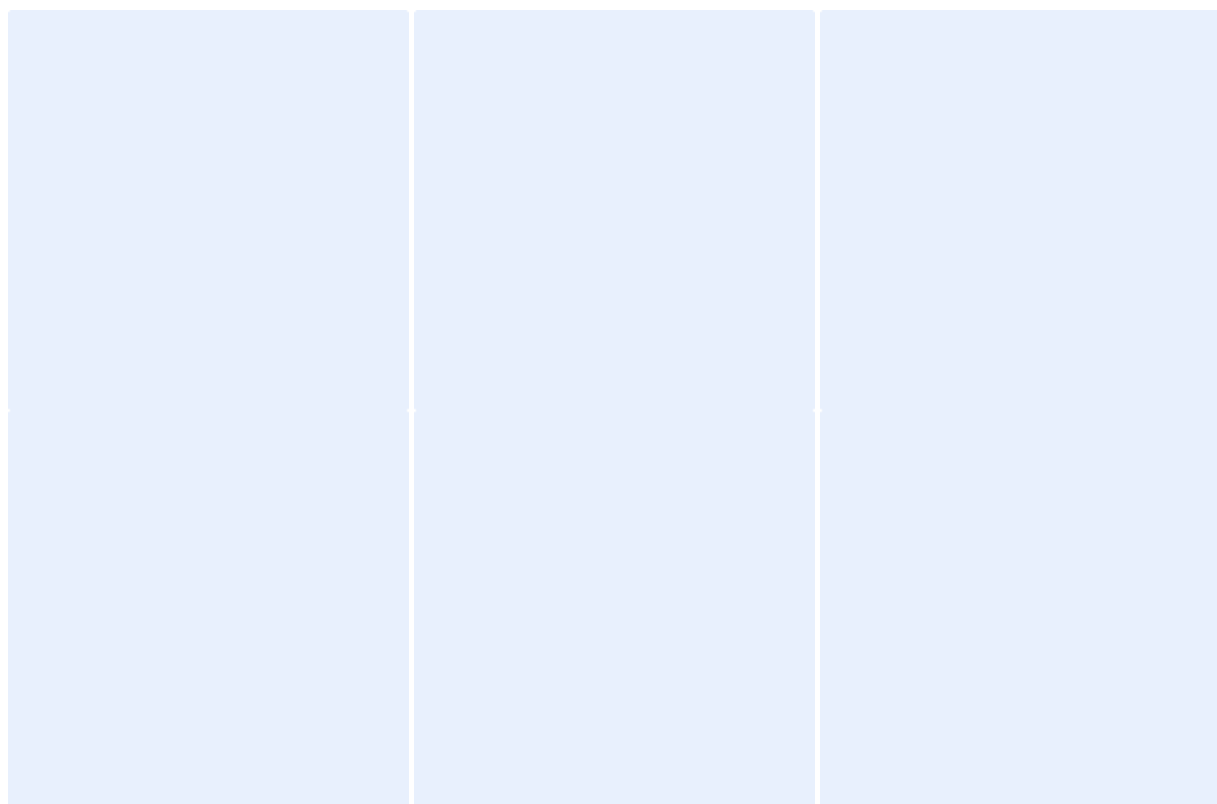
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<p>Truck involved in accident on road, driver lost control, vehicle overturned, driver injured, fire department responded, scene secured, no further action required.</p>	
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Make	Make
Color	Color
Year	Year
Model	Model
Other	Other

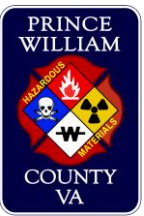
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Reported by Technician	Incident type and Technician
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<p>M called for a consultation to assist with a call that they were on. He called to find a 1-gallon gas can on the side of the road. Seeing a little bit of a can still appeared to be a 1-gallon can full of fuel. The gas appeared to be evaporating and stayed out of any storm drains. M advised to contact the person to claim the gas can. M contacted M and advised that he could go to the person to investigate the gas can. He took the can to the station.</p>	
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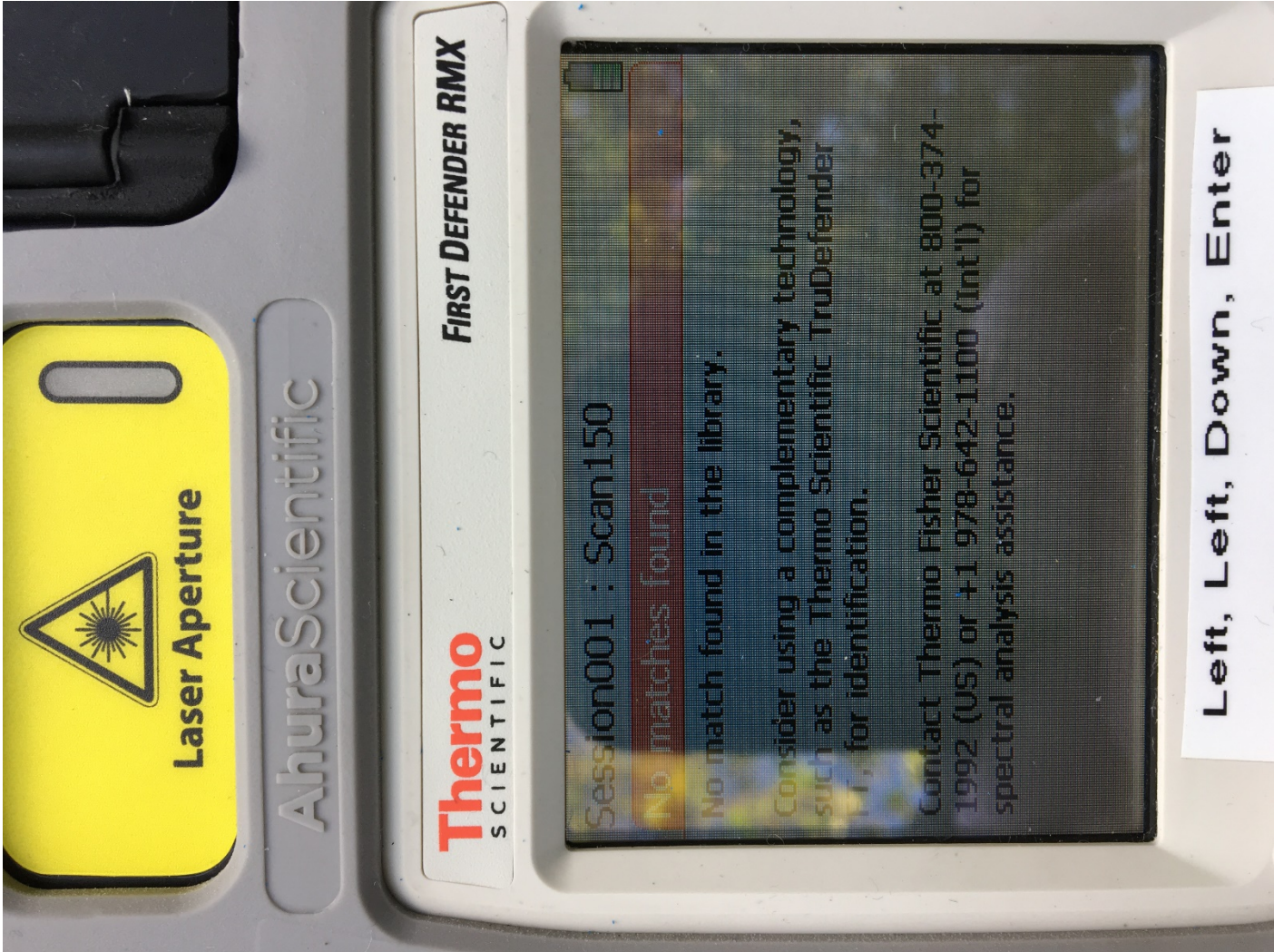
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PRINCE WILLIAM COUNTY VA
 FIRE DEPARTMENT
 RESCUE
 COUNTY VA

PRINCE WILLIAM COUNTY VA FIRE DEPARTMENT

Date of Incident	at
Location	City
Reported on	Incident No and Crew B
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Other	

PRINCE WILLIAM COUNTY VA FIRE DEPARTMENT

M received a phone consult from officer reported that a roof at 4045 North County Court had leaked out from the engine bay of a tractor trailer. Officer also stated that a car had been hit down and no battery. Officer contacted area at 4045 S to find a tractor trailer on the right shoulder. Could not find out near oil barrel. It had damaged to the front end due to rear ending a passenger car causing the loss of oil. Oil leaked on the shoulder and flowed at the edge of the grade along with the car. Had placed cones and covered the spill. A car had no action. Had been found to be at the location for any potential concern. Upon investigation found that no battery had been disconnected and no investigation concerns. Driver of the tractor trailer advised a sign for and could not use. Had the car clean up. M cleared the cones and went in service after returning to the station to the area in or out of the incident.

SIB	Report
Name	Name
Phone	Phone
Address	Address
Company	Company
Motor	Motor

PRINCE WILLIAM COUNTY VA FIRE DEPARTMENT

Date	Date
City	City
Name	Name
Agency	Agency
Notified of incident and told no aid required	Notified
Date	Date
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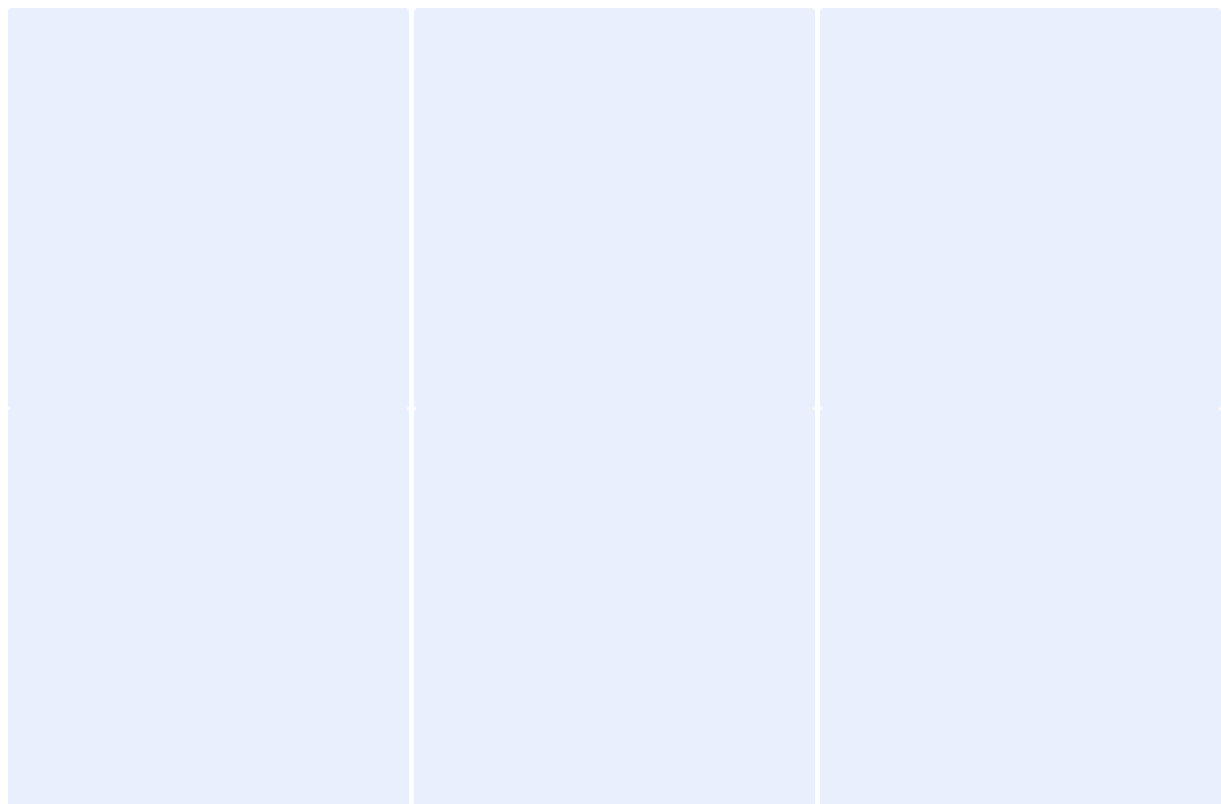


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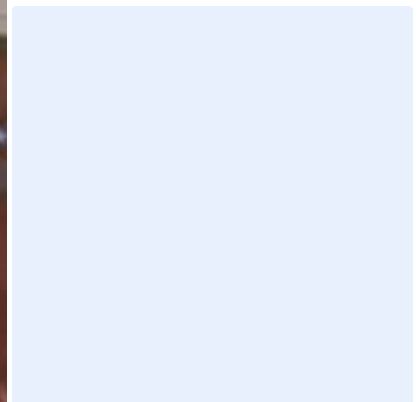
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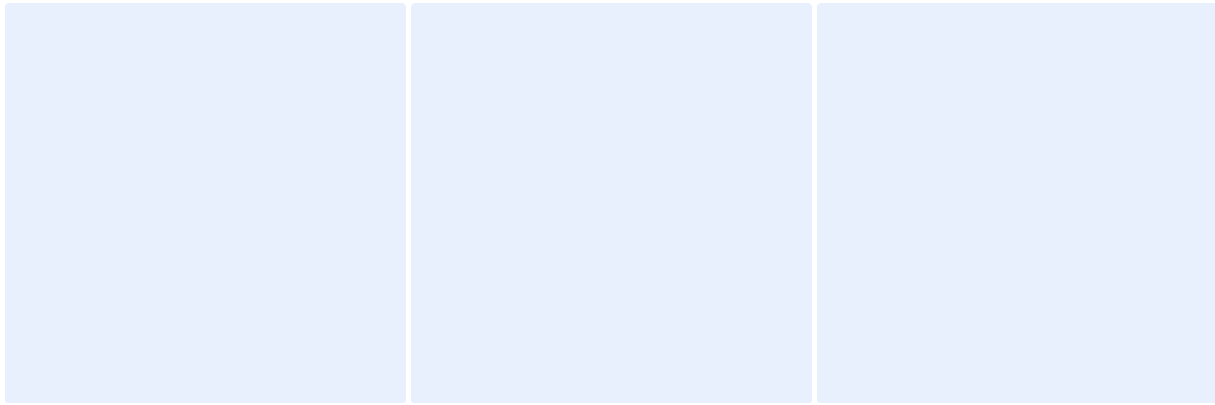
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Date of Incident	Date
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<p> A vehicle was involved in a collision with a truck at the intersection of Ellington Road and Sudley Manor. The truck was carrying a load of approximately 1000 gallons of fuel which spilled onto the road and into the ground. The driver of the truck was not injured. The driver of the car was not injured. The driver of the truck was not injured. The driver of the car was not injured. </p>	
SIB	Name
Richard Bailey	Quij Sanchez
Broad Run Contracting	Any
Address	Address
Phone	Phone
Other	Other

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Date	Date
Location	
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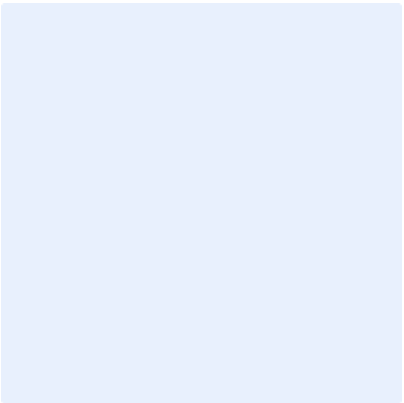
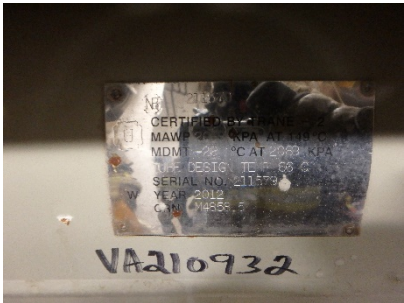
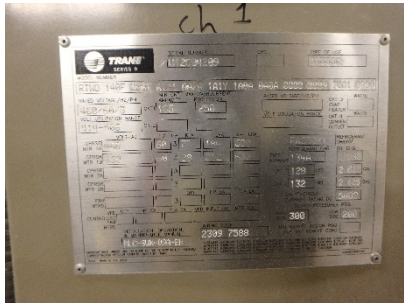
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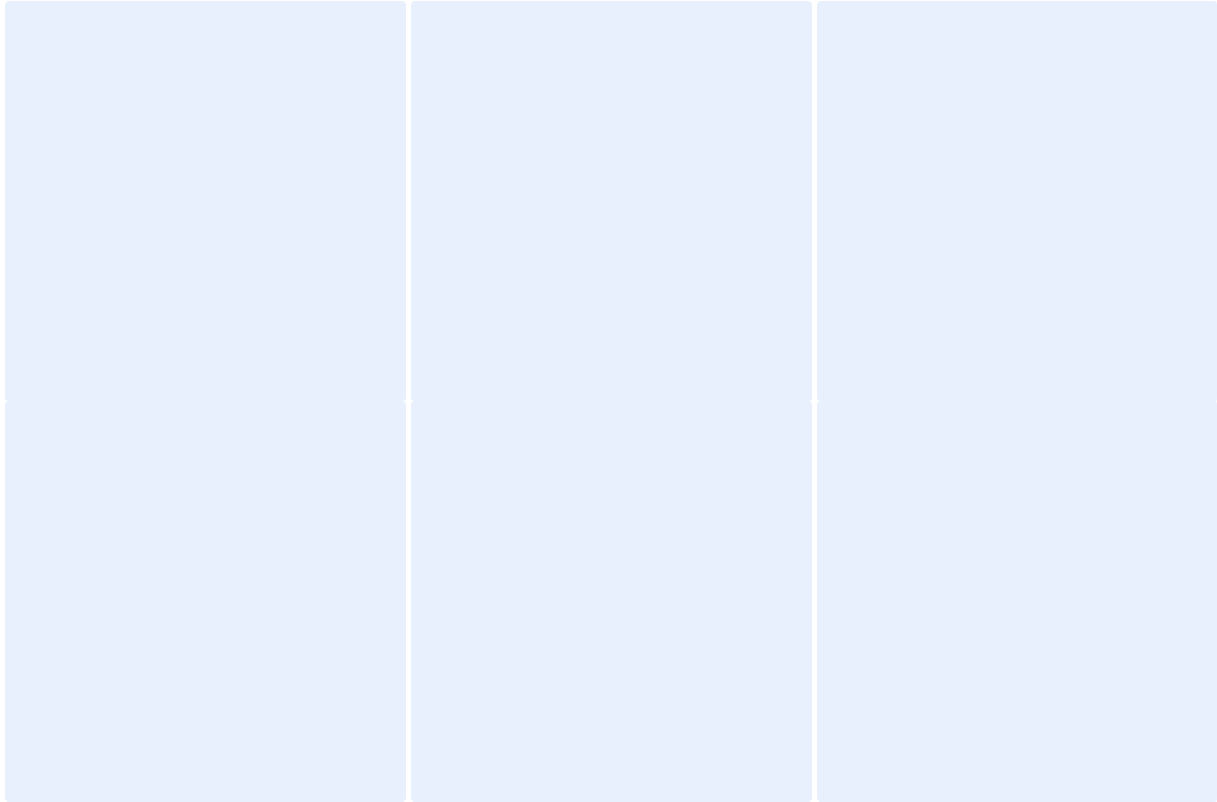


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Phone	Phone
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State	State
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Additional Information
MEMBER CONTACT
Primary Contact Name



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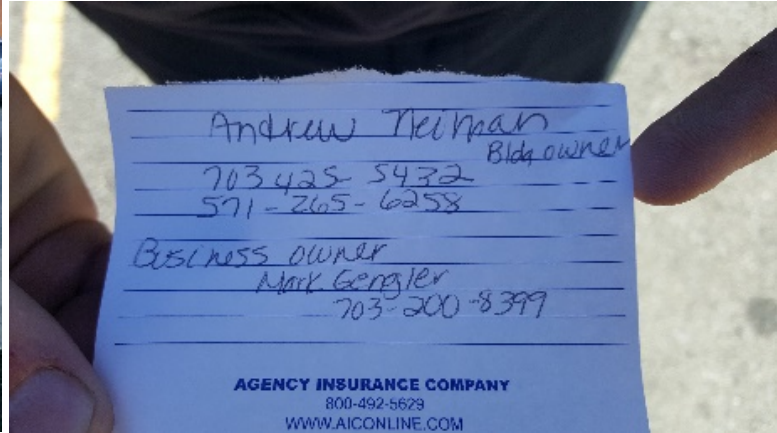


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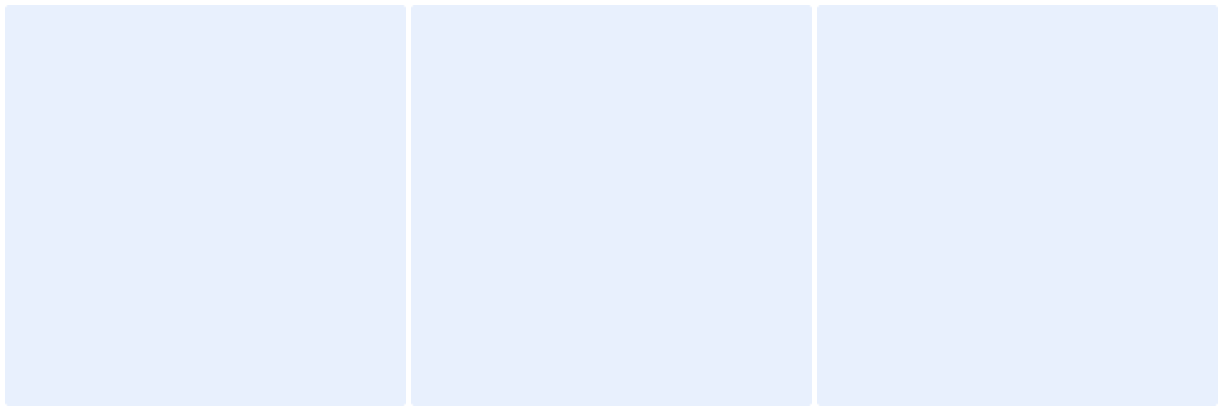




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Additional information
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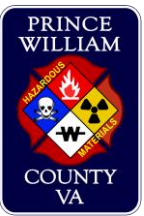
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Additional information
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SAFETY DATA SHEET



1. Identification

Covestro LLC
1 Covestro Circle
Pittsburgh, PA 15205
USA

TRANSPORTATION EMERGENCY

CALL CHEMTREC: (800) 424-9300
INTERNATIONAL: (703) 527-3887

NON-TRANSPORTATION

Emergency Phone: Call Chemtrec
Information Phone: (844) 646-0545

Product Name: MONDUR MR LIGHT
Material Number: 83186292
Chemical Family: Aromatic Isocyanate
Use: Di-/polyisocyanate components for the production of polyurethanes

2. Hazards Identification

GHS Classification

Acute toxicity (Inhalation): Category 4
Specific target organ toxicity - single exposure: Category 3 (Respiratory system)
Respiratory sensitisation: Category 1
Specific target organ toxicity - repeated exposure: Category 1 (Respiratory Tract)
Skin irritation: Category 2
Skin sensitisation: Category 1
Eye irritation: Category 2B

GHS Label Elements

Hazard pictograms:



Signal word: Danger

Hazard statements: Harmful if inhaled.
May cause respiratory irritation.
May cause allergy or asthma symptoms or breathing difficulties if inhaled.
Causes skin irritation.
May cause an allergic skin reaction.
Causes eye irritation.
Causes damage to organs (Respiratory Tract) through prolonged or

Material Name: MONDUR MR LIGHT

83186292

repeated exposure if inhaled.

Precautionary statements:

Prevention:

Avoid breathing dust, mist, gas, vapors or spray.
Do not eat, drink or smoke when using this product.
Wash skin and face thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Contaminated work clothing must not be allowed out of the workplace.
Wear protective gloves.
In case of inadequate ventilation wear respiratory protection. The type of respiratory protection selected must comply with the requirements set forth in OSHA's Respiratory Protection Standard (29 CFR 1910.134) or regional standards. For additional details, see section 8 of the SDS.

Response:

Get medical attention if you feel unwell.
IF ON SKIN: Wash with plenty of soap and water.
If skin irritation or rash occurs: Get medical attention.
Wash contaminated clothing before reuse.
IF IN EYES: Rinse cautiously with water for several minutes.
Remove contact lenses, if present and easy to do. Continue rinsing.
If eye irritation persists: Get medical attention.
IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.
If experiencing respiratory symptoms: Call a doctor or emergency medical facility (i.e. 911).

Storage:

Store locked up.
Store in a well-ventilated place. Keep container tightly closed.

Disposal:

Dispose of contents and container in accordance with existing federal, state, and local environmental control laws.

3. Composition/Information on Ingredients

Hazardous Components

<u>Weight Percent</u>	<u>Components</u>	<u>CAS-No.</u>	<u>Classification</u>
58%	Polymeric Diphenylmethane Diisocyanate (pMDI)	9016-87-9	Acute toxicity Category 4 Inhalation. Skin irritation Category 2. Eye irritation Category 2B. Respiratory sensitisation Category 1. Skin sensitisation Category 1. Specific target organ toxicity - single exposure Category 3 Respiratory system. Specific target organ toxicity - repeated exposure Category 1 Respiratory Tract.

38%	4,4'-Diphenylmethane Diisocyanate (MDI)	101-68-8	Acute toxicity Category 4 Inhalation. Skin irritation Category 2. Eye irritation Category 2B. Respiratory sensitisation Category 1. Skin sensitisation Category 1. Specific target organ toxicity - single exposure Category 3 Respiratory system. Specific target organ toxicity - repeated exposure Category 1 Respiratory Tract.
3.8%	2,4'-Diphenylmethane Diisocyanate (MDI)	5873-54-1	Acute toxicity Category 4 Inhalation. Skin irritation Category 2. Eye irritation Category 2B. Respiratory sensitisation Category 1. Skin sensitisation Category 1. Specific target organ toxicity - single exposure Category 3 Respiratory system. Specific target organ toxicity - repeated exposure Category 1 Inhalation Respiratory Tract.
0.2%	2,2'-Diphenylmethane Diisocyanate	2536-05-2	Acute toxicity Category 4 Inhalation. Skin irritation Category 2. Eye irritation Category 2B. Respiratory sensitisation Category 1. Skin sensitisation Category 1. Specific target organ toxicity - single exposure Category 3 Respiratory system. Specific target organ toxicity - repeated exposure Category 1 Inhalation Respiratory Tract.

4. First Aid Measures

Most Important Symptom(s)/Effect(s)

Acute: Diisocyanate vapors or mist at concentrations above the TLV or PEL can irritate (burning sensation) the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Persons with a preexisting, nonspecific bronchial hyperreactivity can respond to concentrations below the TLV or PEL with similar symptoms as well as asthma attack or asthma-like symptoms. Exposure well above the TLV or PEL may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). Chemical or hypersensitivity pneumonitis, with flu-like symptoms (e.g., fever, chills), has also been reported. These symptoms can be delayed up to several hours after exposure. These effects are usually reversible.

Causes skin irritation with symptoms of reddening, itching, and swelling. Persons previously sensitized can experience allergic skin reaction with symptoms of reddening, itching, swelling, and rash. Cured material is difficult to remove. Contact with MDI can cause discoloration.

Causes eye irritation with symptoms of reddening, tearing, stinging, and swelling. May cause temporary corneal injury. Vapor or aerosol may cause irritation with symptoms of burning and tearing.

May cause irritation of the digestive tract. Symptoms may include abdominal pain, nausea, vomiting, and diarrhea.

Delayed: Symptoms affecting the respiratory tract can also occur several hours after overexposure.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Use lukewarm water if possible. Use fingers to ensure that eyelids are separated and that the eye is being irrigated. Get medical attention.

Skin Contact

If direct skin contact with isocyanates occurs, immediately remove contaminated clothing and shoes. Wipe off the isocyanate product from the skin using dry towels or other similar absorbent fabric. If readily available, apply a polyglycol-based cleanser (e.g. Colorimetric Laboratories, Inc. (CLI) D-TAM™ Skin Cleanser) or corn oil. Wash with soap and warm water and pat dry. If a polyglycol-based cleanser is not available, wash with soap and warm water for 15 minutes. If available, use a wipe test pad to verify decontamination is complete (e.g. CLI SWYPE™). Get medical attention if irritation develops. Discard or wash contaminated clothing before reuse.

Inhalation

Move to an area free from further exposure. Extreme asthmatic reactions that may occur in sensitized persons can be life threatening. Get medical attention immediately. Administer oxygen or artificial respiration as needed. Asthmatic symptoms may develop and may be immediate or delayed up to several hours.

Ingestion

Do NOT induce vomiting. Wash mouth out with water. Do not give anything by mouth to an unconscious person. Get medical attention.

Notes to Physician

Eyes: Stain for evidence of corneal injury. If cornea is burned, instill antibiotic/steroid preparation as needed. Workplace vapors could produce reversible corneal epithelial edema impairing vision. Skin: This compound is a skin sensitizer. Treat symptomatically as for contact dermatitis or thermal burn. Ingestion: Treat symptomatically. There is no specific antidote. Inducing vomiting is contraindicated because of the irritating nature of the compound. Inhalation: Treatment is essentially symptomatic. An individual having a dermal or pulmonary sensitization reaction to this material should be removed from further exposure to any diisocyanate.

5. Firefighting Measures

Suitable Extinguishing Media: Dry chemical, Carbon dioxide (CO₂), Foam, water spray for large fires.

Unsuitable Extinguishing Media: High volume water jet

Fire Fighting Procedure

Firefighters should wear NFPA compliant structural firefighting protective equipment, including self-contained breathing apparatus and NFPA compliant helmet, hood, boots and gloves. Avoid contact with product. Decontaminate equipment and protective clothing prior to reuse. During a fire, isocyanate vapors and other irritating, highly toxic gases may be generated by thermal decomposition or combustion. Exposure to heated diisocyanate can be extremely dangerous.

Hazardous Decomposition Products

Material Name: MONDUR MR LIGHT

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By Fire and High Heat: Carbon dioxide (CO₂), carbon monoxide (CO), oxides of nitrogen (NO_x), dense black smoke., Isocyanate, Isocyanic Acid, Other undetermined compounds

Unusual Fire/Explosion Hazards

Closed container may forcibly rupture under extreme heat or when contents are contaminated with water (CO₂ formed). Use cold-water spray to cool fire-exposed containers to minimize the risk of rupture. Large fires can be extinguished with large volumes of water applied from a safe distance, since reaction between water and hot diisocyanate can be vigorous.

6. Accidental Release Measures

Spill and Leak Procedures

Implement site emergency response plan. Evacuate non-emergency personnel. The magnitude of the evacuation depends upon the quantity released, site conditions, and the ambient temperature. Isolate the area and prevent access of unauthorized personnel. Notify management. Call CHEMTREC at 1-800-424-9300 for assistance and advice.

Wear necessary personal protective equipment (PPE) as specified in the SDS or the site emergency response plan. Ventilate and remove ignition sources. Control the source of the leak. Contain the released material by damming, diking, retaining, or diverting into an appropriate containment area. Absorb or pump off as much of the spilled material as possible. When using absorbent, completely cover the spill area with suitable absorbent material (e.g., vermiculite, kitty litter, Oil-Dri®, etc.). Allow for the absorbent material to absorb the spilled liquid. Shovel the absorbent material into an approved metal container (i.e., 55-gallon salvage drum). Do not fill the container more than 2/3 full to allow for expansion, and do not tighten the lid on the container. Repeat application of absorbent material until all liquid has been removed from the surface. For spills involving a solid product, remove mechanically (sweep up, vacuum, shovel etc.) and collect and place into an approved metal container.

Decontaminate the spill surface area using a neutralization solution (see list of solutions on the SDS); scrubbing the surface with a broom or brush helps the decontamination solution to penetrate into porous surfaces. Wait at least 15 minutes after first application of the neutralization solution. Cover the area with absorbent material and shovel this into an approved metal container. Residual surface contamination can be checked using a wipe test pad to verify decontamination is complete (e.g. CLI Surface Swype™). If the wipe test pad demonstrates that isocyanate remains on the surface (red color on pad), repeat applications of neutralization solution, with scrubbing, followed by absorbent until the surface is decontaminated (no color change on wipe pad). Apply lid loosely to metal waste container (do not tighten the lid because carbon dioxide gas and heat can be generated from the neutralization process). With the lid still loosely in place, move the container to an isolated, well-ventilated area to allow release of carbon dioxide. After 72 hours, seal the container, and properly dispose of the waste material and any contaminated equipment (i.e., broom or brush) in accordance with existing federal, state and local regulations.

Additional Spill Procedures/Neutralization

Products or product mixtures that have been shown to be effective neutralization solutions for decontaminating surfaces, tools, or equipment that have been in contact with an isocyanate include, but are not limited to:

- Colorimetric Laboratories, Inc. (CLI): 1-847-803-3737
 - o Isocyanate Decontamination Solution
- Spartan Chemical Company: 1-800-537-8990
 - o Spartan® ShineLine Emulsifier Plus (stripping solution)
 - o Spartan® SC-200 Heavy Duty Cleaner
- ZEP Commercial Heavy Duty Floor Stripper
- A mixture of 90% water, 10% non-ionic surfactant (e.g. Plurafac SL-62, Tergitol TMN-10)

Material Name: MONDUR MR LIGHT

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- A mixture of 75% water, 20% non-ionic surfactant, and 5% n-propanol
- A mixture of 80% water, 10% non-ionic surfactant, 5% isopropanol, 5% ammonium hydroxide (household ammonia)

For more information about neutralization solutions, please refer to spill cleanup and neutralization information available on Covestro's Product Safety First website. www.productsafetyfirst.covestro.com
Note: Always wear proper PPE when cleaning up an isocyanate spill or when decontaminating surfaces, tools, or equipment using a neutralization solution. It may take two or more applications of the neutralization solution to decontaminate the surface. Residual surface contamination can be checked using a surface wipe method such as the CLI Swype™ pad.

7. Handling and Storage

Handling/Storage Precautions

Do not breathe vapors, mists, or dusts. Use adequate ventilation to keep airborne isocyanate levels below the exposure limits. Wear respiratory protection if material is heated, sprayed, used in a confined space, or if the exposure limit is exceeded. Warning properties (irritation of the eyes, nose and throat or odor) are not adequate to prevent overexposure from inhalation. This material can produce asthmatic sensitization upon either single inhalation exposure to a relatively high concentration or upon repeated inhalation exposures to lower concentrations. Individuals with lung or breathing problems or prior allergic reactions to isocyanates must not be exposed to vapor or spray mist. Avoid contact with skin and eyes. Wear appropriate eye and skin protection. Wash thoroughly after handling. Do not breathe smoke and gases created by overheating or burning this material. Decomposition products can be highly toxic and irritating. Store in tightly closed containers to prevent moisture contamination. Do not reseal if contamination is suspected.

Storage Period:

6 Months: after receipt of material by customer

Storage Temperature

Minimum: 10 °C (50 °F)
Maximum: 30 °C (86 °F)

Storage Conditions

Store separate from food products.

Employee education and training in the safe use and handling of this product are required under the OSHA Hazard Communication Standard 29 CFR 1910.1200.

Substances to Avoid

Water, Amines, Strong bases, Alcohols, Copper alloys

8. Exposure Controls/Personal Protection

The recommendations in this section should not be a substitute for a personal protective equipment (PPE) assessment performed by the employer as required by 29 CFR 1910 Subpart I.

Exposure Limits

4,4'-Diphenylmethane Diisocyanate (MDI) (101-68-8)

US. ACGIH Threshold Limit Values
Time weighted average 0.005 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
Ceiling Limit Value 0.02 ppm, 0.2 mg/m³

Any component which is listed in section 3 and is not listed in this section does not have a known ACGIH TLV, OSHA PEL or supplier recommended occupational exposure limit.

Industrial Hygiene/Ventilation Measures

Local exhaust should be used to maintain levels below the TLV whenever MDI is heated, sprayed, or aerosolized. Standard reference sources regarding industrial ventilation (e.g., ACGIH Industrial Ventilation Manual) should be consulted for guidance about adequate ventilation. To ensure that published exposure limits have not been exceeded, monitoring for airborne diisocyanate should become part of the overall employee exposure characterization program. NIOSH, OSHA, Covestro, and others have developed sampling and analytical methods. Covestro methods can be made available, upon request.

Respiratory Protection

Airborne MDI concentrations greater than the ACGIH TLV-TWA (TLV) or OSHA PEL-C (PEL) can occur in inadequately ventilated environments when MDI is sprayed, aerosolized, or heated. In such cases, respiratory protection must be worn. The type of respiratory protection selected must comply with the requirements set forth in OSHA's Respiratory Protection Standard (29 CFR 1910.134). The type of respiratory protection available includes (1) an atmosphere-supplying respirator such as a self-contained breathing apparatus (SCBA) or a supplied air respirator (SAR) in the positive pressure or continuous flow mode, or (2) an air-purifying respirator (APR). If an APR is selected then a change out schedule, based on objective information or data that will ensure that the cartridges are changed out before the end of their service life, must be developed and implemented. The basis for the change out schedule must be described in the written respirator program. Further, if an APR is selected, the airborne diisocyanate concentration must be no greater than 10 times the TLV or PEL. The recommended APR cartridge is an organic vapor/particulate filter combination cartridge (OV/P100).

Hand Protection

Ensure gloves remain in good condition during use and replace if any deterioration is observed.

Gloves should be worn., Nitrile rubber showed excellent resistance., Butyl rubber, neoprene and PVC are also effective.

Eye Protection

When directly handling liquid product, eye protection is required. Examples of eye protection include a chemical safety goggle, or chemical safety goggle in combination with a full face shield when there is a greater risk of splash.

Skin Protection

Avoid all skin contact. Depending on the conditions of use, cover as much of the exposed skin area as possible with appropriate clothing to prevent skin contact., Animal tests and other research indicate that skin contact with MDI can play a role in causing isocyanate sensitization and respiratory reaction., This data reinforces the need to prevent direct skin contact with isocyanates.

Medical Surveillance

All applicants who are assigned to an isocyanate work area should undergo a pre-placement medical evaluation. A history of eczema or respiratory allergies such as hay fever, are possible reasons for medical exclusion from isocyanate areas. Applicants who have a history of adult asthma should be restricted from work with isocyanates. Applicants with a history of prior isocyanate sensitization should be excluded from further work with isocyanates. A comprehensive annual medical surveillance program should be instituted for all employees who are potentially exposed to diisocyanates. Once a worker has been diagnosed as sensitized to any isocyanate, no further exposure can be permitted. Refer to the Covestro pamphlet (Medical Surveillance Program for Isocyanate Workers) for additional guidance.

Additional Protective Measures

Emergency showers and eye wash stations should be available. Educate and train employees in the safe use and handling of this product. Follow all label instructions.

9. Physical and Chemical Properties

State of Matter:	liquid
Appearance:	liquid
Color:	Brown
Odor:	musty
Odor Threshold:	No Data Available
pH:	No Data Available
Boiling Point:	Approximately 208 °C (406.4 °F)
Flash Point:	198 °C (388.4 °F) (ASTM D 93)
Evaporation Rate:	No Data Available
Lower explosion limit:	No Data Available
Upper Explosion Limit:	No Data Available
Vapor Pressure:	< 0.0001 mmHg @ 25 °C (77 °F)
Vapor Density:	No Data Available
Density:	1.234 g/cm ³ @ 20 °C (68 °F)
Relative Vapor Density:	No Data Available
Specific Gravity:	1.24 @ 25 °C (77 °F)
Solubility in Water:	Insoluble - Reacts slowly with water to liberate CO ₂ gas
Partition Coefficient: n-octanol/water:	No Data Available
Auto-ignition Temperature:	No Data Available
Decomposition Temperature:	Not established
Dynamic Viscosity:	150 - 250 mPa.s @ 25 °C (77 °F)
Kinematic Viscosity:	No Data Available
Bulk Density:	1,234 kg/m ³
Self Ignition:	not applicable

10. Stability and Reactivity

Hazardous Reactions

Contact with moisture, other materials that react with isocyanates, or temperatures above 350 F (177 C), may cause polymerization

Stability

Stable under normal conditions of use and storage.

Materials to Avoid

Water, Amines, Strong bases, Alcohols, Copper alloys

Hazardous Decomposition Products

By Fire and High Heat: Carbon dioxide (CO₂), carbon monoxide (CO), oxides of nitrogen (NO_x), dense black smoke., Isocyanate, Isocyanic Acid, Other undetermined compounds

11. Toxicological Information

Likely Routes of Exposure: Skin Contact

Material Name: MONDUR MR LIGHT

83186292

Inhalation
Eye Contact

Health Effects and Symptoms

Acute: Diisocyanate vapors or mist at concentrations above the TLV or PEL can irritate (burning sensation) the mucous membranes in the respiratory tract (nose, throat, lungs) causing runny nose, sore throat, coughing, chest discomfort, shortness of breath and reduced lung function (breathing obstruction). Persons with a preexisting, nonspecific bronchial hyperreactivity can respond to concentrations below the TLV or PEL with similar symptoms as well as asthma attack or asthma-like symptoms. Exposure well above the TLV or PEL may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). Chemical or hypersensitivity pneumonitis, with flu-like symptoms (e.g., fever, chills), has also been reported. These symptoms can be delayed up to several hours after exposure. These effects are usually reversible.

Causes skin irritation with symptoms of reddening, itching, and swelling. Persons previously sensitized can experience allergic skin reaction with symptoms of reddening, itching, swelling, and rash. Cured material is difficult to remove. Contact with MDI can cause discoloration.

Causes eye irritation with symptoms of reddening, tearing, stinging, and swelling. May cause temporary corneal injury. Vapor or aerosol may cause irritation with symptoms of burning and tearing.

May cause irritation of the digestive tract. Symptoms may include abdominal pain, nausea, vomiting, and diarrhea.

Chronic: As a result of previous repeated overexposures or a single large dose, certain individuals may develop sensitization to isocyanates (asthma or asthma-like symptoms) that may cause them to react to a later exposure to isocyanates at levels well below the TLV or PEL. These symptoms, which can include chest tightness, wheezing, cough, shortness of breath or asthmatic attack, could be immediate or delayed up to several hours after exposure. Extreme asthmatic reactions can be life threatening. Similar to many non-specific asthmatic responses, there are reports that once sensitized an individual can experience these symptoms upon exposure to dust, cold air or other irritants. This increased lung sensitivity can persist for weeks and in severe cases for several years. Sensitization can be permanent. Chronic overexposure to isocyanates has also been reported to cause lung damage (including fibrosis, decrease in lung function) that may be permanent.,

Prolonged contact with skin can cause reddening, swelling, rash, and, in some cases, skin sensitization. Animal tests and other research indicate that skin contact with MDI can play a role in causing isocyanate sensitization and respiratory reaction. This data reinforces the need to prevent direct skin contact with isocyanates.

Prolonged vapor contact with the eyes may cause conjunctivitis.

Delayed: Symptoms affecting the respiratory tract can also occur several hours after overexposure.

Toxicity Data for: MONDUR MR LIGHT

Toxicity data based on polymeric MDI (a mixture of monomers and higher molecular weight oligomers).

Acute Oral Toxicity

LD50: > 2,000 mg/kg (rat, male/female)

Acute Inhalation Toxicity

LC50: 0.49 mg/l, 490 mg/m³, 4 h, aerosol (rat)

The test atmosphere generated in the animal study is not representative of workplace environments, how the substance is placed on the market, and how it can reasonably be expected to be used. Therefore the test result cannot be directly applied for the purpose of assessing hazard. Based on expert judgment and the weight of the evidence, a modified classification for acute inhalation toxicity is justified.

Acute Dermal Toxicity

LD50: > 9,400 mg/kg (rabbit, male/female) (OECD Test Guideline 402)

Skin Irritation

rabbit, Slightly irritating

Repeated Dose Toxicity

90 Days, inhalation: NOAEL: 1 mg/m³, (rat, Male/Female, 6 hrs/day 5 days/week)

Irritation to lungs and nasal cavity.

2 years, inhalation: NOAEL: 0.2, (rat, Male/Female, 6 hrs/day 5 days/week)

Irritation to lungs and nasal cavity.

Mutagenicity

Genetic Toxicity in Vitro:

Bacterial - gene mutation assay: negative (Salmonella typhimurium, Metabolic Activation: with/without)

Carcinogenicity

rat, Male/Female, inhalation, 2 Years, 6 hrs/day 5 days/week

LOAEL: 6mg/l

Polymeric MDI has been classified as IARC Group 3 (“Not classifiable as to its carcinogenicity to humans”) (1999) indicating there is inadequate evidence available to describe the carcinogenic potential. Epidemiological studies found no association between isocyanates and cancer. In chronic exposure studies in rodents, pMDI produced tumors only at the highest exposure level of 6 mg/m³. This exposure level is significantly above the TLV for MDI (0.051 mg/m³). Based on the weight of the evidence, a determination of not classified for carcinogenicity is justified.

Developmental Toxicity/Teratogenicity

rat, female, inhalation, gestation days 6-15, 6 hrs/day, NOAEL (teratogenicity): 12 mg/m³, NOAEL

(maternal): 4 mg/m³

No Teratogenic effects observed at doses tested., Fetotoxicity seen only with maternal toxicity.

Toxicity Data for: Polymeric Diphenylmethane Diisocyanate (pMDI)**Toxicity Note**

See data above for polymeric MDI.

Toxicity Data for: 4,4'-Diphenylmethane Diisocyanate (MDI)**Acute Oral Toxicity**

LD50: > 7,616 mg/kg (rat) (OECD Test Guideline 401)

Acute Inhalation Toxicity

LC50: 0.368 mg/l, 4 h, dust/mist (rat, male) (OECD Test Guideline 403)

The test atmosphere generated in the animal study is not representative of workplace environments, how the substance is placed on the market, and how it can reasonably be expected to be used. Therefore the test result cannot be directly applied for the purpose of assessing hazard. Based on expert judgment and the weight of the evidence, a modified classification for acute inhalation toxicity is justified.

Acute Dermal Toxicity

LD50: > 9,400 mg/kg (rabbit, male/female) (OECD Test Guideline 402)

Studies of a comparable product.

Skin Irritation

rabbit, Draize Test, Slightly irritating

Human, irritating

Eye Irritation

rabbit, Draize, Moderately irritating

Human, irritating

Sensitization

Skin sensitization (local lymph node assay (LLNA)):: positive (Mouse, OECD Test Guideline 429)

Respiratory sensitization: positive (Guinea pig)

Repeated Dose Toxicity

90 Days, inhalation: NOAEL: 0.3 mg/m³, (rat, Male/Female, 18 hrs/day, 5 days/week)

Irritation to lungs and nasal cavity.

(Human)

Irritation to lungs and nasal cavity.

Mutagenicity

Genetic Toxicity in Vitro:

Ames: (Salmonella typhimurium, Metabolic Activation: with/without)

Positive and negative results were reported. The use of certain solvents which rapidly hydrolyze diisocyanates is suspected of producing the positive mutagenicity results.

Genetic Toxicity in Vivo:

Micronucleus Assay: (Mouse)

negative

Micronucleus test: negative (rat, male, Inhalative (exposure period: 3x1h/day over 3 weeks))

negative

Carcinogenicity

rat, Female, inhalation, 2 Years, 17 hrs/day, 5 days/week negative

Other Relevant Toxicity Information

May cause irritation of respiratory tract.

Toxicity Data for: 2,4'-Diphenylmethane Diisocyanate (MDI)**Toxicity Note**

See data above for polymeric MDI.

Toxicity Data for: 2,2'-Diphenylmethane Diisocyanate**Toxicity Note**

See data above for polymeric MDI.

Carcinogenicity:

No carcinogenic substances as defined by IARC, NTP and/or OSHA

12. Ecological Information

Ecological Data for: MONDUR MR LIGHT

Ecotoxicity data based on polymeric MDI (a mixture of monomers and higher molecular weight oligomers).

Biodegradation

0 %, Exposure time: 28 d, i.e. not degradable

Bioaccumulation

Oncorhynchus mykiss (rainbow trout), Exposure time: 112 d, < 1 BCF
Does not bioaccumulate.

Acute and Prolonged Toxicity to Fish

LC0: > 1,000 mg/l (Danio rerio (zebra fish), 96 h)

LC0: > 3,000 mg/l (Oryzias latipes (Orange-red killifish), 96 h)

Acute Toxicity to Aquatic Invertebrates

EC50: > 1,000 mg/l (Water flea (Daphnia magna), 24 h)

Toxicity to Aquatic Plants

NOEC: 1,640 mg/l, End Point: growth (Green algae (Scenedesmus subspicatus), 72 h)

Toxicity to Microorganisms

EC50: > 100 mg/l, (activated sludge, 3 h)

Ecological Data for Polymeric Diphenylmethane Diisocyanate (pMDI)

Additional Ecotoxicological Remarks

See data above for polymeric MDI.

Ecological Data for 4,4'-Diphenylmethane Diisocyanate (MDI)

Acute and Prolonged Toxicity to Fish

LC50: > 500 mg/l (Zebra fish (Brachydanio rerio), 24 h)

Acute Toxicity to Aquatic Invertebrates

EC50: > 500 mg/l (Water flea (Daphnia magna), 24 h)

Ecological Data for 2,4'-Diphenylmethane Diisocyanate (MDI)

Additional Ecotoxicological Remarks

See data above for polymeric MDI.

Ecological Data for 2,2'-Diphenylmethane Diisocyanate

Additional Ecotoxicological Remarks

See data above for polymeric MDI.

13. Disposal Considerations

Waste Disposal Method

Waste disposal should be in accordance with existing federal, state and local environmental control laws.
Incineration is the preferred method.

Empty Container Precautions

Material Name: MONDUR MR LIGHT

83186292

Empty containers retain product residue; observe all precautions for product. Do not heat or cut empty container with electric or gas torch because highly toxic vapors and gases are formed. Do not reuse without thorough commercial cleaning and reconditioning. If container is to be disposed, ensure all product residues are removed prior to disposal.

14. Transportation Information

Land transport (DOT)

Proper Shipping Name: Other regulated substances, liquid, n.o.s. (contains 4,4'-Diphenylmethane Diisocyanate (MDI))
Hazard Class or Division: 9
UN/NA Number: NA3082
Packaging Group: III
Hazard Label(s): CLASS 9

RSPA/DOT Regulated Components:

4,4'-Diphenylmethane Diisocyanate (MDI)

Reportable Quantity: 5040 kg (11111 lb)

Sea transport (IMDG)

Non-Regulated

Air transport (ICAO/IATA)

Non-Regulated

Additional Transportation Information

When in individual containers of less than the Product RQ, this material ships as non-regulated.

MARPOL/IBC

PRODUCT NAME: Diphenylmethane Diisocyanate

POLLUTION CATEGORY: Y

SHIP TYPE: 2

FLASH POINT: 390°F

15. Regulatory Information

United States Federal Regulations

US. Toxic Substances Control Act: Listed on the TSCA Inventory.

No substances are subject to TSCA 12(b) export notification requirements.

US. EPA CERCLA Hazardous Substances (40 CFR 302) Components:

4,4'-Diphenylmethane Diisocyanate Reportable quantity: 5000 lbs
(MDI)

SARA Section 311/312 Hazard Categories:

Acute Health Hazard

Chronic Health Hazard

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A) Components:

Material Name: MONDUR MR LIGHT

83186292

None

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required Components:

Polymeric Diphenylmethane Diisocyanate (pMDI)
4,4'-Diphenylmethane Diisocyanate (MDI)

US. EPA Resource Conservation and Recovery Act (RCRA) Composite List of Hazardous Wastes and Appendix VIII Hazardous Constituents (40 CFR 261):

Under RCRA, it is the responsibility of the person who generates a solid waste, as defined in 40 CFR 261.2, to determine if that waste is a hazardous waste.

State Right-To-Know Information

The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the SDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

This product contains a trace (ppm) amount of phenyl isocyanate (CAS# 103-71-9) and monochlorobenzene (CAS# 108-90-7) as impurities.

Massachusetts, New Jersey or Pennsylvania Right to Know Substance Lists:

<u>Weight percent</u>	<u>Components</u>	<u>CAS-No.</u>
58%	Polymeric Diphenylmethane Diisocyanate (pMDI)	9016-87-9
38%	4,4'-Diphenylmethane Diisocyanate (MDI)	101-68-8
3.8%	2,4'-Diphenylmethane Diisocyanate (MDI)	5873-54-1

New Jersey Environmental Hazardous Substances List and/or New Jersey RTK Special Hazardous Substances Lists:

<u>Weight percent</u>	<u>Components</u>	<u>CAS-No.</u>
58%	Polymeric Diphenylmethane Diisocyanate (pMDI)	9016-87-9
38%	4,4'-Diphenylmethane Diisocyanate (MDI)	101-68-8

California Prop. 65:

To the best of our knowledge, this product does not contain any of the listed chemicals, which the state of California has found to cause cancer, birth defects or other reproductive harm.

CFATS (Chemical Facility Anti-Terrorism Standards) Chemicals

To the best of our knowledge, this product does not contain Appendix A Chemicals of Interest (COI), at or above the Screening Threshold Quantity (STQ), as defined by the Department of Homeland Security Chemical Facility Anti-terrorism Standard (CFATS, 6 CFR Part 27.

Based on information provided by our suppliers, this product is considered "DRC Conflict Free" as defined by the SEC Conflict Minerals Final Rule (Release No. 34-67716; File No. S7-40-10; Date: 2012-08-22).

16. Other Information

The method of hazard communication for Covestro LLC is comprised of product labels and safety data sheets. Safety data sheets for all of our products and general product declarations are available for download at www.productsafetyfirst.covestro.com.

Material Name: MONDUR MR LIGHT

83186292

Contact: Product Safety Department
Telephone: (412) 413-2835
SDS Number: 112000021929
Version Date: 09/26/2017
SDS Version: 2.9

Information contained in this SDS is believed to be accurate but is furnished without warranty, express or implied, including warranties of merchantability or fitness for a particular purpose. The information relates only to the specific material designated herein. Covestro LLC. assumes no legal responsibility for use of or reliance upon the information in this SDS and such information shall in no case be considered a part of our terms and conditions of sale. The user is responsible for determining whether the Covestro product is suitable for user's method of use or application. Covestro is not liable for any failure to observe the precautionary measures described in this SDS or for any misuse of the product.

|| Changes since the last version are highlighted in the margin. This version replaces all previous versions.



Covestro LLC
1 Covestro Circle
Pittsburgh PA 15205

Page: 1

Date Printed: 2018-02-09
Straight Bill of Lading-
Original- Not Negotiable

Ship To: Stonhard 7 Esterbrook Ln Cherry Hill NJ 08003-4034 US	Bill of Lading No: 292148 For prepaid shipment, show bill of lading no. on freight acc. to the given Incoterm, please issue your invoice to Covestro c/o Cass Information Systems PO Box 67 St.Louis, MO 63166-0067	24 Hour Number Emergency Contact Covestro (CCN2472) via CHEMTREC 1-800-424-9300 International +1-703-527-3887
Shipper: Covestro LLC 8406 FM 1405 Baytown TX 77523-9913 ORH5	Delivery Number: 4003339118 Shipping Date: 12.02.2018 Delivery Date: 16.02.2018 08:00:00 Carrier: FV: Customer Requested Carrier Trailer/Container:	Payment/Invoice Instructions Customer: Please reference Delivery Number with Payment: 4003339118 Customer POs: 299197 Carrier: Please reference Bill of Lading Number 292148 with Freight Invoice

RECEIVED, subject to the Contract Carrier Master Agreement for Trucking Service, if applicable, between Carrier and Shipper in effect on the date, the shipment is tendered to Carrier, the property described below in apparent good order, except as noted (contents and conditions of packages unknown), marked consigned and destined as shown below. This Bill of Lading is not subject to any rates, rules, tariffs or classifications, whether individually determined or filed with any federal or state regulatory agency, except as specifically agreed to in writing by Carrier or Shipper.

No. of Packages	Container Type Material and Description	Quantity	Weight	HM	
16	TOTE Material Number: 01668998		40036 LB 18160 KG		2 55920
		Weight Totals:	NET: 40036 LB 18160 KG	TARE: 1975 LB 896 KG	GROSS: 42011 LB 19056 KG

Special Instructions for Delivery:

Tanker Endorsement Needed

SHIPPER'S INTERMODAL CERTIFICATION

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked, and labeled/ placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. This certification includes IMDG 5.4.2.1.

Date: _____ Shipper Per: Jennifer Kaswita

FEB 12 2018

DRIVER'S CERTIFICATION AND RECEIPT

Driver hereby certifies that the above Special Instructions have been read and understood that:

- Emergency response information in accordance with 49 CFR, part 172.
- Subpart G is present on board the vehicle.
- The required placards have been offered and the required placards are properly affixed to the vehicle.

Received _____ pallets _____ pieces

Carrier: VALUED TRANSPORT

Trailer: 181169

[Signature]
Driver's Signature

SECTION 7

If this shipment is to be delivered to the Consignee without recourse on the Shipper/Consignor for any charges that are not prepaid or agreed to be prepaid, the Shipper/Consignor shall sign the following statement:

Carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

Covestro LLC

FREIGHT CHARGE TERMS

Line Haul charges will be paid as Follows:

COLLECT

FMCSA Motor Carrier

USDOT Number: **2474595**
Docket Number: **MC855868**
Legal Name: **VALUED TRANSPORT LLC**
DBA (Doing-Business-As) Name



Addresses

Business Address: **5050 POPLAR AVE SUITE 900
MEMPHIS, TN 38157**
Business Phone: **(901) 312-3316** Business Fax: **Fax: (901) 259-0565**
Mail Address:
Mail Phone: Mail Fax: Undeliverable Mail: **NO**

Authorities:

Common Authority:	ACTIVE	Application Pending:	NO	
Contract Authority:	ACTIVE	Application Pending:	NO	
Broker Authority:	NONE	Application Pending:	NO	
Property:	YES	Passenger:	NO	Household Goods: NO
Private:	NO	Enterprise:	NO	

Insurance Requirements:

BIPD Exempt:	NO	BIPD Waiver:	NO	BIPD Required:	\$750,000	BIPD on File:	\$1,000,000
Cargo Exempt:	NO	Cargo Required:	NO	Cargo on File:	NO		
BOC-3:	YES	Bond Required:	NO	Bond on File:	NO		

Blanket Company: **PROCESS AGENT SERVICE COMPANY, INC.**

Comments:

Active/Pending Insurance:

Form: 91X	Type: BIPD/Primary	Posted Date: 03/17/2017
Policy/Surety Number: CA170065	Coverage From: \$0	To: \$1,000,000
Effective Date: 03/19/2017	Cancellation Date:	

Insurance Carrier: **CHEROKEE INSURANCE COMPANY**
Attn: **MARK J. DADABBO, PRES.**
Address: **34200 MOUND RD.
STERLING HEIGHTS, MI 48310 US**
Telephone: **(800) 201 - 0450** Fax: **(810) 795 - 3130**

Rejected Insurances:

Form:	Type:	Coverage From:	\$0	To:	\$0
Policy/Surety Number:		Received:	Rejected:		
Rejected Reason:					

FMCSA Motor Carrier

USDOT Number: **2474595**
 Docket Number: **MC855868**
 Legal Name: **VALUED TRANSPORT LLC**
 DBA (Doing-Business-As) Name



Insurance History:

Form: 91X	Type: BIPD/Primary		
Policy/Surety Number: CA 1434825	Coverage From	\$0	To: \$750,000
Effective Date From: 03/19/2014	To: 08/22/2014	Disposition: Replaced	

Insurance Carrier: PROGRESSIVE HAWAII INSURANCE CORP
 Attn: CUSTOMER SERVICE
 Address: P. O. BOX 94739
 CLEVELAND, OH 44101 US
 Telephone: (800) 444 - 4487 Fax: (440) 603 - 4555

Form: 91X	Type: BIPD/Primary		
Policy/Surety Number: CA 1434825	Coverage From	\$0	To: \$750,000
Effective Date From: 08/22/2014	To: 03/19/2016	Disposition: Cancelled	

Insurance Carrier: PROGRESSIVE HAWAII INSURANCE CORP
 Attn: CUSTOMER SERVICE
 Address: P. O. BOX 94739
 CLEVELAND, OH 44101 US
 Telephone: (800) 444 - 4487 Fax: (440) 603 - 4555

Form: 91X	Type: BIPD/Primary		
Policy/Surety Number: ATR0047275	Coverage From	\$0	To: \$750,000
Effective Date From: 03/19/2016	To: 03/19/2017	Disposition: Cancelled	

Insurance Carrier: GREENWICH INSURANCE COMPANY
 Attn: RECECCA CLARK
 Address: 505 EAGLEVIEW BLVD
 EXTON, PA 19341 US
 Telephone: (800) 327 - 1414 Fax: (610) 458 - 8667

Authority History:

Sub No.	Authority Type	Original Action	Disposition Action
	MOTOR PROPERTY CONTRACT CARRIER	GRANTED	03/25/2014
	MOTOR PROPERTY COMMON CARRIER	GRANTED	03/25/2014

Pending Application:

Authority Type	Filed	Status	Insurance	BOC-3

FMCSA Motor Carrier

USDOT Number: **2474595**

Docket Number: **MC855868**

Legal Name: **VALUED TRANSPORT LLC**

DBA (Doing-Business-As) Name



Revocation History:

Authority Type	1st Serve Date	2nd Serve Date	Reason

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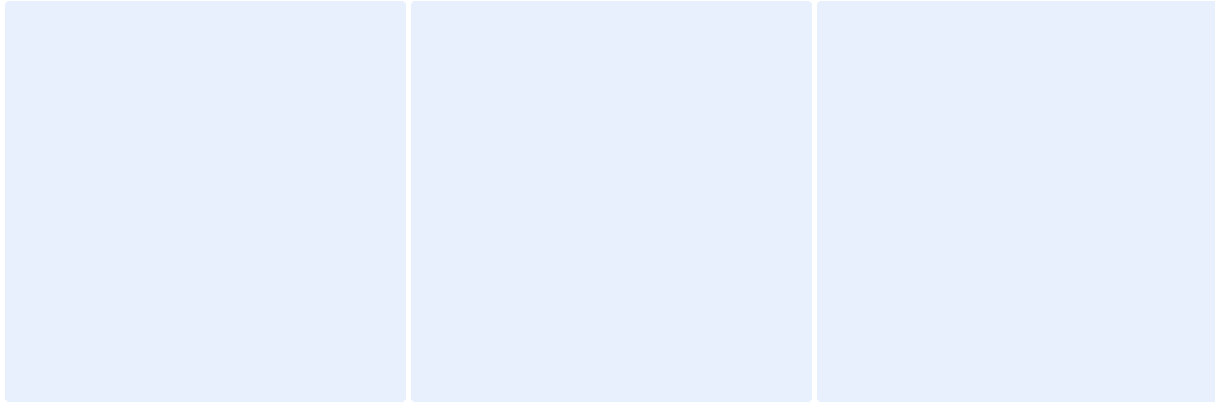


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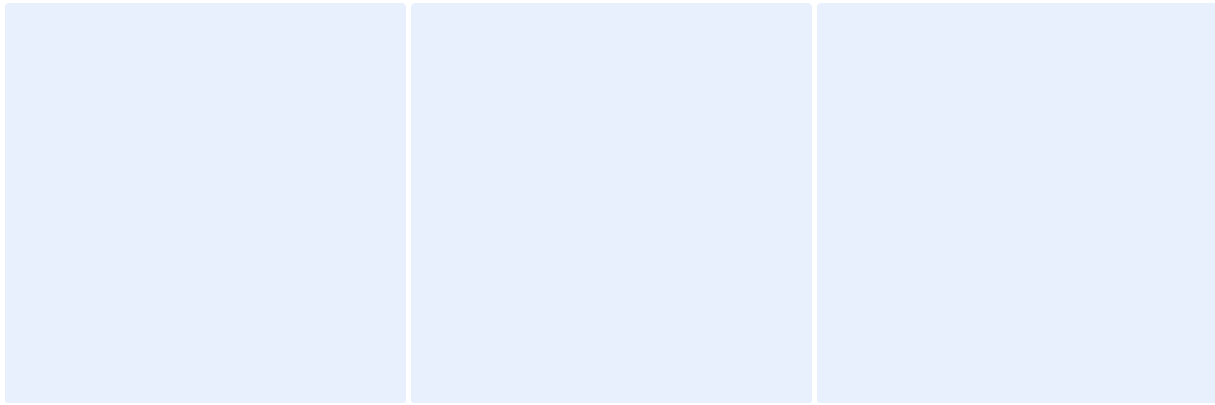
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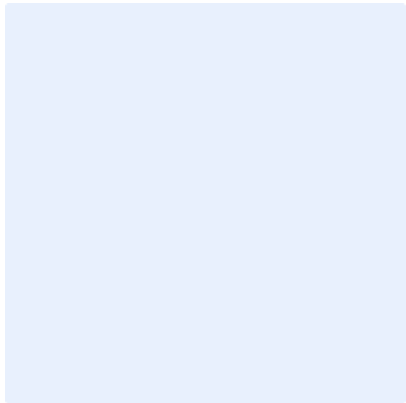
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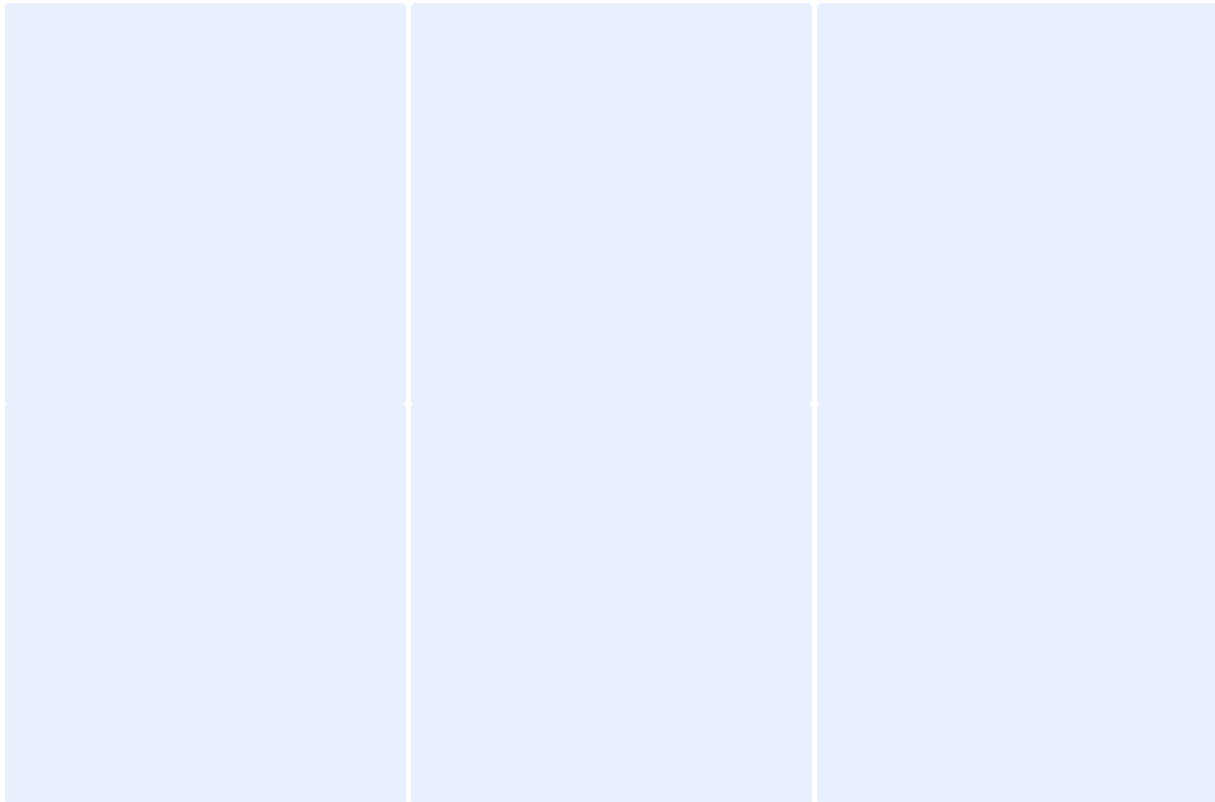
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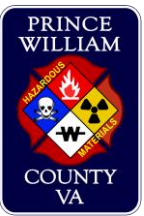


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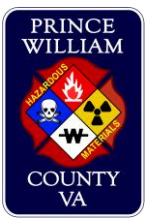


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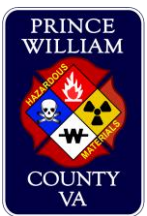


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M	
Date of Incident	Time
Location	City
Reported by	Incident type
Incident description Personnel involved Equipment used	

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Description of spill: A tractor trailer with a leaking motor oil canister spilled approximately 200 gallons of oil on the roadway. The driver reported the spill at approximately 10:30 AM on 10/26/2011. The spill was contained and cleaned up by the Fire Department. The driver was advised to call the Virginia Department of Transportation for any further action.	
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Name	Name
Phone	Phone
Address	Address
Company	Company
Notes	Notes

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Name	Name
City	City
Address	Address
Phone	Phone
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Date of Incident: _____	Location: _____
Reported By: _____	Incident No. and Report No.: _____
M Personnel Responding: _____ S Personnel Responding: _____ Other M Personnel Responding: _____	

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<p> M was dispatched to an _____ loading dock _____ for the _____ and _____ and _____ had _____ on the _____ but did _____ driver had _____ filled the _____ and _____ carried _____ gallon _____ organ _____ operation by placing an oil catch _____ under the _____ a _____ di _____ on the _____ and the _____ could _____ and digging a _____ in the _____ _____ dug _____ the _____ and _____ a _____ out _____ that no _____ and _____ to the _____ _____ a _____ no _____ _____ a _____ _____ and _____ _____ clean _____ </p>	
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Name: _____	Name: _____
Title: _____	Title: _____
Address: _____	Address: _____
Phone: _____	Phone: _____
Other: _____	Other: _____

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Name: _____	Name: _____
Title: _____	Title: _____
Name: Brandon	Name: _____
Agency: _____	Agency: _____
Other: _____	Other: _____
Name: _____	Name: _____
Title: _____	Title: _____
Name: _____	Name: _____
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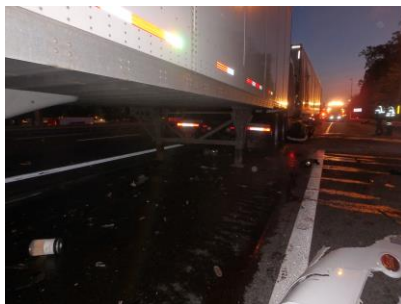
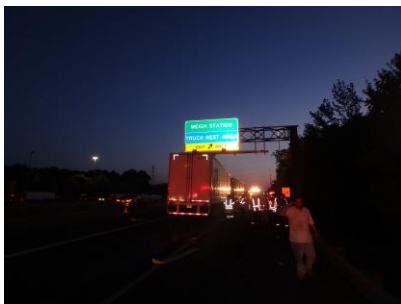
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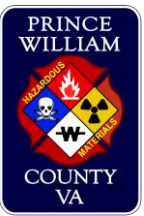


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Date of Incident	Date
Location City Rd Main Mill	City
Reported by	Incident # and R/B Mc #
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<p> at a residential lot for a full of gasoline in the fairway of Iron Bar on Main Mill and in the storm drain at City Rd Main Mill. The gas arrived on scene and started to monitor storm drain around City Rd storm drain had normal readings. The drain had a odor of gasoline at the time the water in the storm drain around City Rd was clear. The cause of the gas at the investigation of the lot determined that there was no gasoline in the storm drain. Our investigation also determined that there was no leak toward the in Iron Bar ensuring our investigation did determine that the Gas Station at City Rd had a leak in one of the gas dispensing island that was running back to the tank line. The leaking gasoline did not get into the water way or storm drain. The traffic station manager stated that there was no loss of product for the station. The monitoring by the Prince William County Fire Marshal's Station manager and the fire on scene to deal with the leaking tank. The lot to be using Mid Atlantic to correct the clean up of the leaking gas tank. </p>	
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Street Address	Address
City	City
County	County
Phone	Phone
Notes	Notes

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Date	Date
City	City
Address	Address
Agency	Agency
Notification Agency	Notification Agency
Date	Date
City	City
Address	Address
Agency	Agency
Notification Agency	Notification Agency

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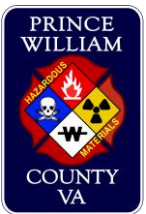


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Date of Incident	Date
Location	City
Reported by	Incident type
Responding Personnel S M S	

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<p>On 05/11/2018 a fire was reported at [Location] in [City] and the incident was turned over to the Fire Marshals (FM). At 1137 on 05/11/2018, the FM's reported a strong smell of propane coming from the [Location] M and contacted and a fire consulting it and determined that M had been used to further investigate the source. HM506 was met up with the FM's on scene. The PID and Multirae Pro were deployed to obtain readings and identified the area where the source was located to be located at [Location] that the source was a propane cylinder and the [Location] turned away and the [Location] all residual product from the earlier [Location] was reported by the burn pattern coding from the cylinder to further [Location]</p>	
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Name	Name
Company	Company
Address	Address
Phone	Phone
Notes	Notes

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Date	Date
City	City
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Date	Date
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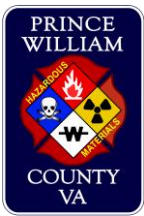


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Figure 1: M... M... S... M... M...





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<input type="checkbox"/> Location <input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Report of <input type="checkbox"/>	<input type="checkbox"/> Incident <input type="checkbox"/>
<input type="checkbox"/> M <input type="checkbox"/> S <input type="checkbox"/>	

S	
<p> <input type="checkbox"/> M <input type="checkbox"/> S <input type="checkbox"/> </p>	
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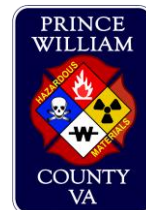
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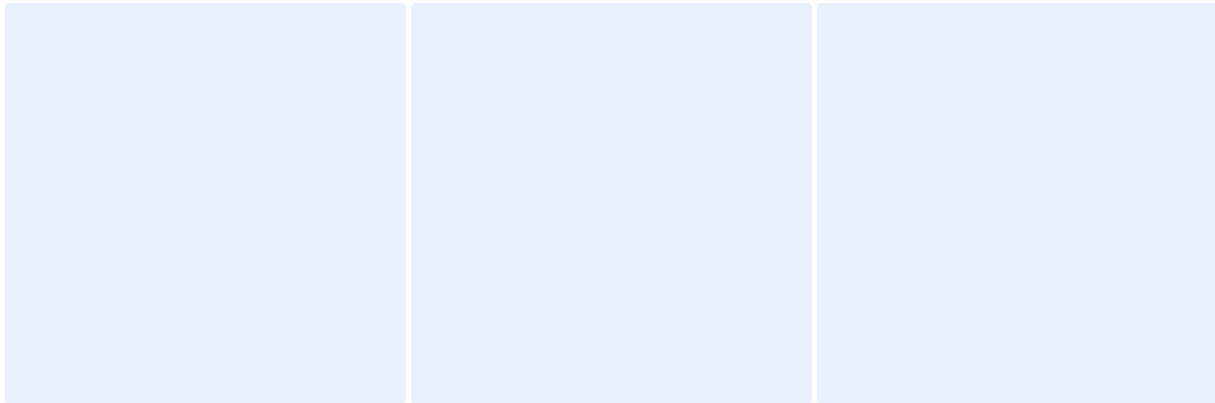
PRINCIPLE OF M	
Date of Incident	Location
Location/Address and Route	City/Town
Reported by/Contact	Incident Number and/or Bait
<input type="checkbox"/> M Unit Responding <input type="checkbox"/> S Unit Responding <input type="checkbox"/> Other M Unit Responding	

S	
Brief description of event including odor and color during night hours in the area of street and Route Address on day stated that the person unconsciously reported about 50 gallon drum being set down area wanting to see current status for notification or follow up address that we could address and address and that area source around that M unit could investigate duty M contacted and will attempt to survey the area once it is a follow up will be done in the morning by person on duty M will also conduct an assessment during day light hours	
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Name	Name
Phone	Phone
Address	Address
Company	Company
Notes	Notes

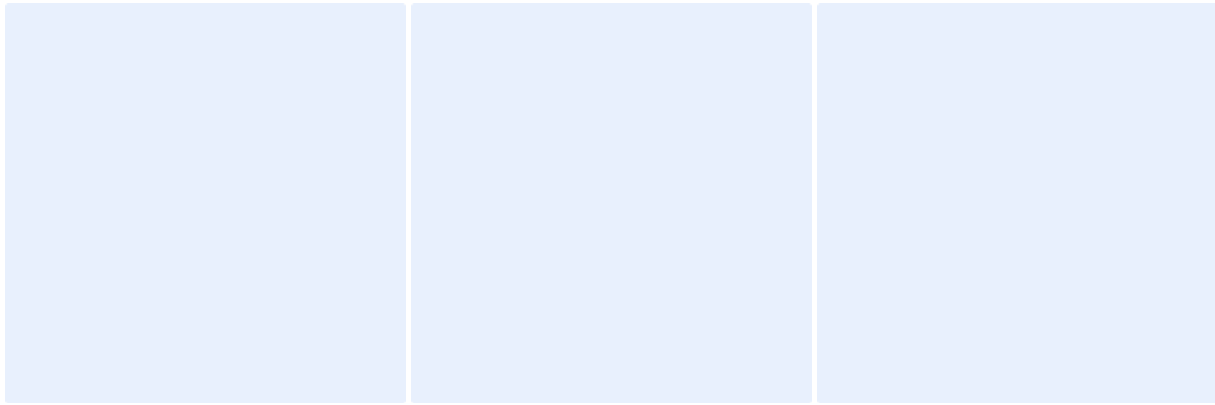
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Date	Date
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Agency/Contact Name	Agency/Contact Name
Notes/Description	Notes/Description
Date	Date
City	City
Name	Name
Agency/Contact Name	Agency/Contact Name
Notes/Description	Notes/Description

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Additional information
Metric
Marital record



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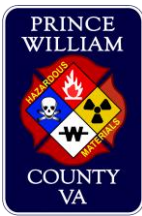
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0ot000	0ot000
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PRINCE WILLIAM COUNTY
 INCIDENT REPORT
 FORM

PRINCE WILLIAM COUNTY	
Date of Incident: _____	Time of Incident: _____
Location: _____	City: _____
Reported by: _____	Incident Type: _____
<input type="checkbox"/> Motor Vehicle Accident <input type="checkbox"/> Structural Fire <input type="checkbox"/> Other: _____	

PRINCE WILLIAM COUNTY	
<p>The following information was provided to the Fire Department on the day of the incident:</p> <p>On the day of the incident, a fire occurred at the intersection of _____ and _____, resulting in _____ injuries and _____ damage. The fire was caused by _____.</p>	
Name of Contact: _____	Name of Contact: _____
Address: _____	Address: _____
City: _____	City: _____
Phone Number: _____	Phone Number: _____

PRINCE WILLIAM COUNTY	
Name: _____	Name: _____
Address: _____	Address: _____
City: _____	City: _____
State: _____	State: _____
Agency: _____	Agency: _____
Phone: _____	Phone: _____
Name: _____	Name: _____
Address: _____	Address: _____
City: _____	City: _____
State: _____	State: _____
Agency: _____	Agency: _____
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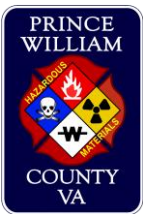


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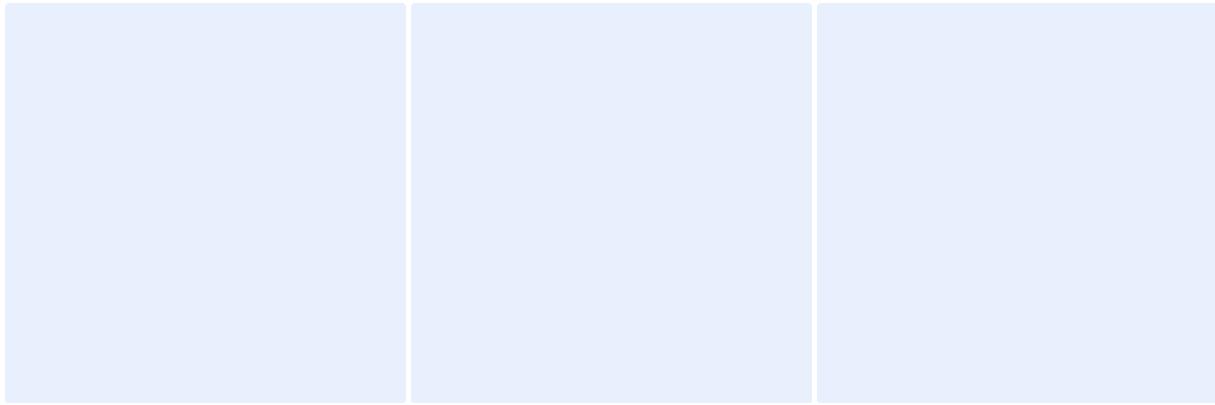
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Date of Incident	Date
Location: Intersection of Minniehill Rd and Cal Blvd	City
Reported by: [Name]	Incident type and/or description
<input type="checkbox"/> Motorist Responding <input type="checkbox"/> Sheriff Responding <input type="checkbox"/> Other Responding	

S	
<p> Officer [Name] advised for a "leak" at the intersection of Minniehill Rd and Cal Blvd. Upon arrival to find two 5-gallon gas cans sitting on the side of the road near the intersection. One of the cans contained a liquid product on the roadway. Officer did not enter any storm drains or other areas. No need to place a sign or barrier on roadway. The liquid had dried already. The apparent that the two gas cans had fallen off a vehicle and struck the roadway only on the can had leaked its contents. Officer advised that the gas cans had fallen off a vehicle and struck the roadway only on the can had leaked its contents. Officer advised that the gas cans had fallen off a vehicle and struck the roadway only on the can had leaked its contents. </p>	
SIB	Other
Name	Name
Company	Company
Address	Address
Phone	Phone
Other	Other

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Date	Date
City	City
Name: [Name]	Name
Agency: [Agency]	Agency
Other: [Other]	Other
Date	Date
City	City
Name	Name
Agency	Agency
Other	Other

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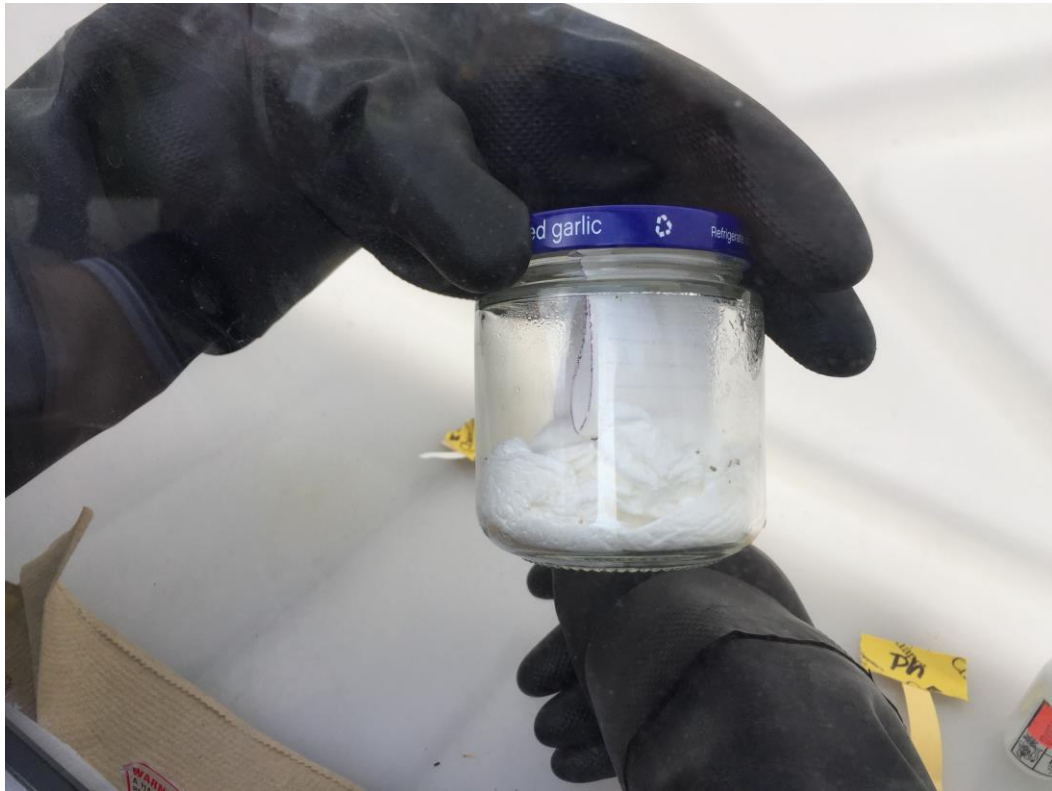
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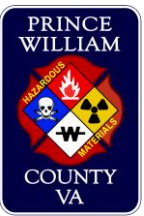


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Date of Incident	Time of Incident
Location	City
Reported by	Incident number and report number
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<p> at approximately 10:00 AM on 10/10/2018, a tractor/trailer had a mechanical breakdown and crossed a utility line that was connected to the driver's side add-on tank of the truck. The add-on tank had approximately 100 gallons of oil and the driver reported the tank to be full. The oil leaked out of the tank and onto the road. The driver was able to contain the spill with a spill kit and contacted the fire department. The fire department arrived and cleaned up the spill. The driver was not injured and the truck was towed to a repair shop. </p>	
SIB	S
Name	Name
Company	Company
Address	Address
Phone	Phone
Notes	Notes

S	
Date	Date
City	City
Name: Brian	Name
Agency	Agency
Notes	Notes
Date	Date
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Agency	Agency
Notes	Notes

Section 1: M, S, M, S

Table with 2 columns and 15 rows of text boxes for data entry.

Additional information section with three rows of text boxes.



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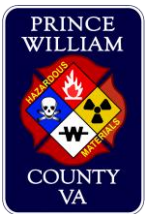


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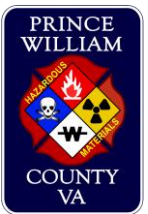


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PRINCE WILLIAM COUNTY
HAZARDOUS WASTE
INCIDENT REPORT

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I have conducted a search of the site and the following information was obtained: The site is a <input type="text"/> square foot parcel located at <input type="text"/> <input type="text"/> Rd, <input type="text"/> VA. The site is currently zoned <input type="text"/> .	
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PRINCE WILLIAM COUNTY FIRE RESCUE
 INCIDENT REPORT FORM
 MARCH 2019
 COUNTY OF PRINCE WILLIAM, VIRGINIA

PRINCE WILLIAM COUNTY FIRE RESCUE	
<input type="checkbox"/> Air <input type="checkbox"/> Fire <input type="checkbox"/> Hazardous Materials <input type="checkbox"/> Medical <input type="checkbox"/> Motor Vehicle <input type="checkbox"/> Public Works <input type="checkbox"/> Rescue <input type="checkbox"/> Traffic <input type="checkbox"/> Utility	<input type="checkbox"/> Air <input type="checkbox"/> Fire <input type="checkbox"/> Hazardous Materials <input type="checkbox"/> Medical <input type="checkbox"/> Motor Vehicle <input type="checkbox"/> Public Works <input type="checkbox"/> Rescue <input type="checkbox"/> Traffic <input type="checkbox"/> Utility
Location: _____ City: _____	Date: _____ Time: _____
Reported By: _____ Title: _____	Incident Type: _____ Priority: _____
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PRINCE WILLIAM COUNTY FIRE RESCUE

Incident Description: <p style="font-size: small;"> A truck driven by _____ on _____ at _____ in the _____ lane of _____ on _____ failed catastrophically causing a significant oil leak. _____ incident occurred at the _____ mile _____ and extended for roughly a quarter of a mile _____ in the _____ lane a total of _____ gallons of oil being _____ a _____ oil _____ in the _____ lane and no _____ or _____ were _____ </p> <p style="font-size: small;"> _____ arrived on scene to find it _____ and consulted _____ M _____ advised that _____ no further _____ that could _____ and _____ turned control of the _____ over to _____ for _____ and _____ of _____ </p>	
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PRINCE WILLIAM COUNTY FIRE RESCUE

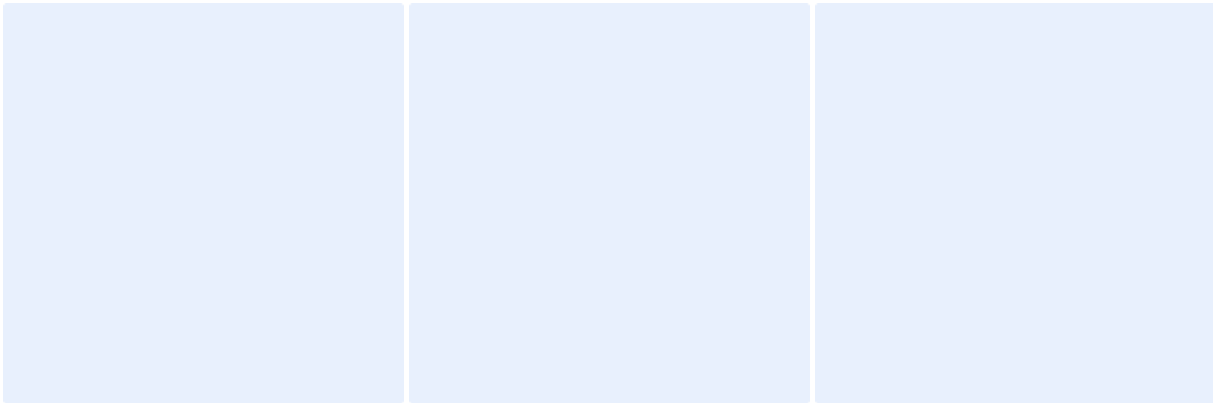
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Appendix G – Industrial and High Risk Runoff

GPIN	ST_NO	ST_NAME	ST_TYPE	CITY	ZIP	NAME	PWC_MAP	usecode	use_descri	Use_Probab	owner_cur	BuildingNa
8390-06-4290	15801	NEABSCO	RD	WOODBIDGE	22191	PWC SERVICE AUTHORITY	8390NW	224	Sewage	2	PWC SERVICE AUTHORITY	MAINT BLDG
8391-59-7928	14227	JEFFERSON DAVIS	HY	WOODBIDGE	22191	JD HWY LLC	8391NE	361	Motor Vehicle Sales	3	JD HWY LLC	LUSTINE TOTOTA
7697-42-3704	7681	SUDLEY	RD	MANASSAS	20109	BTR MANASSAS INC	7697SW	313	Shopping Center	3	SUDLEY TOWNE PLAZA LLC	SUDLEY TOWNE PLAZA
8192-50-4578	14150	MINNIEVILLE	RD	WOODBIDGE	22193	MINNIEVILLE PLAZA LTD PTNSHP	8192SE	312	Shopping Center	3	MINNIEVILLE PLAZA LLC	MINNIEVILLE PLAZA
8292-81-3425	14050	TELEGRAPH	RD	WOODBIDGE	22192	SUSA PARTNERSHIP LP	8292SE	151	Mini Warehousing	3	ESS PRISA LLC	STORAGE USA-BLDG C
8192-50-8821	14119	MINNIEVILLE	RD	WOODBIDGE	22193	REGENCY REALTY GROUP INC	8192SE	313	Shopping Center	3	SVAP CHESHIRE LP	CHESHIRE W/ PETCO & SAFEWAY
8492-43-4786.01	559	HARBOR SIDE	ST	WOODBIDGE	22191	MARINA LANDING ASSOCIATES LLC	8492SW	318	Shopping Center	3	MARINA LANDING ASSOCIATES LLC	
8492-43-5380.01	551	HARBOR SIDE	ST	WOODBIDGE	22191	MARINA LANDING ASSOCIATES LLC	8492SW	318	Shopping Center	3	MARINA LANDING ASSOCIATES LLC	
8492-43-4192.01	567	HARBOR SIDE	ST	WOODBIDGE	22191	MARINA LANDING ASSOCIATES LLC	8492SW	318	Shopping Center	3	MARINA LANDING ASSOCIATES LLC	
8492-43-3795.01	571	HARBOR SIDE	ST	WOODBIDGE	22191	MARINA LANDING ASSOCIATES LLC	8492SW	318	Shopping Center	3	MARINA LANDING ASSOCIATES LLC	
8492-43-4489.01	563	HARBOR SIDE	ST	WOODBIDGE	22191	MARINA LANDING ASSOCIATES LLC	8492SW	318	Shopping Center	3	MARINA LANDING ASSOCIATES LLC	
8492-43-5083.01	555	HARBOR SIDE	ST	WOODBIDGE	22191	MARINA LANDING ASSOCIATES LLC	8492SW	318	Shopping Center	3	MARINA LANDING ASSOCIATES LLC	
7696-59-1631	8025	SUDLEY	RD	MANASSAS	20109	WESTGATE SHOPPING CENTER LLC	7696NE	311	Small Shopping Center	3	WESTGATE MZL LLC	WESTGATE
7397-28-0270	6876	PIEDMONT CENTER	PZ	GAINESVILLE	20155	PIEDMONT COMMERCIAL CENTER INC	7397NW	311	Small Shopping Center	3	PIEDMONT PLAZA LLC	PIEDMONT CTR Pcl B *see notes
7896-19-8912	8030	CENTREVILLE	RD	MANASSAS	20111	SCHICK RORY LEE	7896NW	216	Auto Parking	3	SCHICK RORY LEE	
8193-19-4944	4650	ASDEE	LN	WOODBIDGE	22192	OLD HICKORY GOLF CLUB LLC	8193NW	832	Golf Course	2	OLD HICKORY GOLF CLUB LLC	
8292-71-6115	14001	WORTH	AV	WOODBIDGE	22192	ARI POTOMAC MILLS AND D LLC ETAL	8292SE	312	Shopping Center	3	ALLIANCE HSP POTOMAC MILLS LLC	
7595-57-4944	9435	CONTRACTORS	CT	MANASSAS	20109	SWAN ROBERT E TR	7595NE	150	Wholesale Warehousing	4	GRR LAND OF VIRGINIA LLC	
7497-02-6514.01	7689	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	156	Wholesale Warehousing (Condo)	2	GATEWAY BUSINESS CENTER	BLDG D UNIT 100
8292-66-4137	13270	MINNIEVILLE	RD	WOODBIDGE	22192	GARBER PROPERTIES LLC	8292NE	390	Retail	3	GARBER PROPERTIES LLC	Holly Acres Marine
8292-56-8930	2826	GARBER	WY	WOODBIDGE	22192	MINNIEVILLE ROAD DEVELOPMENT CO LLC	8292NE	311	Small Shopping Center	3	LIBERIA INVESTMENTS LLC	GARBER SHOPPING CENTER
7497-02-7698	5524	WELLINGTON	RD	GAINESVILLE	20155	CRABTREE ROBERT ROSANNA CRABTREE	7497SW	190	Other Industrial	4	FULL OF SUNSHINE LLC	MASTERCRAFT AUTO
7497-23-0068	7300	RAIL LINE	CT	GAINESVILLE	20155	DALRYMPLE REALTY CORPORATION	7497SW	121	Durable Manufacturing	4	DALRYMPLE REALTY CORPORATION	NEWINGTON CONCRETE PLANT
8393-11-3391	12730	HARBOR	RD	WOODBIDGE	22192	MCDONALDS CORPORATION	8393SW	354	Restaurant	3	MCDONALDS CORPORATION	MCDONALDS- HARBOR
7892-54-6381	13641	DUMFRIES	RD	MANASSAS	20112	VARGAS FERNANDO R & GRACIELLA VARGAS	7892SE	312	Shopping Center	3	VARGAS FERNANDO R & GRACIELLA VARGAS	BRADFORD SQUARE
8192-58-7724	4071	PRINCE WILLIAM	PY	WOODBIDGE	22193	STOR ALL LPD LLC	8192NE	151	Mini Warehousing	3	PS WOODBRIDGE PRINCE WILLIAM 2013 LLC	PUBLIC STORAGE A
7397-45-1913	14251	JOHN MARSHALL	HY	GAINESVILLE	20155	CPC GAINESVILLE LLC	7397NW	190	Other Industrial	4	CPC-GAINESVILLE LLC	ATLANTIC COAST COTTON
7595-68-1509	9449	HAWKINS	DR	MANASSAS	20109	ROSS HAROLD M	7595NE	121	Durable Manufacturing	4	ROSS DAVID L	H.M. ROSS PAVING
8192-67-1576	4021	PRINCE WILLIAM	PY	WOODBIDGE	22192	STEICO INCORPORATED	8192NE	344	Convenience Store with Gas	4	STEICO INCORPORATED	SHEETZ - PW PKWY & HILLENDALE
8192-77-7307	3908	PRINCE WILLIAM	PY	WOODBIDGE	22192	3908 PRINCE WILLIAM LLC	8192NE	351	Restaurant	3	DJASSEBI JOE MEHRDAD & NORMA ISABEL SURV	JOE'S AMERICAN DINER
7697-33-9426	7500	BROKEN BRANCH	LN	MANASSAS	20109	LOWES HOME CENTERS INC	7697SW	320	Building Materials	3	LOWES HOME CENTERS INC	LOWE'S HOME CENTER
8093-52-8034	5304	HOADLY	RD	MANASSAS	20112	CHRISTOPHER CLAYTON C AND DORIS N	8093SE	911	Agricultural Resources	3	CHRISTOPHER CLAYTON C & DORIS N	
8289-35-3480	17247	WAYSIDE	DR	DUMFRIES	22026	ATLANTIC INVESTMENT CORPORATION	8289NW	311	Small Shopping Center	3	PREMIER SOUTHBRIDGE LLC	
7697-32-9173	7501	BROKEN BRANCH	LN	MANASSAS	20109	GENERAL MILLS RESTAURANTS INC	7697SW	351	Restaurant	3	ARCP RL/OG MANASSAS VA LLC	RED LOBSTER
7696-76-9773	8345	SUDLEY	RD	MANASSAS	20109	MANAPORT PLAZA LLC	7696NE	313	Shopping Center	3	MANAPORT PLAZA LLC	MANAPORT S C
7497-01-6194.01	7689	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	156	Wholesale Warehousing (Condo)	2	INDIE LLC	BLDG D UNIT 125
7497-02-6302.01	7689	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	156	Wholesale Warehousing (Condo)	2	GATEWAY BUSINESS CENTER	BLDG D UNIT 120
7497-02-3717.01	7679	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	156	Wholesale Warehousing (Condo)	2	BLUE LABEL CUSTOMS LLC	BLDG B UNIT 120
7497-02-2519.01	7679	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	156	Wholesale Warehousing (Condo)	2	NATIVE VENTURES LLC	BLDG B UNIT 140
7695-28-5649	10801	UNIVERSITY	BL	MANASSAS	20110	PWC BOARD OF COUNTY SUPERVISORS	7695NW	140	Research and Testing	2	PWC BOARD OF COUNTY SUPERVISORS	AMERICAN TYPE CULTURE (ATCC)
7594-91-5941	11507	VALLEY VIEW	DR	BRISTOW	20136	BRISTOW MANOR PARTNERSHIP	7594SE	832	Golf Course	2	BRISTOW MANOR PARTNERSHIP	Bristow Estates Manor House
8292-55-1036	13356	MINNIEVILLE	RD	WOODBIDGE	22192	FARM LLC	8292NE	311	Small Shopping Center	3	FARM LLC	SHOPS AT MADISON FARM
7892-55-2432	13550	DUMFRIES	RD	MANASSAS	20112	WOODBINE SHOPPING CENTER ASSOCS LLC	7892NE	313	Shopping Center	3	WOODBINE SHOPPING CENTER ASSOCS LLC	WOODBINE S C
8292-23-8176	13540	MINNIEVILLE	RD	WOODBIDGE	22192	DOMINION CENTER LLC	8292SW	312	Shopping Center	3	DOMINION CENTER TWO LLC	DOMINION CENTER
8188-64-1129	18638	TRIANGLE	ST	TRIANGLE	22172	CHOI SUNG KUL HAI SUN SURV	8188SE	216	Auto Parking	3	CHOI JASON SUNG KUL TR & HAI SUN	
7794-93-8087	8675	PLANT	PL	MANASSAS	20112	MEADOWS MERLIN GILVEN	7794SE	390	Retail	3	MEADOWS MERLIN W TR & STAN L TR	GIL MEADOWS NURSERIES INC
8090-48-6613	15701	CARRS BROOKE	WY	MANASSAS	20112	EXXON MOBIL CORPORATION	8090NE	344	Convenience Store with Gas	4	MACS RETAIL LLC	CAR WASH
8190-34-9190	4370	KEVIN WALKER	DR	DUMFRIES	22025	MONTCLAIR PLAZA LLC	8190SW	312	Shopping Center	3	MONTCLAIR PLAZA LLC	MONTCLAIR PL I
8193-11-8551	12730	BLACK FOREST	LN	WOODBIDGE	22192	RENSCHLER ROLF MARGARETE K TRS	8193SW	351	Restaurant	3	RENSCHLER ROLF & MARGARETE K TRS	QUEEN'S GAMBIT
7397-18-6524	14670	GAP	WY	GAINESVILLE	20155	EXXONMOBIL OIL COPORATION	7397NW	311	Small Shopping Center	3	GAP WAY LLC	GREENHILL COMMERCIAL
8289-36-4320	17171	WAYSIDE	DR	DUMFRIES	22026	ATLANTIC INVESTMENT CORPORATION	8289NW	311	Small Shopping Center	3	PREMIER SOUTHBRIDGE LLC	SOUTHBRIDGE PLAZA
8393-12-2614	2201	OLD BRIDGE	RD	WOODBIDGE	22192	TACKETTS MILL CENTER LLC	8393SW	353	Restaurant	3	TACKETT'S MILL CENTER LLC	Dunkin Donuts
8190-85-7263	15823	LAZY DAY	LN	DUMFRIES	22025	U S GOLF PROPERTIES LP	8190NE	832	Golf Course	2	CJ EAGLE LLC	
8188-64-2402	18723	FULLER HEIGHTS	RD	TRIANGLE	22172	HEPBURN ANDREW PHILLIP	8188SE	390	Retail	3	HEPBURN ANDREW PHILLIP	
7493-86-1936	12026	ADEN	RD	NOKESVILLE	20181	COWNE FAMILY LP	7493NE	224	Sewage	2	PWC SERVICE AUTHORITY	
8190-87-4542	3802	DALEBROOK	DR	DUMFRIES	22025	U S GOLF PROPERTIES LP	8190NE	832	Golf Course	2	CJ EAGLE LLC	
7299-71-8268	5200	MERCHANTS VIEW	SQ	HAYMARKET	20169	DOMINION COUNTRY CLUB LP	7299SE	311	Small Shopping Center	3	DOMINION VALLEY OWNER LLC	BUILDING ""M""
7497-01-4392.01	7699	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	156	Wholesale Warehousing (Condo)	2	GATEWAY BUSINESS CENTER	BLDG C UNIT 140
7497-01-3294.01	7699	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	156	Wholesale Warehousing (Condo)	2	GATEWAY BUSINESS CENTER	BLDG C UNIT 125
8492-53-7716	401	BELMONT BAY	DR	WOODBIDGE	22191	BELMONT BAY LC	8492SE	831	Golf Course	2	BELMONT BAY LC	BELMONT BAY GOLF CLUBHOUSE
7696-86-5847	8441	IRONGATE	WY	MANASSAS	20109	IRONGATE GROUP LLC	7696NE	351	Restaurant	3	IRON GATE GROUP LLC	GUNNI'S RESTAURANT & GRILL
7497-02-4315.01	7679	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	156	Wholesale Warehousing (Condo)	2	GATEWAY BUSINESS CENTER	BLDG B UNIT 110
8190-97-0062	3702	DALEBROOK	DR	DUMFRIES	22025	U S GOLF PROPERTIES LP	8190NE	832	Golf Course	2	CJ EAGLE LLC	
7497-12-4811	7805	PROGRESS	CT	GAINESVILLE	20155	PLEIN SCOTT AND INGRID SURV	7497SW	150	Wholesale Warehousing	4	PROSPECT COURT LLC	TOTAL DEVELOPMENT SOLUTIONS
8292-34-9675	13430	MINNIEVILLE	RD	WOODBIDGE	22192	SULLINS THURMAN D TR	8292SW	150	Wholesale Warehousing	4	FORECLOSURE DEVELOPMENT CO LLC	SULLINS FURNITURE
7595-57-4598	9401	CONTRACTORS	CT	MANASSAS	20109	CRONIN DANIEL SHARON CRONIN SURV	7595NE	190	Other Industrial	4	CRONIN DANIEL & SHARON CRONIN SURV	CRONIN FLOORS
8192-57-9857	13131	HILLENDALE	DR	WOODBIDGE	22193	TRAVERS ROBERT L TR	8192NE	343	Convenience Store	2	TRAVERS ROBERT L TR	7-ELEVEN
8292-82-0694	13798	TELEGRAPH	RD	WOODBIDGE	22192	SHURGARD FREMONT PARTNERS I	8292SE	151	Mini Warehousing	3	SHURGARD/FREMONT PARTNERS I	SHURGARD STORAGE
8292-82-2050	2600	PRINCE WILLIAM	PY	WOODBIDGE	22192	MOTIVA ENTERPRISES LLC	8292SE	344	Convenience Store with Gas	4	PMG NORTHERN VIRGINIA LLC	SHELL- PW PKWY & TELEGRAPH RD
8291-65-7904	14700	POTOMAC MILLS	RD	WOODBIDGE	22192	PWC	8291NE	213	Bus	4	PWC BOARD OF COUNTY SUPERVISORS	PRTC
8292-45-9012	13360	MINNIEVILLE	RD	WOODBIDGE	22192	PARCEL C2 LLC	8292NE	344	Convenience Store with Gas	4	PARCEL C-2 LLC	7-ELEVEN - MADISON FARM
7397-92-9807.01	7669	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	156	Wholesale Warehousing (Condo)	2	GATEWAY BUSINESS CENTER	BLDG A UNIT 115
7497-02-0122.01	7669	LIMESTONE	DR	GAINESVILLE	20155	GATEWAY BUSINESS CENTER LP	7497SW	354	Restaurant	3	S & J ENTERPRISE INC	BLDG A UNIT 110

7994-94-6606	5901 DAVIS FORD	RD	MANASSAS	20112 OCCOQUAN FOREST SANITARY DISTRICT	7994SE	190 Other Industrial	4 PWC SERVICE AUTHORITY	
7697-60-2801	10309 LOMOND	DR	MANASSAS	20109 NORTHERN VIRGINIA ELECTRIC COOP	7697SE	216 Auto Parking	3 NORTHERN VIRGINIA ELECTRIC COOP	
7895-71-8052	10404 MOORE	DR	MANASSAS	20111 MCGARRY ALLAN D & KIL S MCGARRY	7895SE	390 Retail	3 KONDOLOY ROSTAM	BUCKHALL GENERAL STORE
8292-23-6078	13550 MINNIEVILLE	RD	WOODBIDGE	22192 DOMINION CENTER LLC	8292SW	312 Shopping Center	3 DOMINION CENTER LLC	DOMINION CENTER - RETAIL
7694-24-6033	11713 BRISTOW	RD	BRISTOW	20136 JOHN RUFF AND PHILLIP WHEELER PTNSHP	7694SW	910 Agricultural Resources	3 BRISTOW BROADRUN LLC	
8492-43-8235	499 HARBOR SIDE	ST	WOODBIDGE	22191 HARBOR VIEW ASSOCIATES LLC	8492SW	841 Swimming Pool	3 UNIT OWNERS HARBOR VIEW CONDO AT	
8189-69-1607	4100 TALON	DR	DUMFRIES	22025 7 ELEVEN INC	8189NE	344 Convenience Store with Gas	4 SEI ASSET MANAGEMENT & INVESTMENT CO	7-ELEVEN
7896-18-7963	8104 CENTREVILLE	RD	MANASSAS	20111 RESTLESS WHEELS INC	7896NW	390 Retail	3 RESTLESS WHEELS INC	RESTLESS WHEELS CAMPER SALES
7497-02-2220.01	7679 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 VG 145 LLC	BLDG B UNIT 145
7497-01-3993.01	7699 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG C UNIT 135
7497-01-2895.01	7699 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG C UNIT 120
7497-02-2818.01	7679 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 FOUR CORNERS REAL ESTATE INVESTMENT GROUP	BLDG B UNIT 135
7496-07-8757	8217 LINTON HALL	RD	BRISTOW	20136 AMERICA ONLINE INC	7496NW	191 Technology Services	1 PORPOISE VENTURES LLC	AOL II
8092-54-6085	13698 MAPLEDALE	AV	WOODBIDGE	22193 HYLTON CECIL D ESTATE	8092SE	354 Restaurant	3 HYLTON CONRAD C TR & MALCOLM W COOK TR &	MCDONALD'S @ MAPLEDALE
7396-83-1971	13900 ESTATE MANOR	DR	GAINESVILLE	20155 TOWER GROUP LLC	7396SE	311 Small Shopping Center	3 GLENKIRK RETAIL CENTER LLC	FAMILY MART
7696-77-3723	8319 SUDLEY	RD	MANASSAS	20109 MANAPORT PLAZA LLC	7696NE	313 Shopping Center	3 MANAPORT PLAZA LLC	MANAPORT S C
8192-05-3469	4802 DALE	BL	WOODBIDGE	22193 DELANEY PLAZA LLC	8192NW	312 Shopping Center	3 WOODBRIDGE VILLAGE LLC	DELANEY PLAZA
7595-66-6386	9650 HAWKINS	DR	MANASSAS	20109 NEWBILL HOLDINGS LLC	7595NE	190 Other Industrial	4 ASHLAND INVESTMENTS LLC	NEWBILL HOLDINGS
8193-50-0347	4255 SEETON	SQ	WOODBIDGE	22192 EXXON CORP	8193SE	344 Convenience Store with Gas	4 SOUTHSIDE OIL LLC	EXXON - THE GLEN SHOP CTR
8292-72-9509	2651 PRINCE WILLIAM	PY	WOODBIDGE	22192 BRINKER VIRGINIA INC	8292SE	351 Restaurant	3 COLE OB WOODBRIDGE VA LLC	ON THE BORDER
8292-51-4135	13901 SMOKE TOWN	RD	WOODBIDGE	22192 MINI U STORAGE WOODBRIDGE LTD PTNSHP ET	8292SE	151 Mini Warehousing	3 MINI U STORAGE WOODBRIDGE LTD PTNSHP ET AL	MINI-U STORAGE - OFFICE/APT
8292-23-2492	3340 ELM FARM	RD	WOODBIDGE	22192 LORD FAIFAX COMMUNITY COLLEGE	8292SW	151 Mini Warehousing	3 POTOMAC MILLS LAND LLLP	EZ SELF STORAGE
8190-62-6732	4202 FORTUNA CENTER	PZ	DUMFRIES	22025 FORTUNA REGENCY LLC	8190SE	313 Shopping Center	3 BRE DDR CROCODILE FORTUNA CENTER LLC	FORTUNA CENTER - SHOPPERS, etc
8393-22-9054	2010 OLD BRIDGE	RD	WOODBIDGE	22192 BOROCZI SCOTT TR	8393SW	366 Service Station	5 RUBY & HARRY LLC	SUNOCO-OLD BRIDGE & CLIPPER
8292-55-3681	13606 FOWKE	LN	WOODBIDGE	22192 GARBER J MANLEY JEANETTE ESTATE	8292NE	361 Motor Vehicle Sales	3 GARBER DANIEL C	Lake Ridge Auto Sales
7298-37-4137	5942 INTERLACHEN	CT	HAYMARKET	20169 DOMINION COUNTRY CLUB LP	7298NW	831 Golf Course	2 DOMINION VALLEY COUNTRY CLUB I LLC	
7298-77-8242	15191 GOLF VIEW	DR	HAYMARKET	20169 DOMINION COUNTRY CLUB LP	7298NE	831 Golf Course	2 DOMINION VALLEY COUNTRY CLUB I LLC	
7298-79-3018	15201 ARNOLD PALMER	DR	HAYMARKET	20169 DOMINION COUNTRY CLUB LP	7298NE	831 Golf Course	2 DOMINION VALLEY COUNTRY CLUB I LLC	
7595-57-0682	9400 CONTRACTORS	CT	MANASSAS	20109 L F JENNINGS INC	7595NE	190 Other Industrial	4 L F JENNINGS INC	L F JENNINGS INC
7497-12-2047	7750 PROGRESS	CT	GAINESVILLE	20155 POTOMAC GAINESVILLE PROPERTY LLC	7497SW	160 Industrial Service Garage	4 POTOMAC GAINESVILLE PROPERTY LLC	POTOMAC MACK SALES/SERVICE
8190-66-1721	16500 EDGEWOOD	DR	DUMFRIES	22025 U S GOLF PROPERTIES LP	8190NE	832 Golf Course	2 CJ EAGLE LLC	MONTCLAIR COUNTRY CLUB
8190-52-9272	4406 FORTUNA CENTER	PZ	DUMFRIES	22025 FORTUNA REGENCY LLC	8190SE	352 Restaurant	3 BRE DDR CROCODILE FORTUNA CENTER LLC	PANERA BREAD & STARBUCKS
8193-40-9299	4350 PRINCE WILLIAM	PY	WOODBIDGE	22192 LEOPOLD CHARLES W JAQUELINE M SURV	8193SE	190 Other Industrial	4 G & L ENTERPRISES LLC	MAINTENANCE BLDG @ THE GLEN
7696-84-7480	8621 SUNNYGATE	DR	MANASSAS	20109 SUNNYGATE DRIVE SELF STORAGE LLC	7696NE	151 Mini Warehousing	3 U-STORE-IT LP	CUBESMART
7497-24-9109	7201 RAIL LINE	CT	GAINESVILLE	20155 DALRYMPLE REALTY CORP	7497SW	121 Durable Manufacturing	4 DALRYMPLE REALTY CORPORATION	CHEMUNG ASPHALT PLANT
7397-20-9268	7754 VIRGINIA OAKS	DR	GAINESVILLE	20155 NGP REALTY SUB LP	7396SE	832 Golf Course	2 VIRGINIA OAKS LLC	
7595-57-1046	9430 CONTRACTORS	CT	MANASSAS	20109 9430 INC	7595NE	190 Other Industrial	4 9430 INC	A
8492-44-5722	530 HARBOR SIDE	ST	WOODBIDGE	22191 BELMONT TOWN CENTER ASSOCS LLC	8492NE	851 Marina	3 BELMONT TOWN CENTER ASSOCS LLC	BELMONT BAY CENTER MARINA
7595-67-6742	9489 HAWKINS	DR	MANASSAS	20109 TOUSHA NOBLE A ROBIN	7595NE	150 Wholesale Warehousing	4 TOUSHA NOBLE A & ROBIN	EQUIPMENT SPECIALISTS
8391-88-6685	14398 MELBOURNE	AV	WOODBIDGE	22191 PWC PARK AUTHORITY	8391NE	224 Sewage	2 PWC BOARD OF COUNTY SUPERVISORS	
7596-24-1508	12021 WILTON MEADOWS	CT	MANASSAS	20109 BENFIELD AND DRESSLER LLC	7596NW	150 Wholesale Warehousing	4 NAGEOTTE RICHARD R V LLC	BENFIELD ELECTRIC
8391-59-8873	14211 JEFFERSON DAVIS	HY	WOODBIDGE	22191 JD HWY LLC	8391NE	361 Motor Vehicle Sales	3 JD HWY LLC	LUSTINE DODGE - JEEP
7396-59-3972	7689 VIRGINIA OAKS	DR	GAINESVILLE	20155 NGP REALTY SUB LP	7396SE	832 Golf Course	2 VIRGINIA OAKS LLC	
7595-56-9398	11331 INDUSTRIAL	RD	MANASSAS	20109 HUGHES EDDY W	7595NE	150 Wholesale Warehousing	4 DAVID RAMOS FAMILY LLC	MIKE & BRYAN CONTRACTORS
8192-41-7315	4326 DALE	BL	WOODBIDGE	22193 TRUSTEES OF THE IRENE V HYLTON CHARITABL	8192SW	312 Shopping Center	3 GLENDALE PLAZA LLC	GLENDALE PLAZA
7596-14-5500	8780 VIRGINIA MEADOWS	DR	MANASSAS	20109 PEREIRA ANTONIO AND MARIO RAMOS ETAL	7596NW	190 Other Industrial	4 PEREIRA ANTONIO & MARIO RAMOS ETAL	POTOMAC CONCRETE
7697-50-9508	10319 LOMOND	DR	MANASSAS	20109 NORTHERN VIRGINIA ELECTRIC COOP	7697SE	216 Auto Parking	3 NORTHERN VIRGINIA ELECTRIC COOP	
7595-67-8821	9651 HAWKINS	DR	MANASSAS	20109 HAMP WILLIAM A III TR	7595NE	190 Other Industrial	4 HAWKINS DRIVE LLC	CALVERT MASONRY
7496-50-4931	12912 HUNTING COVE	PL	BRISTOW	20136 BRIDGEWOOD AT BRIDLEWOOD MANOR ASSOC LLC	7496SE	841 Swimming Pool	3 BRIDLEWOOD MANOR COMMUNITY ASSN	
7993-01-0402	12805 DUSTY WILLOW	RD	MANASSAS	20112 OAK RIDGE SWIM CLUB INC	7993SW	841 Swimming Pool	3 OAK RIDGE SWIM CLUB INC	
8391-56-6917	1551 FEATHERSTONE	RD	WOODBIDGE	22191 HALL MICHAEL T TR	8391NE	343 Convenience Store	2 THE KENTLAND FOUNDATION INC	7 MARKET FOOD STORE
8193-37-0594	4600 ASDEE	LN	WOODBIDGE	22192 OLD HICKORY GOLF CLUB LLC	8193NW	832 Golf Course	2 OLD HICKORY GOLF CLUB LLC	OLD HICKORY GOLF CLUB STOR/BAT
7497-02-0329.01	7669 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 TEAMC PROPERTIES LLC	BLDG A UNIT 100
8293-04-3660	3310 OLD BRIDGE	RD	WOODBIDGE	22192 OLD BRIDGE RETAIL INVESTMENTS LLC	8293SW	313 Shopping Center	3 OLD BRIDGE RETAIL INVESTMENTS LLC	FESTIVAL-OLD BRIDGE
7497-01-6089.01	7689 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 DLE LLC	BLDG D UNIT 135
7497-01-3594.01	7699 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG C UNIT 130
7497-01-1299.01	7699 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG C UNIT 100
7497-02-3417.01	7679 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG B UNIT 120
8391-58-3691	14335 JEFFERSON DAVIS	HY	WOODBIDGE	22191 LYNNWOOD SHOPPING CENTER LLC	8391NE	312 Shopping Center	3 LYNNWOOD SHOPPING CENTER LLC	LYNNWOOD SHOPPING CENTER
8193-93-5944	3514 OLD BRIDGE	RD	WOODBIDGE	22192 EXXON CORP	8193SE	344 Convenience Store with Gas	4 SOUTHSIDE OIL LLC	EXXON-OLD BRIDGE & SMOKE TOWN
8293-04-2352	3312 OLD BRIDGE	RD	WOODBIDGE	22192 OLD BRIDGE RETAIL INVESTMENTS LLC	8293SW	313 Shopping Center	3 OLD BRIDGE RETAIL INVESTMENTS LLC	FESTIVAL-OLD BRIDGE FOOD LION
8191-35-7187	14797 DARBYDALE	AV	WOODBIDGE	22193 TRAVERS ROBERT L TR	8191NW	343 Convenience Store	2 TRAVERS ROBERT L TR	7-ELEVEN
8293-03-0262	3318 OLD BRIDGE	RD	WOODBIDGE	22192 STORAGE SQUIREBAC 101 LTD PTNSHP	8293SW	151 Mini Warehousing	3 STORAGE SQUIREBAC 101 LTD PTNSHP	STORAGE USE - BLDG D
8292-88-9614	13059 MINNIEVILLE	RD	WOODBIDGE	22192 ARCHIE HENRY E SR & ANNIE WILLIAMS	8292NE	369 Other Automotive	4 ARCHIE HENRY ELVIN JR	Penny's Used Auto Parts
8193-93-0718	12576 GRAND TARGHEE	DR	WOODBIDGE	22192 AMOCO OIL CO	8193SE	344 Convenience Store with Gas	4 OLD BRIDGE 101 LLC	Car Wash
8293-05-8957	3500 COMMISSION	CT	WOODBIDGE	22192 COMMISSION COURT LLC	8293NW	151 Mini Warehousing	3 COMMISSION COURT LLC	ATLANTIC STORAGE
8193-92-0448	3705 OLD BRIDGE	RD	WOODBIDGE	22192 MICHAEL R VANDERPOOL ET ALL	8193SE	390 Retail	3 JVG LLC	LOW ROOFED GREENHOUSE
7595-68-5645	11141 INDUSTRIAL	RD	MANASSAS	20109 S S REAL ESTATE HOLDINGS L L C	7595NE	150 Wholesale Warehousing	4 11141 INDUSTRIAL ROAD LLC	S & S REAL ESTATE
8392-88-5002	13244 PUTNAM	CL	WOODBIDGE	22191 GREENWICH HILL HOMEOWNERS ASSOC	8392NE	841 Swimming Pool	3 GREENWICH HILL HOMEOWNERS ASSOC	
8292-80-9997	14103 TELEGRAPH	RD	WOODBIDGE	22192 HAMILTON C ISAAC TR & JUDITH TR	8292SE	131 NonDurable Manufacturing	4 TELEGRAPH MANAGEMENT GROUP LLC	HAMILTON IRON WORKS
8292-51-2288	13889 SMOKE TOWN	RD	WOODBIDGE	22192 PUBLIC STORAGE INC	8292SE	151 Mini Warehousing	3 PUBLIC STORAGE INC	PUBLIC STORAGE BLDG A
8391-82-5162	15060 FARM CREEK	DR	WOODBIDGE	22191 TRIDEX ASSOCIATES INC	8391SE	150 Wholesale Warehousing	4 TRIDEX ASSOCIATES INC	TRIDEX MACHINE SHOP/WAREHOUSE
8193-30-7146	4383 RIDGEWOOD CENTER	DR	WOODBIDGE	22192 PFITZNER G RICHARD TR	8193SW	216 Auto Parking	3 PFITZNER G RICHARD TR	
7595-58-6956	11250 INDUSTRIAL	RD	MANASSAS	20109 KALOS PETER VERON L KALOS	7595NE	190 Other Industrial	4 COSTA ENTERPRISES LLC	

8393-11-6795	12721 HARBOR	DR	WOODBIDGE	22192 TACO BELL OF AMERICA INC	8393SW	354 Restaurant	3 TACO BELL OF AMERICA INC	TACO BELL
7896-19-9330	8028 CENTREVILLE	RD	MANASSAS	20111 AKSOYLU AHMET	7896NW	150 Wholesale Warehousing	4 AKSOYLU AHMET	VAMAC PLUMBING SUPPLIES
8392-51-7103	1641 WIGGLESWORTH	WY	WOODBIDGE	22191 PEP BOYS MANNY MOE JACK	8392SE	369 Other Automotive	4 PEP BOYS MANNY MOE & JACK	Pep Boys
8292-83-0326	13790 TELEGRAPH	RD	WOODBIDGE	22192 PASCACAVE JOAN	8292SE	150 Wholesale Warehousing	4 PERRY FAMILY LIMITED PARTNERSHIP LLP	AIRECO, VAMAC, JACKSON TRANSP
8292-90-3172	14105 TELEGRAPH	RD	WOODBIDGE	22192 HARRISON KIMBERLY C STEVEN H	8292SE	369 Other Automotive	4 VROOM VROOM HOLDINGS LLC	COLEMAN POWERSPORT
8292-23-4763	13598 MINNIEVILLE	RD	WOODBIDGE	22192 DOMINION CENTER LLC	8292SW	312 Shopping Center	3 DOMINION CENTER TWO LLC	DOMINION CENTER - RETAIL
8292-72-9845	2630 PRINCE WILLIAM	PY	WOODBIDGE	22192 EKW ENTERPRISES LLC	8292SE	351 Restaurant	3 HO AMY Y & JAMES HO ETAL T-C	HOOTERS
8292-82-6528	2631 PRINCE WILLIAM	PY	WOODBIDGE	22192 JBAC L L C	8292SE	344 Convenience Store with Gas	4 JBAC L L C	7-ELEVEN
7497-01-2097.01	7699 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG C UNIT 110
7497-01-1698.01	7699 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG C UNIT 105
7497-02-4714.01	7679 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG B UNIT 105
7497-02-4016.01	7679 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG B UNIT 115
7497-02-3118.01	7679 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG B UNIT 130
7497-01-5983.01	7689 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG D UNIT 140
8191-94-0237	14820 CLOVERDALE	RD	WOODBIDGE	22193 TRAVERS ROBERT L TR	8191SE	343 Convenience Store	2 TRAVERS ROBERT L TR	7-ELEVEN
7595-67-5757	9479 HAWKINS	DR	MANASSAS	20109 HAWKINS ROAD ASSOCIATES LLC	7595NE	150 Wholesale Warehousing	4 DOBYNS PROPERTIES LLC	DOBYN'S CONSTRUCTION
7596-14-7467	8713 VIRGINIA MEADOWS	DR	MANASSAS	20109 GRC LLC	7596NW	150 Wholesale Warehousing	4 GRC LLC	COASTAL ELECTRIC
7497-02-0225.01	7669 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	
7596-13-8198	8760 VIRGINIA MEADOWS	DR	MANASSAS	20109 AMERICAN MANAGEMENT ENTERPRISES	7596SW	150 Wholesale Warehousing	4 8760 LLC	Helpcomm, Inc.
8392-29-7921	13065 LUPINE	TN	WOODBIDGE	22192 PWC BOARD OF COUNTY SUPERVISORS	8392NW	224 Sewage	2 PWC BOARD OF COUNTY SUPERVISORS	SEWAGE PUMPING STATION
7991-05-2666	14823 DUMFRIES	RD	MANASSAS	20112 VENABLE JEAN S	7991NW	369 Other Automotive	4 KELLY SCOTT D	ASAP AUTO RECYCLING CENTER
8393-11-6935	2211 TACKETTS MILL	DR	WOODBIDGE	22192 DOMINION FOODS LTD	8393SW	354 Restaurant	3 BRC TACKETTS MILL LAND LLC	BURGER KING
8289-36-2339	17165 WAYSIDE	DR	DUMFRIES	22026 ATLANTIC INVESTMENT CORPORATION	8289NW	311 Small Shopping Center	3 PREMIER SOUTHBIDGE LLC	AUTO ZONE
8292-82-5976	13851 TELEGRAPH	RD	WOODBIDGE	22192 PARKWAY CROSSING LLC	8292SE	150 Wholesale Warehousing	4 PARKWAY CROSSING LLC	P.W. COUNTY ARCHIVES
8190-45-6117	4413 ASHGROVE	DR	DUMFRIES	22025 U S GOLF PROPERTIES L P	8190NW	832 Golf Course	2 CJ EAGLE LLC	
8193-50-7773	13211 TOUCHSTONE	CL	WOODBIDGE	22192 SAUL HOLDINGS LIMITED PARTNERSHIP	8193SE	311 Small Shopping Center	3 SAUL HOLDINGS LIMITED PARTNERSHIP	THE GLEN
7497-02-1720.01	7679 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG B UNIT 150
8190-66-9015	16066 DEER PARK	DR	DUMFRIES	22025 U S GOLF PROPERTIES L P	8190NE	832 Golf Course	2 CJ EAGLE LLC	
8293-25-1320	12241 HEDGES RUN	DR	WOODBIDGE	22192 LAKE RIDGE E AND A LLC	8293NW	311 Small Shopping Center	3 LAKE RIDGE (E&A) LLC	GIANT'S HEDGES RUN/LAKE RIDGE
8190-39-3819	15516 GOLF CLUB	DR	DUMFRIES	22025 U S GOLF PROPERTIES L P	8190NW	832 Golf Course	2 CJ EAGLE LLC	
8190-35-4496	4412 ASHGROVE	DR	DUMFRIES	22025 U S GOLF PROPERTIES L P	8190NW	832 Golf Course	2 CJ EAGLE LLC	
8190-54-0778	16225 EDGEWOOD	DR	DUMFRIES	22025 U S GOLF PROPERTIES L P	8190SE	832 Golf Course	2 CJ EAGLE LLC	
8190-77-2247	15870 NORTHGATE	DR	DUMFRIES	22025 U S GOLF PROPERTIES L P	8190NE	832 Golf Course	2 CJ EAGLE LLC	
7595-56-7123	9515 CONTRACTORS	CT	MANASSAS	20109 BROAD RUN DEVELOPMENT LLC	7595NE	190 Other Industrial	4 EURO GROUP LLC	
8193-50-3541	13261 TOUCHSTONE	CL	WOODBIDGE	22192 MCDONALDS CORPORATION	8193SE	354 Restaurant	3 MCDONALDS CORPORATION	MCDONALD'S
7497-01-2496.01	7699 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG C UNIT 115
7497-02-6408.01	7689 LIMESTONE	DR	GAINESVILLE	20155 GATEWAY BUSINESS CENTER LP	7497SW	156 Wholesale Warehousing (Condo)	2 GATEWAY BUSINESS CENTER	BLDG D UNIT 110
7299-40-8683	15251 WEISKOPF	CT	HAYMARKET	20169 DOMINION VALLEY COUNTRY CLUB LP	7299SW	831 Golf Course	2 THE REGENCY GOLF CLUB I LLC	
8190-46-3671	15915 DOLPHIN	DR	DUMFRIES	22025 U S GOLF PROPERTIES L P	8190NW	832 Golf Course	2 CJ EAGLE LLC	
8090-96-0386	5055 WATERWAY	DR	DUMFRIES	22025 E&A ACQUISITION LTD PTPSH	8090NE	313 Shopping Center	3 LAKE MONTCLAIR-DUMFRIES VA LLC	LAKE MONTCLAIR SHOPPING CENTER
8190-48-2675	15601 RHAME	DR	DUMFRIES	22025 U S GOLF PROPERTIES L P	8190NW	832 Golf Course	2 CJ EAGLE LLC	
8292-60-8719	2850 POTOMAC MILLS	CL	WOODBIDGE	22192 BURLINGTON COAT REALTY POTOMAC INC	8292SE	314 Large Mail	3 BURLINGTON COAT REALTY POTOMAC INC	POTOMAC MILLS-BURLINGTON COAT
7696-76-6475	8375 SUDLEY	RD	MANASSAS	20109 PADILLA LOUIS A CHARLOTTE M	7696NE	344 Convenience Store with Gas	4 PADILLA LOUIS A & CHARLOTTE M	7-ELEVEN
7794-18-3364	10501 CEDAR CREEK	DR	MANASSAS	20112 COUNTRY ROADS HOMEOWNERS ASSOC	7794NW	841 Swimming Pool	3 COUNTRY ROADS HOMEOWNERS ASSOC	
7992-89-0253	7001 DALE	BL	WOODBIDGE	22193 7 ELEVEN INC	7992NE	344 Convenience Store with Gas	4 SEI ASSET MANAGEMENT & INVESTMENT CO	7-ELEVEN
7797-53-8297	7420 BEN LOMOND PARK	DR	MANASSAS	20109 UPPER OCCOQUAN SEWAGE AUTHORITY	7797SE	224 Sewage	2 UPPER OCCOQUAN SEWAGE AUTHORITY	SEWAGE TREATMENT/NOVEC
8292-82-1711	2641 PRINCE WILLIAM	PY	WOODBIDGE	22192 BRINKER VIRGINIA INC	8292SE	351 Restaurant	3 BARBERS LLC	MACARONI GRILL
7596-24-0125	8740 VIRGINIA MEADOWS	DR	MANASSAS	20109 BENFIELD AND DRESSLER LLC	7596NW	190 Other Industrial	4 BENFIELD & DRESSLER LLC	PERMNT SEAL, BENEFIELD ELECTRC
7497-13-3145	5579 WELLINGTON	RD	GAINESVILLE	20155 PRESIDENTIAL PROPERTIES USA LLC	7497SW	151 Mini Warehousing	3 PRESIDENTIAL PROPERTIES USA LLC	PRESIDENTIAL STORAGE
7196-84-1142	8230 BUCKLAND MILL	RD	GAINESVILLE	20155 BUCKLAND FARM LLC	7196SE	911 Agricultural Resources	3 BUCKLAND FARM LLC	
7896-18-5692	8100 CENTREVILLE	RD	MANASSAS	20111 SCHICK RORY LEE	7896NW	361 Motor Vehicle Sales	3 SCHICK RORY LEE	MANASSAS CHRYSLER
7497-02-1157	7645 LIMESTONE	DR	GAINESVILLE	20155 PROSPERITY INVESTORS LLC	7497SW	150 Wholesale Warehousing	4 PROSPERITY INVESTORS LLC	UNITED STATES POSTAL SERVICE
8393-10-4281	12831 HARBOR	DR	WOODBIDGE	22192 KIM HAK K OK J	8393SW	369 Other Automotive	4 SHAD HOLDING LLC	TACKETTS MILL CAR WASH
7296-19-8769	15694 LEE	HY	GAINESVILLE	20155 STRINGER RODNEY B AND CORA R A SURV	7296NW	351 Restaurant	3 STRINGER INVESTMENT GROUP LLLP	BLUE RIDGE SEA FOOD RESTAURANT
7397-43-5429	7500 ALEXANDER SOPHIA	CT	GAINESVILLE	20155 GAINESVILLE 29 LLC	7397SW	150 Wholesale Warehousing	4 CRAIG ENTERPRISES LLC	
7696-49-6563	8001 SUDLEY	RD	MANASSAS	20109 EXXON CORP	7696SW	344 Convenience Store with Gas	4 MACS RETAIL LLC	EXXON
7595-68-8696	11128 INDUSTRIAL	RD	MANASSAS	20109 WISE GUYS CONTRACTING INC	7595NE	121 Durable Manufacturing	4 INDUSTRIAL ROAD REALTY LLC	WISE GUYS CONSTRUCTION
8390-30-3120	16656 RADCLIFFE	LN	WOODBIDGE	22191 PWC SERVICE AUTHORITY	8390SW	224 Sewage	2 PWC SERVICE AUTHORITY	SEWAGE PUMP STATION
8289-49-8567	16555 RIVER RIDGE	BL	WOODBIDGE	22191 LSB WHEATON LLC KODIAK RIVER OAKS LLC	8289NE	311 Small Shopping Center	3 LSB WHEATON LLC & KODIAK RIVER OAKS LLC	RIVER OAKS SC
7599-33-0540	5003 SUDLEY	RD	CATHARPIN	20143 POAGUE JOHN R	7599SW	390 Retail	3 POAGUE JOHN R & JEAN C SURV	SUDLEY GARDEN CENTER
7595-78-1595	11120 INDUSTRIAL	RD	MANASSAS	20109 PAVONE VINCENT F CHARLOTTE C	7595NE	150 Wholesale Warehousing	4 11120 LLC	V.F. PAVONE
7991-25-7431	7044 COLCHESTER PARK	DR	MANASSAS	20112 RIDGE LONG LTD CO	7991NW	150 Wholesale Warehousing	4 L & R REAL ESTATE LLC	RIDGE AND LONG LIMITED LLC
8191-22-5293	3541 WATERWAY	DR	WOODBIDGE	22193 KEENE MILL CORP	8191SW	312 Shopping Center	3 AHNS REAL ESTATE INC & HEI SIL AHN	MONTCLAIR
7396-59-8754	7950 VIRGINIA OAKS	DR	GAINESVILLE	20155 NGP REALTY SUB LP	7396NE	832 Golf Course	2 VIRGINIA OAKS LLC	VIRGINIA OAKS CLUBHOUSE
8190-44-1875	16160 COUNTRY CLUB	DR	DUMFRIES	22025 SOUTHLAND CORP	8190NE	312 Shopping Center	3 SOUTHLAND CORP	MONTCLAIR 7-11
8193-50-0968	4245 SEETON	SQ	WOODBIDGE	22192 BNE LLC	8193SE	369 Other Automotive	4 BNE LLC	Lakeridge Auto Care
7298-71-0059	6450 TRADING	SQ	HAYMARKET	20169 HAYMARKET E A LLC	7298SE	313 Shopping Center	3 HAYMARKET (E&A) LLC	BUILDING 4
7298-56-1368	5943 INTERLACHEN	CT	HAYMARKET	20169 DOMINION COUNTRY CLUB LP	7298NE	831 Golf Course	2 DOMINION VALLEY COUNTRY CLUB I LLC	
8192-67-9463	13295 TROWBRIDGE	DR	WOODBIDGE	22192 PW PETROLEUM INC	8192NE	344 Convenience Store with Gas	4 PW PETROLEUM INC	VALERO PW PARKWAY
7594-17-9564	12108 NOKESVILLE	RD	BRISTOW	20136 NOKESVILLE LIVESTOCK AUCTION INC	7594NW	390 Retail	3 NOKESVILLE LIVESTOCK AUCTION INC	
7595-31-6547	10500 BRISTOW CENTER	DR	BRISTOW	20136 BLUV	7595SW	311 Small Shopping Center	3 BLUV LLC	BLDG C 10410-10418 BRISTOW CTR
7296-49-9598	7900 STONEWALL SHOPS	SQ	GAINESVILLE	20155 STONEWALL REGENCY LLC	7297SW	313 Shopping Center	3 STONEWALL REGENCY LLC	
7296-68-0445	15601 TURTLE POINT	DR	GAINESVILLE	20155 LAKE MANASSAS LIMITED LIABILITY CO	7296NE	832 Golf Course	2 STONEWALL GOLF CLUB AT LAKE MANASSAS INC	STONEWALL GOLF/CLUBHOUSE
8292-60-5581	14050 WORTH	AV	WOODBIDGE	22192 SAM'S REAL ESTATE BUSINESS TRUST	8292SE	390 Retail	3 SAM'S REAL ESTATE BUSINESS TRUST	SAM'S CLUB GAS

7896-17-1798	8501 MAPLEWOOD	DR	MANASSAS	20111 BEATTY FAMILY LP	7896NW	216 Auto Parking	3 BEATTY FAMILY LP	
8393-01-9573	2219 OLD BRIDGE	RD	WOODBIDGE	22192 TACKETTS MILL CENTER LLC	8393SW	311 Small Shopping Center	3 TACKETT'S MILL CENTER LLC	TACKETTS MILL
7697-14-7746	7651 STREAM WALK	LN	MANASSAS	20109 E A SOUTHEAST LTD PTNSHP	7697NW	313 Shopping Center	3 AMCB MANASSAS PROMENADE LLC	MANASSAS PROMENADE
8291-58-4206	14142 SMOKETOWN	RD	WOODBIDGE	22192 PRINCE WILLIAM SQUARE INVESTORS LLC	8291NE	313 Shopping Center	3 PRINCE WILLIAM SQUARE INVESTORS LLC	PW SQUARE
8392-05-3846	13455 TELEGRAPH	RD	WOODBIDGE	22192 PWC BOARD OF COUNTY SUPERVISORS	8392NW	216 Auto Parking	3 PWC BOARD OF COUNTY SUPERVISORS	
8392-87-7647	13249 OCCOQUAN	RD	WOODBIDGE	22191 AMETHYST COMPANY LLC	8392NE	311 Small Shopping Center	3 AMETHYST COMPANY LLC	WOODBIDGE SQUARE
7300-54-9159	14050 SHELTER	LN	HAYMARKET	20169 LATHAM CARROLL H AND MARY ANNE L	7300SE	911 Agricultural Resources	3 LATHAM FAMILY LAND LLC	
8192-40-8479	4300 DALE	BL	WOODBIDGE	22193 TRUSTEES OF THE IRENE V HYLTON CHARITABL	8192SW	351 Restaurant	3 GLENDALE PLAZA LLC	PIZZA HUT
8393-11-8693	12700 MINNIEVILLE	RD	WOODBIDGE	22192 EXXON CORPORATION	8393SW	344 Convenience Store with Gas	4 SOUTHSIDE OIL LLC	CAR WASH
7595-83-2458	10040 SOWDER VILLAGE	SQ	MANASSAS	20109 INNOVATION E AND A LLC	7595SE	313 Shopping Center	3 INNOVATION (E&A) LLC	RED ROBIN
7595-46-9946	9480 CONTRACTORS	CT	MANASSAS	20109 BROAD RUN DEVELOPMENT LLC	7595NE	190 Other Industrial	4 TRANSATLANTIC REALTY LLC	INDUSTRIAL SHELL
7595-56-3112	9520 CONTRACTORS	CT	MANASSAS	20109 BROAD RUN DEVELOPMENT LLC	7595NE	190 Other Industrial	4 FMJS COMMERCIAL PROPERTIES LLC	BROAD RUN BUSINESS
8191-59-7049	4176 DALE	BL	WOODBIDGE	22193 TRUSTEES OF THE IRENE V HYLTON CHARITABL	8191NE	312 Shopping Center	3 FORESTDALE PLAZA LLC	FORESTDALE PLAZA
8092-43-9145	5301 DALE	BL	WOODBIDGE	22193 PWC PARK AUTHORITY	8092SW	841 Swimming Pool	3 PWC BOARD OF COUNTY SUPERVISORS	DALE CITY
8292-70-7645	2860 POTOMAC MILLS	CL	WOODBIDGE	22192 POTOMAC MILLS OPERATING CO LLC	8292SE	315 Large Mall	3 MALL AT POTOMAC MILLS LLC	POTOMAC MILLS PHASE 3
8292-70-0588	14070 WORTH	AV	WOODBIDGE	22192 RED ROBIN INTERNATIONAL INC	8292SE	351 Restaurant	3 RED ROBIN INTERNATIONAL INC	RED ROBIN
8291-79-1954	2700 POTOMAC MILLS	CL	WOODBIDGE	22192 POTOMAC MILLS OPERATING CO LLC	8291NE	315 Large Mall	3 MALL AT POTOMAC MILLS LLC	POTOMAC MILLS I&II
8091-45-7860	14640 MINNIEVILLE	RD	WOODBIDGE	22193 ZP NO 44 LLC	8091NW	311 Small Shopping Center	3 ZP NO. 44 LLC	STAPLES MILL SC
7896-16-8253	8391 CENTREVILLE	RD	MANASSAS	20111 ABDI PARVIZ AND MAHBOUBEH SAEEDI	7896NW	390 Retail	3 8391 CENTERVILLE ROAD LLC	CARPET GALLERY
7495-77-7361	12691 BRAEMAR VILLAGE	PZ	BRISTOW	20136 BRAEMAR SHOPPING CENTER LLC	7495NE	311 Small Shopping Center	3 CAR BRAEMAR VILLAGE LLC	BRAEMAR SHOPPING CTR
8293-04-2120	3314 OLD BRIDGE	RD	WOODBIDGE	22192 OLD BRIDGE RETAIL INVESTMENTS LLC	8293SW	313 Shopping Center	3 OLD BRIDGE RETAIL INVESTMENTS LLC	FESTIVAL AT OLD BRIDGE
7696-30-1623	10850 PYRAMID	PL	MANASSAS	20110 ARE VIRGINIA NO 2 LLC	7696SW	140 Research and Testing	2 COMMONWEALTH OF VA DEPT OF FORENSIC SCIENCE	VIRGINIA FORENSICS LAB
7496-60-1866	9100 DEVLIN	RD	BRISTOW	20136 BRISTOW COMMONS LLC	7496SE	313 Shopping Center	3 BC PLAZA LLC	Building 3
7497-12-0220	7800 PROGRESS	CT	GAINESVILLE	20155 WMB LC	7497SW	190 Other Industrial	4 WMB LC	BERGER BUILDING
8093-72-2873	12601 GALVESTON	CT	MANASSAS	20112 HOADLY REGENCY LLC	8093SE	311 Small Shopping Center	3 HOADLY REGENCY LLC	HARRIS TEETER
7296-19-0372	7900 CRESCENT PARK	DR	GAINESVILLE	20155 MADISON CRESCENT RETAIL LLC	7296NW	313 Shopping Center	3 MADISON CRESCENT RETAIL LLC	MADISON CRESCENT BUILDING B
7595-58-7311	11301 INDUSTRIAL	RD	MANASSAS	20109 TECHNOLOGY LEASING CONSULTANTS INC	7595NE	190 Other Industrial	4 TECHNOLOGY & LEASING CONSULTANTS INC	ACUTY AUDIO VISUAL
8291-94-2928	2401 OPITZ	BL	WOODBIDGE	22191 DIAMOND POTOMAC TOWN CENTER LLC	8291SE	314 Large Mall	3 DIAMOND POTOMAC TOWN CENTER LLC	BLDG 1 - EYE DOCTOR
8393-23-6788	12500 CLIPPER	DR	WOODBIDGE	22192 THOUSAND OAKS TOWNHOUSE ASSOC	8393SW	841 Swimming Pool	3 THOUSAND OAKS TOWNHOUSE ASSOC	COMMUNITY POOL
7696-85-6632	8500 SUDLEY	RD	MANASSAS	20109 ABEL FAMILY LTD PARTNERSHIP LLP	7696NE	361 Motor Vehicle Sales	3 ABEL FAMILY LIMITED PARTNERSHIP LLP	MILLER TOYOTA
7497-12-6630	7755 PROGRESS	CT	GAINESVILLE	20155 BILLYS LLC	7497SW	190 Other Industrial	4 PROGRESS COURT LLC	FANNON OIL
8391-51-7302	1851 RIPPON	BL	WOODBIDGE	22191 PWC SERVICE AUTHORITY	8391SE	224 Sewage	2 PWC SERVICE AUTHORITY	H.L. MOONEY
8292-34-8341	13470 MINNIEVILLE	RD	WOODBIDGE	22192 SOLANO NELIDA & ITALO F TRS	8292SW	352 Restaurant	3 SOLANO NELIDA J & ITALO F SOLANO TRS	EL POLLO RICO
8191-06-5175	14410 MINNIEVILLE	RD	WOODBIDGE	22193 TRAVERS GUY CHRISTOPHER	8191NW	343 Convenience Store	2 TRAVERS GUY CHRISTOPHER	7-ELEVEN
8093-73-7672	5019 DAVIS FORD	RD	WOODBIDGE	22192 CREST LIMITED PARTNERSHIP	8093SE	150 Wholesale Warehousing	4 CREST LIMITED PARTNERSHIP	PALM POOLS

FID	STRUC_ID	OUTFALL
41	21270	24
158	21517	15
534	20186	30
536	20188	24
652	19942	36
655	19950	24
818	20789	15
827	17878	0
852	30228	15
1059	18570	21
1065	18576	12
1070	18588	36
1075	18593	27
1630	16261	30
1886	15542	0
1944	14926	0
2176	15305	15
2570	32176	18
2756	11631	0
2764	12308	0
2798	12353	21
2800	12355	15
3013	60379	36
3301	11361	18
3304	11366	8
3382	11707	15
3561	27032	0
3682	4722	15
3683	4724	18
3947	9761	15
3969	9843	15
3972	10321	36
3973	10322	0
3974	10323	36
3975	10324	0
3976	10325	12
3978	10327	30
4101	10033	48
4186	9482	42
4789	2279	228
5004	36226	18
5007	34453	24
5662	36869	24
5671	36828	15
6267	37801	0
6291	37374	24

6426	27777	0
6543	36874	15
6545	37690	27
6565	37660	15
6848	8399	15
7291	32345	15
7369	61713	0
7378	61717	0
7426	61707	0
7430	61711	0
8067	956	0
8457	4429	36
8932	35986	42
8937	36087	24
8939	36069	18
8966	35934	0
8974	35905	21
9532	2295	15
9533	2311	24
9620	30650	66
9696	37976	15
9740	37973	0
9741	18854	0
9807	30709	0
9818	30720	60
9890	25177	15
9899	25199	36
10012	38703	0
10047	37974	15
10056	37986	15
10145	40728	0
10146	40729	15
10267	31940	0
10268	31942	0
10372	39737	18
10376	39743	15
10381	40742	36
10412	14975	36
10476	25755	0
10538	26012	0
10539	26014	0
10540	26017	0
10593	33082	48
10623	39748	15
10632	39699	18
10637	39753	15
10639	39705	15

10648	39714	24
10653	39719	15
10876	34159	41
10877	34163	42
10970	39722	15
11006	39413	15
11164	26774	42
11165	26776	36
11439	26876	0
11555	41239	48
11811	36824	42
12124	36793	15
12413	28284	60
12445	39375	24
12457	37980	12
12786	37964	15
12794	19553	0
12805	34733	0
12811	37975	0
12970	23443	36
13366	39287	36
13611	24019	36
13731	38247	21
13894	2394	18
14069	19554	15
14268	30155	42
14565	51105	30
14799	7558	18
14805	7574	0
15254	51141	30
15363	19919	36
15379	19946	18
15397	11488	0
15413	4263	18
15420	4368	0
15429	4437	18
15434	4457	0
15855	19316	15
15874	13639	48
15888	13580	15
15933	26655	135
16198	13811	24
16199	13813	15
16225	30625	0
16226	30626	80
16594	9759	21
16618	9795	33

16619	9797	15
16650	9871	42
16658	9882	21
16668	9874	15
16800	27474	23
17106	41551	0
17526	9465	21
17845	8397	15
18366	21282	36
18513	16264	0
18517	16270	36
18518	16272	30
19626	11009	0
19847	34739	27
19854	38615	42
20770	34735	0
20797	18855	15
20807	38073	21
21437	31024	0
21438	31025	48
21570	27139	15
21671	35935	121
21686	35932	18
21688	35896	21
21698	39443	15
21803	46092	0
21821	46110	24
21829	46112	36
21940	36025	15
21950	35901	18
21959	12262	21
21964	36061	24
22059	40053	15
22267	36341	18
22356	39906	15
22572	36424	47
22970	37363	48
22980	36822	15
23029	30174	27
23064	12987	18
23073	13004	0
23221	37720	42
23283	37344	24
23522	2278	0
23961	30159	0
24637	1922	54
24873	31736	0

25400	28274	15
25458	31943	21
25536	42081	30
25543	42088	18
25545	42090	30
25893	24764	36
26387	34160	0
26388	34161	18
26463	42330	42
26468	42335	18
26481	42348	21
26490	42357	24
26567	25183	24
26568	25185	36
26633	10042	84
26650	10046	0
26655	10051	0
27012	35487	15
27013	35489	15
27199	25756	53
27259	29576	27
27400	23686	30
27527	26013	24
27528	26016	0
27529	26015	18
27530	26018	36
27542	971	84
28494	26767	0
28499	26775	0
28533	30153	0
28621	41817	72
28749	26873	0
28751	26877	18
29074	27126	0
29075	27128	48
29773	14979	15
30528	22257	24
30529	22350	0
30531	22352	24
30549	22373	15
30550	22374	0
30552	22376	24
30733	14388	24
30734	14391	15
31063	31048	72
31463	12795	60
31545	45846	0

31546	45847	24
31547	45848	0
31551	45852	18
31554	45855	15
31555	45856	0
32076	19769	30
32079	19772	21
32080	19789	0
32081	19796	46
32082	19809	30
32083	19822	18
32287	43448	30
32288	43449	0
32289	43450	0
32290	43451	0
32428	31941	18
32715	29827	24
32820	42563	36
32822	42565	36
32958	44481	15
33105	45337	0
33106	45338	15
33111	45341	0
33112	45342	15
33248	34912	18
33351	23727	0
33381	12969	18
33397	32955	0
33487	8392	15
33637	44484	0
33648	36533	15
33649	36534	0
33658	44485	0
33968	36535	18
33985	36110	15
33986	36532	0
34139	16557	15
34142	16575	36
34292	44480	0
34361	45552	30
34438	16580	18
34439	25950	0
34440	25951	15
34442	16564	42
34514	43862	48
34517	43865	15
34555	43903	48

34556	43904	0
34637	47379	4
34643	14335	18
34646	14338	42
34748	21193	27
34749	21195	15
35455	4615	15
35481	4641	36
35484	4644	15
35491	4651	15
35499	4659	27
36491	7220	0
36493	13197	0
36494	13198	15
36501	13205	21
36505	13210	15
36933	31045	21
38013	46739	0
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38016	46742	15
38293	27770	0
38297	27775	60
38462	33077	48
38479	48353	15
38488	48362	21
38525	48403	39
38528	48406	15
38740	42743	18
38747	42751	54
39023	43434	48
39046	47150	18
39344	47232	0
39345	47233	15
39464	5523	24
39466	11353	8
39555	10459	21
39556	10460	0
39621	5371	30
39805	10513	0
39807	10521	15
40166	4019	15
40486	4151	27
40496	4161	27
40497	4162	0
40498	4163	15
40508	4173	15
40509	4174	0

40517	4182	0
40519	4184	0
40536	4201	0
40811	4226	66
40816	4231	0
40833	4250	15
41158	21416	27
41159	21418	15
41160	21419	0
41161	21421	15
41167	21427	0
41168	21428	8
41169	15585	0
41171	21430	15
41226	12068	0
41227	12069	21
41244	14627	0
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41246	14629	0
41247	14630	30
41267	19259	0
41577	27006	0
41578	27007	12
42453	4511	0
42455	4513	0
42469	4527	54
42475	4533	15
42480	4493	18
42483	4485	15
42690	49117	21
42692	49119	15
42694	49121	18
42697	49124	30
42699	49126	60
43025	4305	24
43028	4308	15
43032	4312	15
43036	4373	15
43038	4375	15
43047	4420	24
43051	4424	15
43137	26667	15
43138	26672	15
43139	26678	15
43140	26750	15
43178	30025	0
43243	25901	0

43245	25903	56
43304	4427	0
43314	4441	15
43316	4535	144
43319	4538	21
43527	2673	33
43528	2677	15
43529	2678	0
43530	2679	15
43531	2680	0
43532	2681	18
43753	5181	15
43838	6023	0
43839	6024	24
44145	22746	15
44368	1952	15
44423	2007	18
44432	2016	21
44554	17235	0
44682	3188	0
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44980	50778	24
45069	51726	30
46008	30262	0
46009	30266	0
46010	30267	30
46011	30268	0
46012	30269	15
46271	31028	72
46415	40175	48
46506	53535	54
46555	32959	36
46751	52159	0
46783	52191	15
46901	25533	56
46904	25531	53
46945	28197	48
46947	28286	15
47230	29072	48
47231	29073	0
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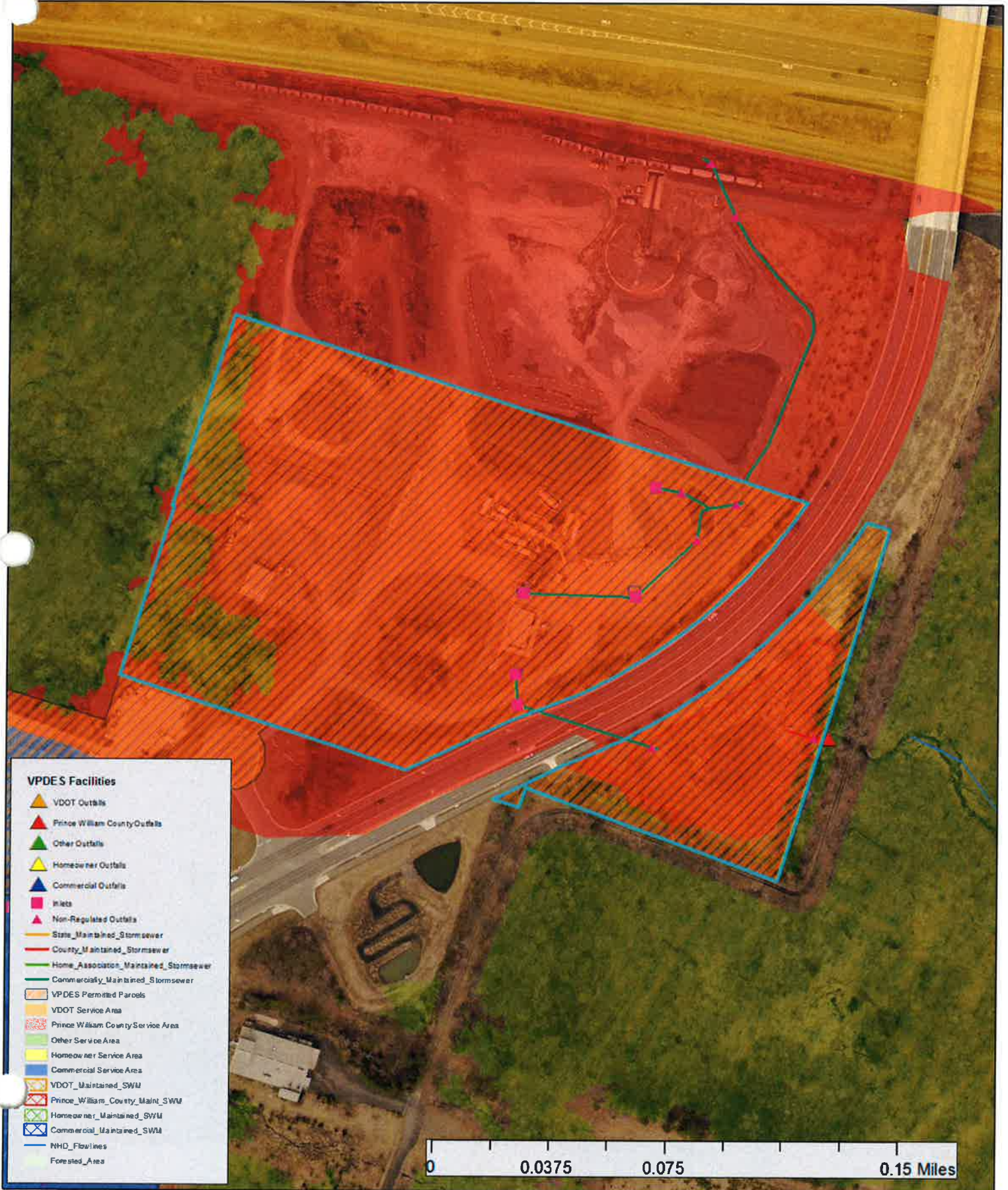
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56724	10475	0
56894	59620	15
56910	59544	15
57208	58075	0
57314	30230	15
57527	58076	15
58015	4718	0
58064	16738	0
58292	10508	42
58537	59734	36
58625	19287	18
58736	60935	24
58758	60957	0
58805	10480	15
58853	59055	0
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58981	26054	0
59182	59639	24
59587	46351	18
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60191	26101	15
60193	26103	12
60194	26104	0
60196	26106	15
60376	64095	21
60535	64179	27
60536	64180	24
60537	64181	21
60709	27141	48
60735	63043	54
61074	52341	0
61543	62841	24
61788	62906	54
62021	62984	54
62036	62994	30
62396	8565	15
62877	14650	18
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63263	63203	30

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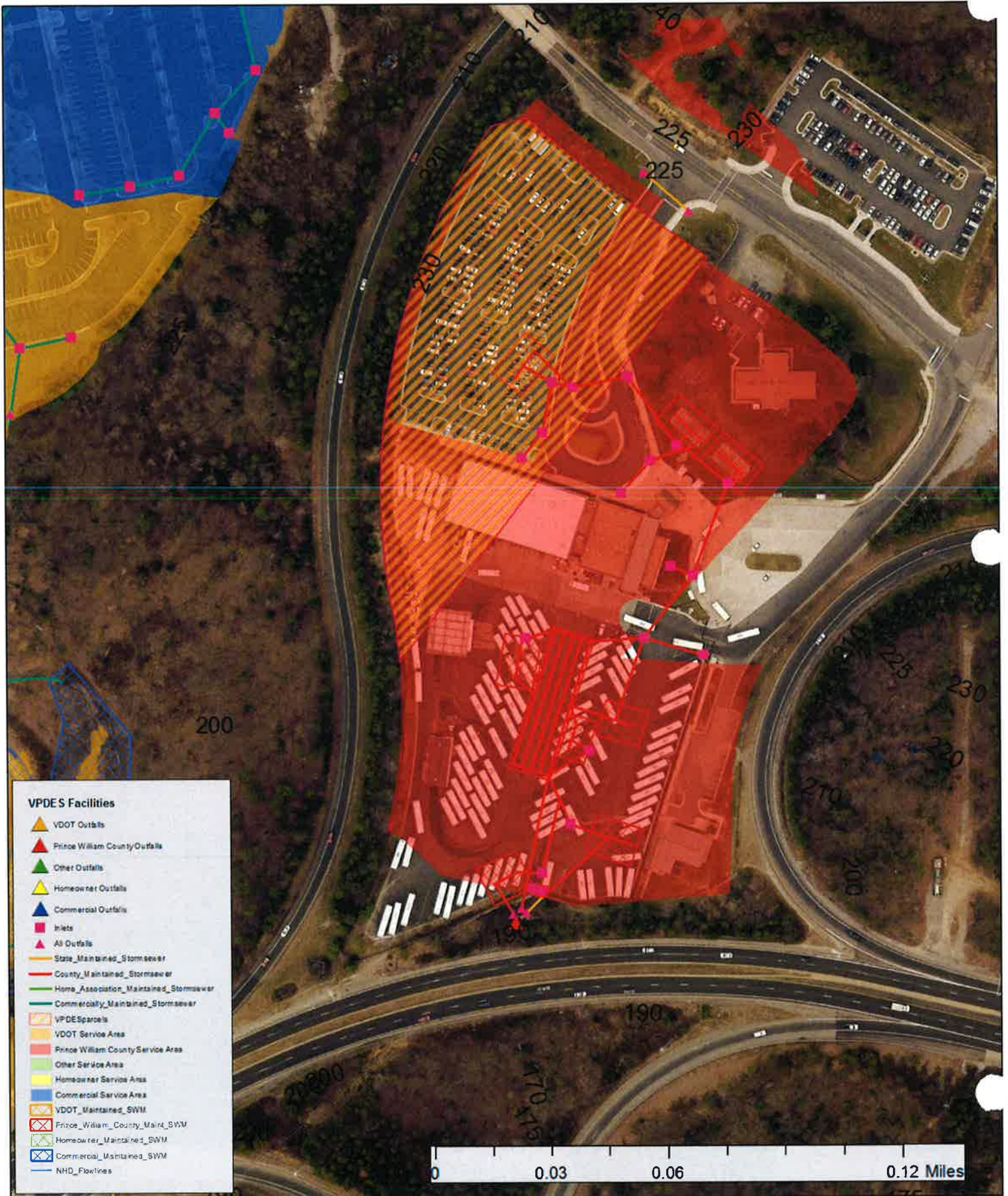
VPDES Permitted Facilities

Chemung Contracting Corporation - Gainesville
Permit No: VAR051949



VPDES Permitted Facilities

First Transit Incorporated
Permit No: VAR051477



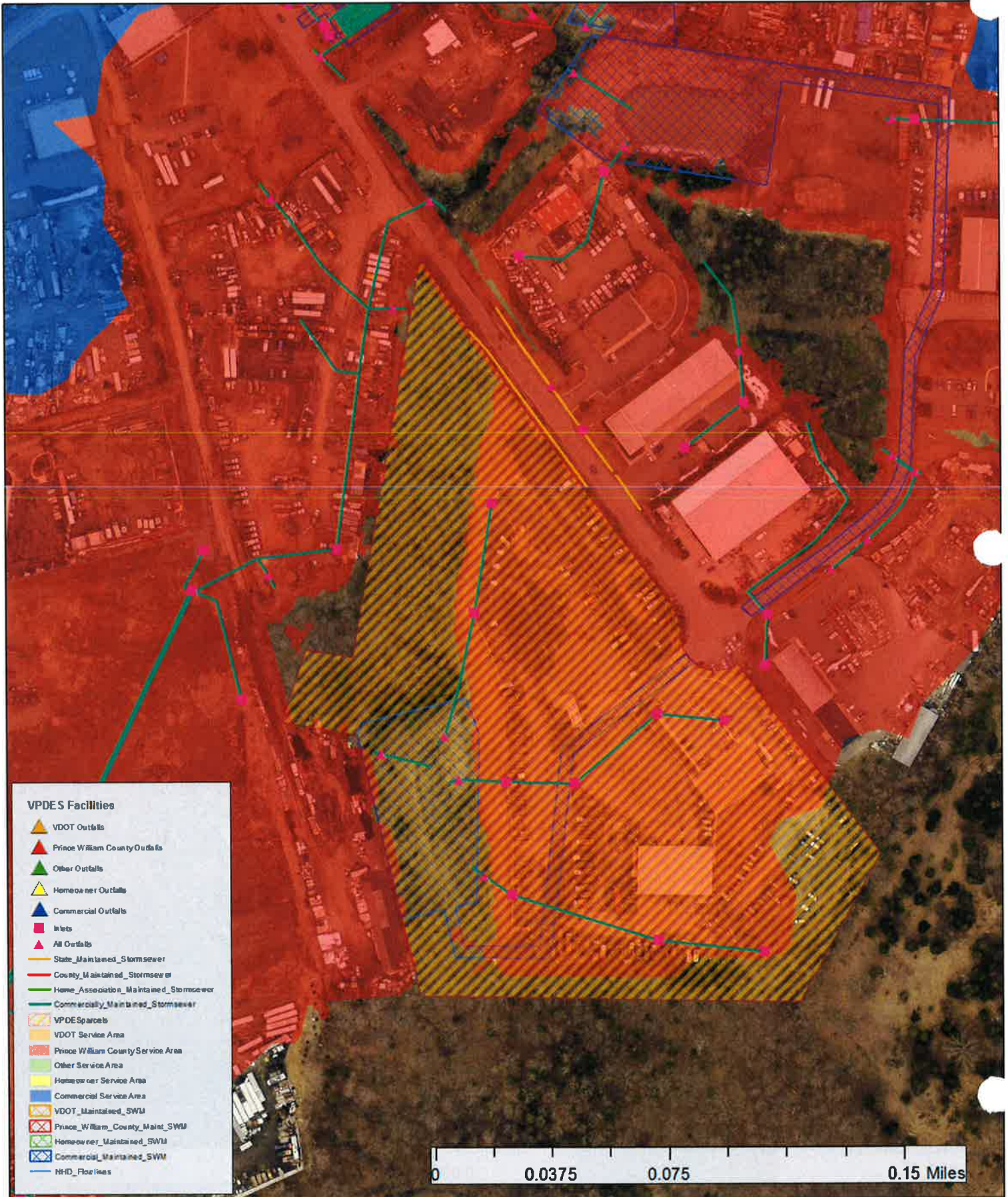
VPDES Permitted Facilities

Penny's Used Auto Parts
Permit No: VAR052115



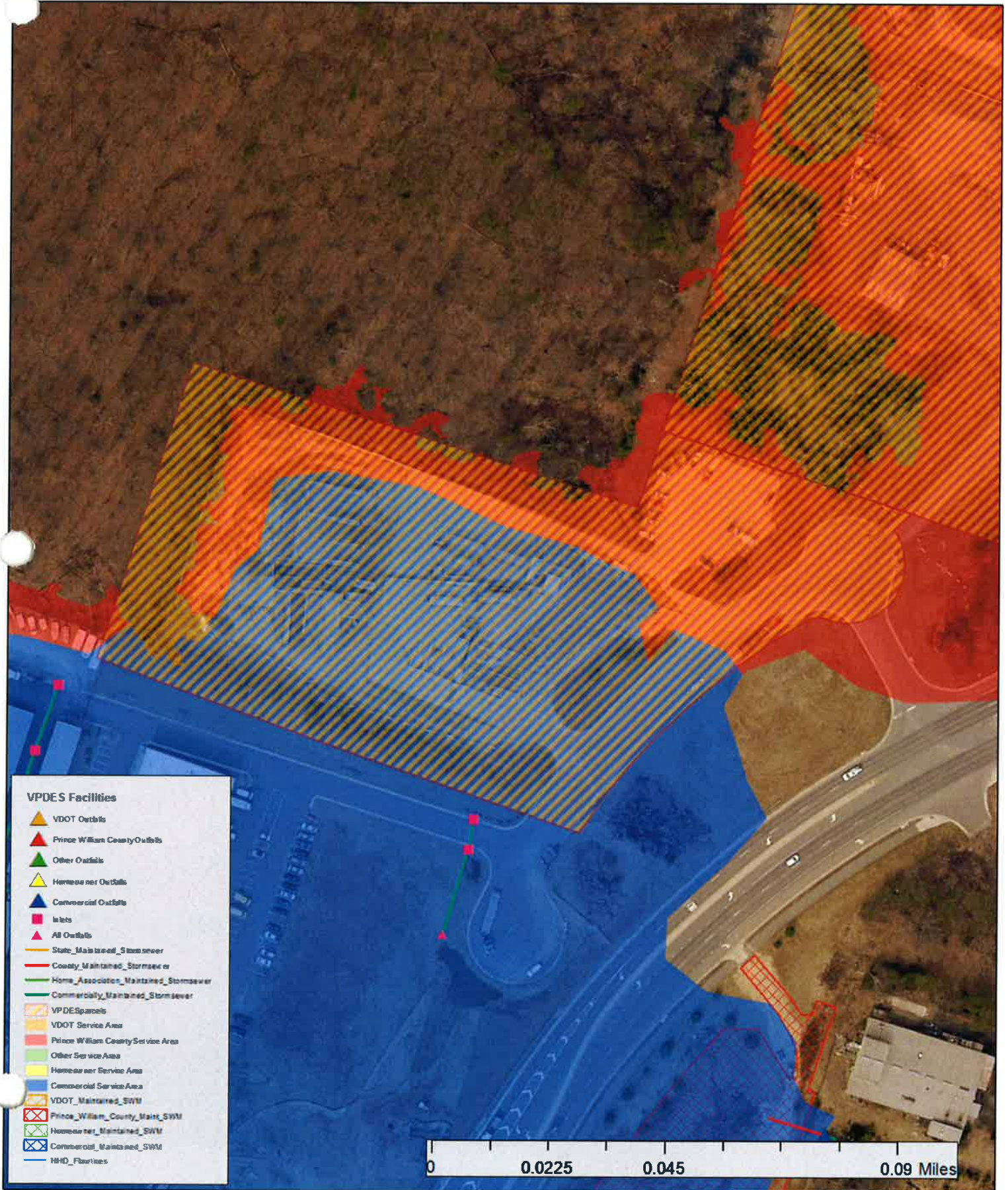
VPDES Permitted Facilities

Potomac Disposal Services of Virginia, LLC
Permit No: VAR051639



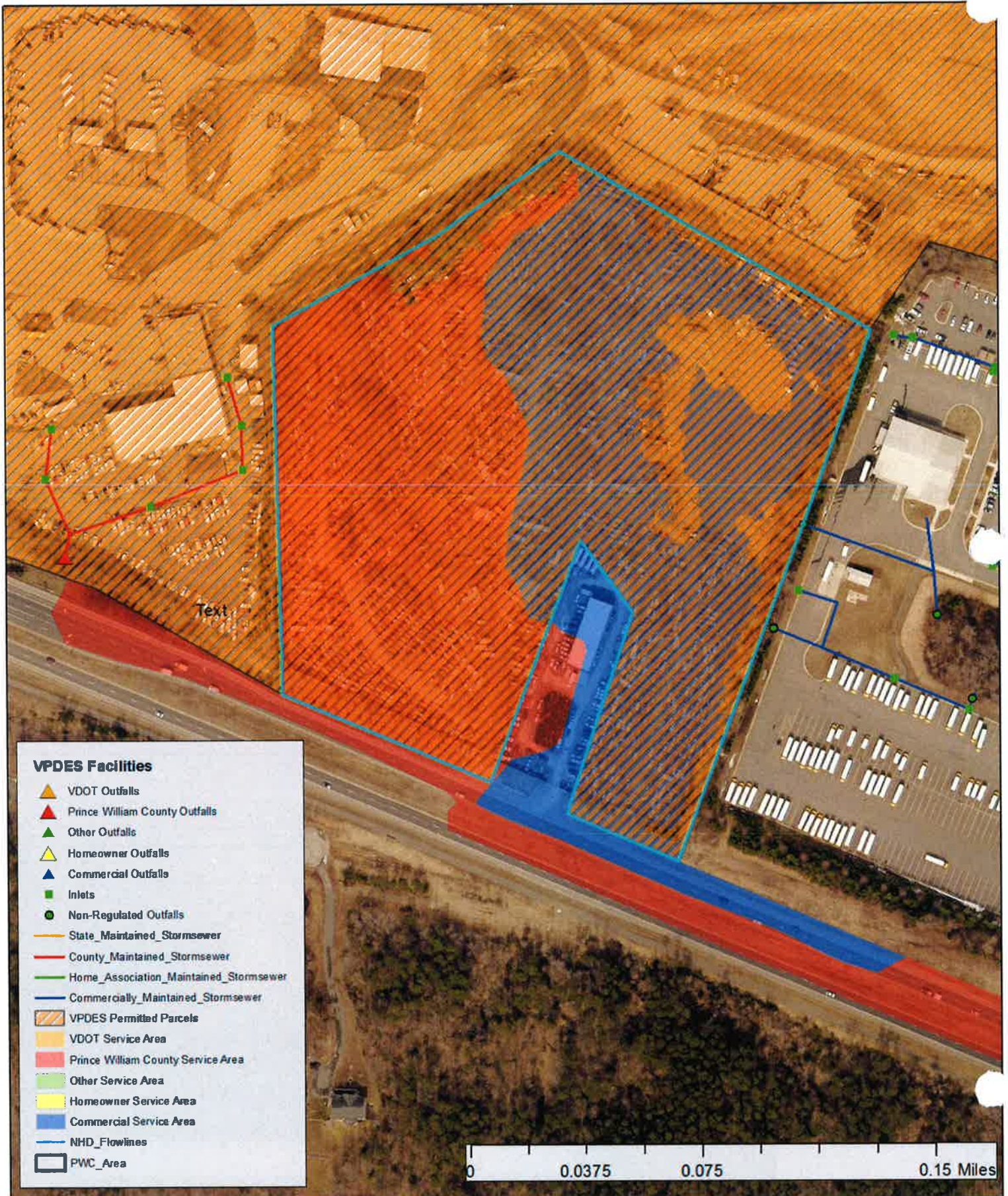
VPDES Permitted Facilities

Virginia Concrete Company Inc - Gainesville
Permit No: VAG110100



VPDES Permitted Facilities

234 Auto and Truck Salvage Limited Liability Company
Permit No: VAR052243



VPDES Permitted Facilities

Chase David D Residence
Permit No: VAG830458



Appendix H – Stormsewer Infrastructure Management

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
1	587	7/10/2017	Routine	No	Maintenance needed	Y	N
2	28	7/11/2017	Routine	No	Maintenance needed	Y	N
3	637	7/17/2017	Routine	No	Maintenance needed	Y	N
4	638	7/17/2017	Routine	No	Maintenance needed	Y	N
5	58	7/17/2017	Routine	No	Maintenance needed	Y	N
6	915	7/17/2017	Routine	No	Maintenance needed	Y	N
7	914	7/17/2017	Routine	No	Maintenance needed	Y	N
8	933	7/17/2017	Routine	No	Maintenance needed	Y	N
9	956	7/17/2017	Routine	Yes	No maintenance needed at this time.	N	N
10	923	7/18/2017	Routine	No	Maintenance needed	Y	N
11	220	7/18/2017	Routine	No	Maintenance needed	N	Y
12	639	7/18/2017	Routine	Yes	No maintenance needed at this time.	Y	N
13	611	7/18/2017	Routine	No	Maintenance needed	Y	N
14	963	7/18/2017	Routine	No	Maintenance needed	Y	N
15	913	7/18/2017	Routine	Yes	No maintenance needed at this time.	Y	N
16	900	7/18/2017	Routine	No	Maintenance needed	Y	N
17	71	7/18/2017	Routine	No	Maintenance needed	Y	N
18	110	7/19/2017	Routine	No	Maintenance needed	Y	N
19	840	7/25/2017	Routine	No	Maintenance needed	Y	N
20	557	8/1/2017	Routine	No	Maintenance needed	Y	N
21	560	8/1/2017	Routine	Yes	No maintenance needed at this time.	Y	N
22	569	8/1/2017	Routine	No	Maintenance needed	Y	N
23	440	8/1/2017	Routine	No	Maintenance needed	Y	N
24	528	8/2/2017	Routine	No	Maintenance needed	Y	N
25	353	8/3/2017	Routine	Yes	No maintenance needed at this time.	Y	N
26	511	8/3/2017	Routine	No	Maintenance needed	Y	N
27	510	8/3/2017	Routine	No	Maintenance needed	Y	N
28	516	8/3/2017	Routine	Yes	No maintenance needed at this time.	Y	N
29	514	8/3/2017	Routine	No	Maintenance needed	Y	N
30	469	8/8/2017	Routine	No	Maintenance needed	Y	Y

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
31	185	8/8/2017	Routine	No	Maintenance needed	Y	Y
32	441	8/8/2017	Routine	No	Maintenance needed	Y	N
33	422	8/9/2017	Routine	No	Maintenance needed	Y	N
34	479	8/9/2017	Routine	Yes	No maintenance needed at this time.	N	N
35	644	8/9/2017	Routine	No	Maintenance needed	Y	N
36	159	8/9/2017	Routine	No	Maintenance needed	Y	N
37	643	8/9/2017	Routine	No	Maintenance needed	Y	N
38	841	8/9/2017	Routine	No	Maintenance needed	Y	N
39	602	8/9/2017	Routine	No	Maintenance needed	Y	N
40	842	8/9/2017	Routine	Yes	No maintenance needed at this time.	N	N
41	619	8/9/2017	Routine	No	Maintenance needed	Y	N
42	574	8/9/2017	Routine	No	Maintenance needed	Y	N
43	572	8/9/2017	Routine	No	Maintenance needed	Y	N
44	573	8/9/2017	Routine	Yes	No maintenance needed at this time.	N	N
45	491	8/9/2017	Routine	No	Maintenance needed	Y	Y
46	538	8/9/2017	Routine	No	Maintenance needed	Y	Y
47	523	8/10/2017	Routine	No	Maintenance needed	Y	N
48	461	8/10/2017	Routine	No	Maintenance needed	Y	N
49	622	8/10/2017	Routine	No	Maintenance needed	Y	N
50	623	8/10/2017	Routine	No	Maintenance needed	Y	N
51	565	8/10/2017	Routine	No	Maintenance needed	Y	N
52	624	8/16/2017	Routine	Yes	No maintenance needed at this time.	N	N
53	561	8/16/2017	Routine	No	Maintenance needed	Y	N
54	612	8/16/2017	Routine	Yes	No maintenance needed at this time.	N	N
55	684	8/16/2017	Routine	No	Maintenance needed	Y	Y
56	309	8/16/2017	Routine	No	Maintenance needed	Y	N
57	310	8/16/2017	Routine	Yes	No maintenance needed at this time.	N	N
58	255	8/16/2017	Routine	No	Maintenance needed	Y	N
59	476	8/16/2017	Routine	No	Maintenance needed	Y	N
60	544	8/16/2017	Routine	No	Maintenance needed	Y	N

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
61	545	8/16/2017	Routine	Yes	No maintenance needed at this time.	N	N
62	46	8/16/2017	Routine	No	Maintenance needed	Y	N
63	322	8/16/2017	Routine	No	Maintenance needed	Y	N
64	299	8/16/2017	Routine	No	Maintenance needed	Y	N
65	52	8/18/2017	Routine	Yes	No maintenance needed at this time.	N	N
66	960	8/18/2017	Routine	No	Maintenance needed	Y	N
67	802	8/18/2017	Routine	No	Maintenance needed	Y	N
68	801	8/18/2017	Routine	No	Maintenance needed	Y	N
69	256	8/23/2017	Routine	No	Maintenance needed	Y	N
70	254	8/23/2017	Routine	No	Maintenance needed	Y	Y
71	527	8/23/2017	Routine	No	Maintenance needed	Y	N
72	518	8/23/2017	Routine	Yes	No maintenance needed at this time.	N	N
73	396	8/23/2017	Routine	No	Maintenance needed	Y	N
74	397	8/23/2017	Routine	No	Maintenance needed	Y	N
75	961	8/24/2017	Routine	No	Maintenance needed	Y	N
76	329	8/24/2017	Routine	No	Maintenance needed	Y	N
77	629	8/24/2017	Routine	No	Maintenance needed	Y	N
78	649	8/24/2017	Routine	No	Maintenance needed	Y	N
79	650	8/24/2017	Routine	No	Maintenance needed	Y	N
80	87	8/24/2017	Routine	No	Maintenance needed	Y	N
81	628	8/24/2017	Routine	No	Maintenance needed	Y	N
82	288	8/24/2017	Routine	Yes	No maintenance needed at this time.	N	N
83	631	8/25/2017	Routine	No	Maintenance needed	Y	N
84	630	8/25/2017	Routine	No	Maintenance needed	Y	N
85	512	8/25/2017	Routine	No	Maintenance needed	Y	N
86	415	8/25/2017	Other	Yes	No maintenance needed at this time.	N	N
87	289	8/28/2017	Routine	Yes	No maintenance needed at this time.	N	N
88	290	8/28/2017	Routine	Yes	No maintenance needed at this time.	N	N
89	672	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
90	673	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
91	674	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
92	681	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
93	675	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
94	676	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
95	677	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
96	678	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
97	679	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
98	680	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
99	291	8/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
100	196	8/30/2017	Routine	No	Maintenance needed	Y	Y
101	162	8/30/2017	Routine	No	Maintenance needed	Y	N
102	584	9/7/2017	Routine	No	Maintenance needed	Y	N
103	699	9/7/2017	Routine	No	Maintenance needed	Y	N
104	655	9/7/2017	Routine	No	Maintenance needed	Y	N
105	604	9/7/2017	Routine	No	Maintenance needed	Y	N
106	520	9/8/2017	Routine	No	Maintenance needed	Y	N
107	789	9/8/2017	Routine	No	Maintenance needed	Y	Y
108	791	9/8/2017	Routine	No	Maintenance needed	Y	Y
109	790	9/8/2017	Routine	No	Maintenance needed	Y	Y
110	817	9/11/2017	Routine	No	Maintenance needed	Y	N
111	506	9/11/2017	Routine	No	Maintenance needed	Y	N
112	507	9/11/2017	Routine	No	Maintenance needed	Y	N
113	513	9/11/2017	Routine	No	Maintenance needed	Y	N
114	889	9/11/2017	Routine	No	Maintenance needed	Y	N
115	610	9/11/2017	Routine	No	Maintenance needed	Y	N
116	522	9/13/2017	Other	Yes	No maintenance needed at this time.	N	N
117	474	9/19/2017	Other	No	Maintenance needed	Y	N
118	688	9/19/2017	Routine	No	Maintenance needed	Y	N
119	689	9/19/2017	Routine	No	Maintenance needed	Y	N
120	501	9/21/2017	Routine	No	Maintenance needed	Y	N

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
121	566	9/26/2017	Other	Yes	No maintenance needed at this time.	N	N
122	936	9/26/2017	Routine	Yes	No maintenance needed at this time.	N	N
123	917	9/26/2017	Routine	No	Maintenance needed	Y	N
124	918	9/26/2017	Routine	No	Maintenance needed	Y	N
125	927	9/26/2017	Routine	No	Maintenance needed	Y	N
126	926	9/26/2017	Routine	Yes	No maintenance needed at this time.	N	N
127	925	9/26/2017	Routine	Yes	No maintenance needed at this time.	N	N
128	919	9/27/2017	Routine	Yes	No maintenance needed at this time.	N	N
129	144	9/28/2017	Routine	No	Maintenance needed	Y	N
130	651	10/2/2017	Other	Yes	No maintenance needed at this time.	N	N
131	352	10/2/2017	Routine	No	Maintenance needed	Y	N
132	515	10/2/2017	Routine	Yes	No maintenance needed at this time.	N	N
133	851	10/2/2017	Routine	Yes	No maintenance needed at this time.	N	N
134	816	10/2/2017	Other	Yes	No maintenance needed at this time.	N	N
135	671	10/10/2017	Routine	No	Maintenance needed	Y	Y
136	398	10/10/2017	Routine	No	Maintenance needed	Y	Y
137	509	10/10/2017	Routine	No	Maintenance needed	Y	N
138	431	10/10/2017	Routine	No	Maintenance needed	Y	N
139	490	10/10/2017	Routine	No	Maintenance needed	Y	N
140	366	10/11/2017	Routine	Yes	No maintenance needed at this time.	N	N
141	70	10/11/2017	Routine	No	Maintenance needed	Y	Y
142	212	10/31/2017	Routine	No	Maintenance needed	Y	Y
143	812	11/2/2017	60-day reinspection	Yes	No maintenance needed at this time.	N	N
144	669	11/6/2017	Routine	No	Maintenance needed	Y	Y
145	421	11/8/2017	Routine	No	Maintenance needed	Y	N
146	634	11/8/2017	Routine	Yes	No maintenance needed at this time.	N	N
147	901	11/14/2017	Routine	No	Maintenance needed	Y	N
148	902	11/14/2017	Routine	No	Maintenance needed	Y	N
149	155	11/14/2017	Routine	No	Maintenance needed	Y	Y
150	237	11/14/2017	Routine	No	Maintenance needed	Y	U

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
151	932	11/14/2017	Routine	No	Maintenance needed	Y	N
152	931	11/14/2017	Routine	Yes	No maintenance needed at this time.	N	N
153	294	11/14/2017	Routine	No	Maintenance needed	Y	Y
154	293	11/14/2017	Routine	No	Maintenance needed	Y	Y
155	595	11/14/2017	Routine	No	Maintenance needed	N	Y
156	368	11/15/2017	Routine	Yes	No maintenance needed at this time.	N	N
157	879	11/16/2017	Routine	Yes	No maintenance needed at this time.	N	N
158	879	11/16/2017	Routine	Yes	No maintenance needed at this time.	N	N
159	581	11/27/2017	Complaint Based	No	Maintenance needed	Y	Y
160	535	11/28/2017	Other	No	Maintenance needed	Y	N
161	964	11/28/2017	Routine	Yes	No maintenance needed at this time.	N	N
162	965	11/28/2017	Routine	Yes	No maintenance needed at this time.	N	N
163	877	11/28/2017	Other	Yes	No maintenance needed at this time.	N	N
164	796	11/29/2017	Routine	No	Maintenance needed	Y	Y
165	878	11/29/2017	60-day reinspection	Yes	No maintenance needed at this time.	N	N
166	950	11/29/2017	Routine	Yes	No maintenance needed at this time.	N	N
167	795	11/30/2017	Routine	No	Maintenance needed	Y	Y
168	794	11/30/2017	Routine	No	Maintenance needed	Y	Y
169	343	12/1/2017	Routine	No	Maintenance needed	Y	N
170	343	12/1/2017	Routine	No	Maintenance needed	Y	N
171	270	12/1/2017	Routine	No	Maintenance needed	Y	N
172	884	12/1/2017	Routine	No	Maintenance needed	Y	N
173	455	12/4/2017	Routine	Yes	No maintenance needed at this time.	N	N
174	805	12/4/2017	Routine	No	Maintenance needed	Y	N
175	882	12/5/2017	Routine	No	Maintenance needed	Y	N
176	558	12/5/2017	Routine	No	Maintenance needed	Y	N
177	590	12/5/2017	Routine	No	Maintenance needed	Y	Y
178	551	12/5/2017	Routine	No	Maintenance needed	Y	Y
179	552	12/5/2017	Routine	No	Maintenance needed	Y	N
180	553	12/5/2017	Routine	No	Maintenance needed	Y	N

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
181	564	12/5/2017	Routine	No	Maintenance needed	Y	Y
182	563	12/5/2017	Routine	Yes	No maintenance needed at this time.	N	N
183	197	12/6/2017	Routine	No	Maintenance needed	Y	N
184	209	12/7/2017	Routine	No	Maintenance needed	Y	Y
185	412	12/7/2017	Routine	No	Maintenance needed	Y	N
186	278	12/7/2017	Routine	No	Maintenance needed	Y	Y
187	99	12/11/2017	Routine	Yes	No maintenance needed at this time.	N	N
188	61	12/11/2017	Routine	No	Maintenance needed	N	Y
189	91	12/12/2017	Routine	No	Maintenance needed	Y	N
190	91	12/12/2017	Routine	No	Maintenance needed	Y	N
191	91	12/12/2017	Routine	No	Maintenance needed	Y	N
192	91	12/12/2017	Routine	No	Maintenance needed	Y	N
193	613	12/12/2017	Routine	No	Maintenance needed	Y	Y
194	907	12/12/2017	Routine	No	Maintenance needed	Y	Y
195	387	12/12/2017	Routine	Yes	No maintenance needed at this time.	N	N
196	906	12/12/2017	Routine	No	Maintenance needed	Y	Y
197	908	12/12/2017	Routine	No	Maintenance needed	Y	Y
198	388	12/12/2017	Routine	No	Maintenance needed	N	Y
199	389	12/12/2017	Routine	Yes	No maintenance needed at this time.	N	N
200	492	12/13/2017	Routine	No	Maintenance needed	Y	N
201	30	12/13/2017	Routine	No	Maintenance needed	N	Y
202	147	12/13/2017	Routine	No	Maintenance needed	Y	Y
203	113	12/14/2017	Routine	No	Maintenance needed	Y	Y
204	922	12/14/2017	Routine	No	Maintenance needed	Y	Y
205	494	12/14/2017	Routine	No	Maintenance needed	Y	N
206	865	12/15/2017	Routine	No	Maintenance needed	Y	Y
207	657	12/15/2017	Routine	No	Maintenance needed	Y	N
208	682	12/15/2017	Routine	No	Maintenance needed	Y	N
209	852	12/18/2017	Routine	No	Maintenance needed	Y	N
210	186	12/19/2017	Routine	No	Maintenance needed	Y	Y

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
211	53	12/19/2017	Routine	No	Maintenance needed	Y	Y
212	214	12/19/2017	Routine	No	Maintenance needed	Y	N
213	797	12/20/2017	Routine	No	Maintenance needed	Y	Y
214	505	12/20/2017	Routine	No	Maintenance needed	Y	Y
215	318	12/20/2017	Routine	No	Maintenance needed	Y	N
216	72	12/20/2017	Routine	No	Maintenance needed	Y	N
217	161	12/20/2017	Routine	No	Maintenance needed	Y	Y
218	911	12/21/2017	Routine	No	Maintenance needed	Y	N
219	338	12/21/2017	Routine	No	Maintenance needed	Y	N
220	912	12/21/2017	Routine	No	Maintenance needed	Y	N
221	339	12/21/2017	Routine	No	Maintenance needed	Y	N
222	238	12/21/2017	Routine	No	Maintenance needed	Y	Y
223	652	12/21/2017	Routine	No	Maintenance needed	Y	Y
224	858	12/21/2017	Routine	No	Maintenance needed	Y	Y
225	151	12/21/2017	Routine	No	Maintenance needed	Y	Y
226	823	12/21/2017	Routine	No	Maintenance needed	Y	N
227	98	12/21/2017	Routine	No	Maintenance needed	Y	Y
228	837	12/21/2017	Routine	No	Maintenance needed	Y	Y
229	377	12/22/2017	Routine	No	Maintenance needed	Y	N
230	328	12/22/2017	Routine	No	Maintenance needed	Y	N
231	166	12/22/2017	Routine	No	Maintenance needed	Y	Y
232	666	12/22/2017	Routine	No	Maintenance needed	Y	N
233	435	12/22/2017	Routine	No	Maintenance needed	N	Y
234	125	12/22/2017	Routine	Yes	No maintenance needed at this time.	N	N
235	75	12/22/2017	Routine	No	Maintenance needed	Y	Y
236	188	12/28/2017	Routine	No	Maintenance needed	Y	Y
237	810	1/2/2018	Routine	No	Maintenance needed	Y	N
238	869	1/2/2018	Routine	No	Maintenance needed	Y	Y
239	483	1/2/2018	Routine	No	Maintenance needed	Y	Y
240	548	1/2/2018	Routine	No	Maintenance needed	Y	Y

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
241	281	1/2/2018	Routine	No	Maintenance needed	N	Y
242	68	1/3/2018	Routine	No	Maintenance needed	Y	Y
243	870	1/3/2018	Routine	No	Maintenance needed	Y	Y
244	924	1/3/2018	Routine	No	Maintenance needed	Y	Y
245	452	1/3/2018	Routine	No	Maintenance needed	Y	Y
246	59	1/3/2018	Routine	No	Maintenance needed	Y	Y
247	531	1/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
248	89	1/3/2018	Routine	No	Maintenance needed	Y	Y
249	411	1/3/2018	Routine	No	Maintenance needed	Y	Y
250	414	1/3/2018	Routine	No	Maintenance needed	Y	Y
251	493	1/3/2018	Routine	No	Maintenance needed	Y	N
252	467	1/4/2018	Routine	No	Maintenance needed	Y	Y
253	317	1/8/2018	Routine	Yes	No maintenance needed at this time.	N	N
254	694	1/8/2018	Routine	No	Maintenance needed	Y	N
255	905	1/8/2018	Routine	No	Maintenance needed	Y	Y
256	876	1/8/2018	Routine	No	Maintenance needed	Y	Y
257	286	1/8/2018	Routine	No	Maintenance needed	Y	N
258	285	1/8/2018	Routine	No	Maintenance needed	Y	N
259	386	1/8/2018	Routine	No	Maintenance needed	Y	N
260	904	1/9/2018	Routine	No	Maintenance needed	Y	N
261	219	1/9/2018	Routine	No	Maintenance needed	Y	Y
262	323	1/9/2018	Routine	No	Maintenance needed	Y	N
263	887	1/9/2018	Routine	No	Maintenance needed	Y	N
264	51	1/9/2018	Routine	No	Maintenance needed	Y	Y
265	324	1/9/2018	Routine	No	Maintenance needed	Y	Y
266	909	1/9/2018	Routine	No	Maintenance needed	Y	Y
267	215	1/9/2018	Routine	No	Maintenance needed	Y	N
268	241	1/9/2018	Routine	Yes	No maintenance needed at this time.	N	N
269	204	1/9/2018	Routine	No	Maintenance needed	Y	N
270	205	1/9/2018	Routine	Yes	No maintenance needed at this time.	N	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
271	243	1/9/2018	Routine	Yes	No maintenance needed at this time.	N	N
272	340	1/9/2018	Routine	No	Maintenance needed	Y	Y
273	244	1/9/2018	Routine	Yes	No maintenance needed at this time.	N	N
274	384	1/9/2018	Routine	No	Maintenance needed	Y	N
275	439	1/9/2018	Routine	No	Maintenance needed	Y	N
276	313	1/9/2018	Routine	No	Maintenance needed	N	Y
277	382	1/9/2018	Other	Yes	No maintenance needed at this time.	N	N
278	217	1/9/2018	Routine	No	Maintenance needed	Y	Y
279	850	1/10/2018	Routine	No	Maintenance needed	Y	N
280	803	1/10/2018	Routine	No	Maintenance needed	Y	N
281	559	1/10/2018	Routine	No	Maintenance needed	Y	N
282	586	1/10/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
283	580	1/10/2018	Routine	No	Maintenance needed	Y	Y
284	242	1/10/2018	Routine	No	Maintenance needed	Y	Y
285	554	1/10/2018	Routine	No	Maintenance needed	N	Y
286	861	1/10/2018	Routine	No	Maintenance needed	Y	Y
287	222	1/10/2018	Routine	No	Maintenance needed	Y	Y
288	221	1/10/2018	Routine	No	Maintenance needed	Y	Y
289	860	1/10/2018	Routine	No	Maintenance needed	Y	Y
290	157	1/10/2018	Routine	No	Maintenance needed	Y	Y
291	477	1/10/2018	Routine	No	Maintenance needed	Y	N
292	154	1/10/2018	Routine	No	Maintenance needed	Y	Y
293	664	1/11/2018	Routine	No	Maintenance needed	Y	N
294	272	1/11/2018	Routine	No	Maintenance needed	Y	N
295	325	1/11/2018	Routine	No	Maintenance needed	Y	N
296	950	1/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
297	525	1/12/2018	Routine	No	Maintenance needed	Y	N
298	269	1/12/2018	Routine	No	Maintenance needed	Y	Y
299	189	1/12/2018	Routine	No	Maintenance needed	Y	N
300	952	1/16/2018	Routine	No	Maintenance needed	N	Y

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
301	641	1/16/2018	Routine	No	Maintenance needed	Y	N
302	653	1/17/2018	Routine	No	Maintenance needed	Y	Y
303	692	1/17/2018	Routine	No	Maintenance needed	Y	Y
304	543	1/17/2018	Routine	No	Maintenance needed	Y	N
305	390	1/17/2018	Routine	No	Maintenance needed	N	Y
306	385	1/17/2018	Routine	No	Maintenance needed	Y	Y
307	945	1/18/2018	Routine	No	Maintenance needed	Y	N
308	940	1/18/2018	Routine	Yes	No maintenance needed at this time.	N	N
309	941	1/18/2018	Routine	Yes	No maintenance needed at this time.	N	N
310	943	1/18/2018	Routine	Yes	No maintenance needed at this time.	N	N
311	944	1/18/2018	Routine	No	Maintenance needed	Y	N
312	947	1/18/2018	Routine	No	Maintenance needed	Y	N
313	949	1/18/2018	Routine	No	Maintenance needed	Y	N
314	826	1/18/2018	Routine	No	Maintenance needed	Y	N
315	827	1/18/2018	Routine	No	Maintenance needed	Y	N
316	165	1/18/2018	Routine	No	Maintenance needed	Y	N
317	831	1/18/2018	Routine	No	Maintenance needed	Y	N
318	833	1/18/2018	Routine	No	Maintenance needed	Y	N
319	284	1/18/2018	Routine	No	Maintenance needed	Y	Y
320	654	1/19/2018	Other	Yes	No maintenance needed at this time.	N	N
321	478	1/19/2018	Routine	No	Maintenance needed	Y	Y
322	946	1/19/2018	Routine	No	Maintenance needed	N	Y
323	948	1/19/2018	Routine	No	Maintenance needed	N	Y
324	942	1/19/2018	Routine	No	Maintenance needed	Y	Y
325	828	1/19/2018	Routine	No	Maintenance needed	Y	N
326	92	1/19/2018	Routine	No	Maintenance needed	Y	Y
327	829	1/19/2018	Routine	No	Maintenance needed	Y	N
328	830	1/19/2018	Routine	No	Maintenance needed	Y	N
329	383	1/19/2018	Routine	No	Maintenance needed	Y	Y
330	832	1/19/2018	Routine	No	Maintenance needed	Y	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
331	167	1/19/2018	Routine	No	Maintenance needed	Y	N
332	378	1/22/2018	Routine	No	Maintenance needed	Y	N
333	402	1/22/2018	Routine	No	Maintenance needed	Y	N
334	844	1/22/2018	Routine	No	Maintenance needed	Y	N
335	843	1/22/2018	Routine	No	Maintenance needed	N	Y
336	403	1/22/2018	Routine	No	Maintenance needed	Y	N
337	424	1/22/2018	Routine	No	Maintenance needed	Y	N
338	216	1/22/2018	Routine	No	Maintenance needed	Y	Y
339	532	1/22/2018	Routine	No	Maintenance needed	Y	N
340	894	1/22/2018	Routine	No	Maintenance needed	Y	Y
341	533	1/22/2018	Routine	No	Maintenance needed	Y	N
342	598	1/23/2018	Other	No	Maintenance needed	Y	N
343	661	1/23/2018	Routine	No	Maintenance needed	Y	N
344	464	1/23/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
345	298	1/23/2018	Routine	No	Maintenance needed	N	Y
346	903	1/23/2018	Routine	No	Maintenance needed	N	Y
347	662	1/23/2018	Routine	No	Maintenance needed	Y	N
348	685	1/23/2018	Routine	No	Maintenance needed	N	Y
349	57	1/23/2018	Routine	No	Maintenance needed	N	Y
350	537	1/23/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
351	463	1/23/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
352	460	1/23/2018	Routine	No	Maintenance needed	Y	Y
353	804	1/25/2018	Other	Yes	No maintenance needed at this time.	N	N
354	250	1/25/2018	Routine	No	Maintenance needed	Y	Y
355	248	1/25/2018	Routine	No	Maintenance needed	Y	Y
356	249	1/25/2018	Routine	No	Maintenance needed	Y	N
357	365	1/25/2018	Routine	Yes	No maintenance needed at this time.	N	N
358	364	1/25/2018	Routine	Yes	No maintenance needed at this time.	N	N
359	367	1/25/2018	Routine	No	Maintenance needed	Y	N
360	899	1/26/2018	Routine	No	Maintenance needed	Y	Y

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
361	898	1/26/2018	Routine	Yes	No maintenance needed at this time.	N	N
362	235	1/26/2018	Routine	No	Maintenance needed	Y	Y
363	633	1/26/2018	Routine	No	Maintenance needed	Y	Y
364	567	1/26/2018	Routine	No	Maintenance needed	Y	Y
365	232	1/26/2018	Routine	No	Maintenance needed	Y	Y
366	405	1/26/2018	Routine	No	Maintenance needed	Y	N
367	63	1/26/2018	Routine	No	Maintenance needed	Y	Y
368	529	1/26/2018	Other	Yes	No maintenance needed at this time.	N	N
369	885	1/26/2018	Routine	No	Maintenance needed	Y	Y
370	199	1/29/2018	Routine	No	Maintenance needed	Y	N
371	198	1/29/2018	Routine	No	Maintenance needed	Y	N
372	327	1/29/2018	Routine	No	Maintenance needed	Y	N
373	190	1/29/2018	Routine	No	Maintenance needed	Y	Y
374	80	1/30/2018	Routine	No	Maintenance needed	Y	N
375	81	1/30/2018	Routine	No	Maintenance needed	Y	N
376	86	1/30/2018	Routine	No	Maintenance needed	Y	N
377	84	1/30/2018	Routine	No	Maintenance needed	Y	Y
378	191	1/30/2018	Routine	No	Maintenance needed	Y	Y
379	394	1/30/2018	Routine	No	Maintenance needed	Y	Y
380	600	1/30/2018	Routine	No	Maintenance needed	Y	Y
381	149	1/31/2018	Routine	Yes	No maintenance needed at this time.	N	N
382	150	1/31/2018	Routine	No	Maintenance needed	Y	N
383	148	1/31/2018	Routine	Yes	No maintenance needed at this time.	N	N
384	434	1/31/2018	Routine	Yes	No maintenance needed at this time.	N	N
385	44	1/31/2018	Routine	No	Maintenance needed	Y	Y
386	47	1/31/2018	Routine	No	Maintenance needed	Y	N
387	471	1/31/2018	Routine	No	Maintenance needed	Y	Y
388	121	1/31/2018	Routine	No	Maintenance needed	Y	N
389	484	1/31/2018	Routine	No	Maintenance needed	Y	Y
390	56	1/31/2018	Routine	No	Maintenance needed	Y	Y

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
391	556	1/31/2018	Routine	No	Maintenance needed	Y	Y
392	819	2/1/2018	Routine	No	Maintenance needed	Y	Y
393	503	2/1/2018	Routine	No	Maintenance needed	Y	Y
394	627	2/5/2018	Routine	No	Maintenance needed	Y	Y
395	45	2/5/2018	Routine	No	Maintenance needed	Y	N
396	128	2/5/2018	60-day reinspection	No	Maintenance needed	Y	N
397	916	2/6/2018	Routine	No	Maintenance needed	Y	Y
398	18	2/6/2018	Routine	No	Maintenance needed	Y	Y
399	312	2/6/2018	Routine	No	Maintenance needed	Y	N
400	836	2/6/2018	Routine	No	Maintenance needed	Y	Y
401	935	2/6/2018	Routine	No	Maintenance needed	Y	Y
402	258	2/6/2018	Routine	No	Maintenance needed	Y	N
403	195	2/6/2018	Routine	No	Maintenance needed	Y	N
404	112	2/6/2018	Routine	No	Maintenance needed	Y	N
405	200	2/8/2018	Routine	No	Maintenance needed	Y	N
406	201	2/8/2018	Routine	No	Maintenance needed	Y	N
407	123	2/8/2018	Routine	No	Maintenance needed	Y	N
408	124	2/8/2018	Routine	No	Maintenance needed	Y	N
409	868	2/8/2018	Routine	No	Maintenance needed	Y	N
410	163	2/8/2018	Routine	No	Maintenance needed	Y	N
411	379	2/8/2018	Routine	Yes	No maintenance needed at this time.	N	N
412	596	2/8/2018	Routine	No	Maintenance needed	Y	N
413	930	2/8/2018	Routine	No	Maintenance needed	Y	N
414	686	2/8/2018	Routine	Yes	No maintenance needed at this time.	N	N
415	640	2/9/2018	Routine	No	Maintenance needed	Y	N
416	530	2/9/2018	Routine	No	Maintenance needed	Y	N
417	315	2/9/2018	Routine	No	Maintenance needed	Y	N
418	588	2/9/2018	Routine	No	Maintenance needed	Y	N
419	496	2/9/2018	Routine	No	Maintenance needed	Y	N
420	589	2/9/2018	Routine	No	Maintenance needed	Y	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
421	497	2/9/2018	Routine	No	Maintenance needed	Y	N
422	498	2/9/2018	Routine	No	Maintenance needed	Y	N
423	495	2/9/2018	Routine	No	Maintenance needed	Y	N
424	499	2/9/2018	Routine	No	Maintenance needed	Y	N
425	500	2/9/2018	Routine	No	Maintenance needed	Y	Y
426	15	2/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
427	133	2/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
428	225	2/12/2018	Routine	No	Maintenance needed	Y	Y
429	156	2/12/2018	Routine	No	Maintenance needed	Y	Y
430	308	2/14/2018	Routine	No	Maintenance needed	Y	Y
431	208	2/15/2018	Routine	No	Maintenance needed	Y	Y
432	207	2/16/2018	Routine	No	Maintenance needed	Y	N
433	457	2/16/2018	Routine	No	Maintenance needed	Y	N
434	400	2/20/2018	Routine	No	Maintenance needed	Y	N
435	395	2/20/2018	Routine	No	Maintenance needed	Y	N
436	296	2/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
437	508	2/20/2018	Routine	No	Maintenance needed	Y	N
438	863	2/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
439	893	2/20/2018	Routine	No	Maintenance needed	Y	N
440	541	2/20/2018	Routine	No	Maintenance needed	Y	N
441	547	2/20/2018	Routine	No	Maintenance needed	Y	Y
442	668	2/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
443	489	2/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
444	632	2/20/2018	Routine	No	Maintenance needed	Y	Y
445	482	2/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
446	465	2/21/2018	Routine	No	Maintenance needed	Y	N
447	481	2/21/2018	Routine	Yes	No maintenance needed at this time.	N	N
448	122	2/21/2018	Routine	No	Maintenance needed	Y	N
449	691	2/21/2018	Routine	No	Maintenance needed	Y	N
450	937	2/21/2018	Routine	Yes	No maintenance needed at this time.	N	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
451	239	2/21/2018	Routine	No	Maintenance needed	N	Y
452	6	2/21/2018	Routine	Yes	No maintenance needed at this time.	N	N
453	240	2/21/2018	Routine	No	Maintenance needed	N	Y
454	5	2/22/2018	Routine	Yes	No maintenance needed at this time.	N	N
455	616	2/22/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
456	90	2/22/2018	Routine	No	Maintenance needed	N	Y
457	524	2/22/2018	Routine	No	Maintenance needed	N	Y
458	607	2/26/2018	Routine	No	Maintenance needed	Y	N
459	606	2/26/2018	Routine	No	Maintenance needed	Y	N
460	314	2/26/2018	Routine	No	Maintenance needed	Y	N
461	178	2/26/2018	Routine	No	Maintenance needed	Y	N
462	179	2/26/2018	Routine	No	Maintenance needed	Y	Y
463	246	2/26/2018	Routine	Yes	No maintenance needed at this time.	N	N
464	245	2/26/2018	Routine	No	Maintenance needed	Y	N
465	576	2/26/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
466	579	2/26/2018	60-day reinspection	No	Maintenance needed	Y	Y
467	578	2/26/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
468	145	2/26/2018	Routine	No	Maintenance needed	N	Y
469	466	2/26/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
470	169	2/26/2018	Routine	No	Maintenance needed	Y	N
471	223	2/26/2018	Routine	No	Maintenance needed	Y	N
472	663	2/26/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
473	224	2/26/2018	Routine	No	Maintenance needed	Y	N
474	277	2/26/2018	Routine	No	Maintenance needed	Y	N
475	648	2/27/2018	Routine	No	Maintenance needed	Y	N
476	391	2/27/2018	Routine	No	Maintenance needed	Y	Y
477	393	2/27/2018	Routine	No	Maintenance needed	Y	N
478	392	2/27/2018	Routine	No	Maintenance needed	Y	N
479	213	2/27/2018	Routine	No	Maintenance needed	Y	N
480	660	2/27/2018	Routine	No	Maintenance needed	Y	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
481	526	2/27/2018	Routine	Yes	No maintenance needed at this time.	N	N
482	605	2/27/2018	Routine	Yes	No maintenance needed at this time.	N	N
483	430	2/27/2018	Routine	Yes	No maintenance needed at this time.	N	N
484	67	2/27/2018	Routine	Yes	No maintenance needed at this time.	N	N
485	468	2/27/2018	Other	Yes	No maintenance needed at this time.	N	N
486	854	2/27/2018	Routine	No	Maintenance needed	Y	N
487	105	2/27/2018	Routine	No	Maintenance needed	Y	N
488	853	2/27/2018	Routine	No	Maintenance needed	Y	Y
489	594	2/27/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
490	445	3/1/2018	Routine	No	Maintenance needed	Y	N
491	446	3/1/2018	Routine	No	Maintenance needed	Y	N
492	229	3/1/2018	Routine	No	Maintenance needed	Y	N
493	170	3/1/2018	Routine	No	Maintenance needed	Y	N
494	171	3/1/2018	Routine	No	Maintenance needed	Y	N
495	96	3/2/2018	Routine	No	Maintenance needed	Y	Y
496	95	3/2/2018	Routine	No	Maintenance needed	Y	N
497	95	3/2/2018	Routine	No	Maintenance needed	Y	N
498	140	3/5/2018	Routine	Yes	No maintenance needed at this time.	N	N
499	135	3/5/2018	Routine	Yes	No maintenance needed at this time.	N	N
500	136	3/5/2018	Routine	Yes	No maintenance needed at this time.	N	N
501	118	3/5/2018	Routine	No	Maintenance needed	Y	N
502	813	3/6/2018	Routine	No	Maintenance needed	Y	Y
503	928	3/6/2018	Routine	Yes	No maintenance needed at this time.	N	N
504	814	3/6/2018	Routine	No	Maintenance needed	Y	N
505	815	3/6/2018	Routine	No	Maintenance needed	Y	Y
506	404	3/6/2018	Routine	No	Maintenance needed	Y	Y
507	793	3/6/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
508	331	3/6/2018	Routine	Yes	No maintenance needed at this time.	N	N
509	21	3/6/2018	Routine	Yes	No maintenance needed at this time.	N	N
510	115	3/7/2018	Routine	No	Maintenance needed	Y	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
511	116	3/7/2018	Routine	Yes	No maintenance needed at this time.	N	N
512	117	3/7/2018	Routine	No	Maintenance needed	Y	N
513	119	3/7/2018	Routine	Yes	No maintenance needed at this time.	N	N
514	120	3/7/2018	Routine	No	Maintenance needed	Y	Y
515	137	3/7/2018	Routine	Yes	No maintenance needed at this time.	N	N
516	138	3/7/2018	Routine	No	Maintenance needed	Y	Y
517	139	3/7/2018	Routine	No	Maintenance needed	N	Y
518	665	3/8/2018	Routine	No	Maintenance needed	N	Y
519	210	3/8/2018	Routine	No	Maintenance needed	N	Y
520	929	3/8/2018	Routine	No	Maintenance needed	Y	Y
521	862	3/8/2018	Routine	No	Maintenance needed	Y	N
522	19	3/8/2018	Routine	Yes	No maintenance needed at this time.	N	N
523	426	3/8/2018	Routine	No	Maintenance needed	Y	N
524	29	3/8/2018	Routine	No	Maintenance needed	Y	Y
525	521	3/8/2018	Routine	No	Maintenance needed	Y	N
526	227	3/8/2018	Routine	No	Maintenance needed	Y	Y
527	226	3/8/2018	Routine	No	Maintenance needed	Y	Y
528	228	3/8/2018	Routine	No	Maintenance needed	Y	Y
529	129	3/8/2018	Routine	Yes	No maintenance needed at this time.	N	N
530	130	3/8/2018	Routine	Yes	No maintenance needed at this time.	N	N
531	131	3/8/2018	Routine	Yes	No maintenance needed at this time.	N	N
532	821	3/9/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
533	820	3/9/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
534	822	3/9/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
535	839	3/9/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
536	570	3/9/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
537	280	3/9/2018	Routine	No	Maintenance needed	Y	Y
538	265	3/9/2018	Routine	No	Maintenance needed	Y	N
539	934	3/9/2018	Routine	Yes	No maintenance needed at this time.	N	N
540	953	3/9/2018	Routine	Yes	No maintenance needed at this time.	N	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
541	206	3/9/2018	Routine	Yes	No maintenance needed at this time.	N	N
542	888	3/9/2018	Routine	Yes	No maintenance needed at this time.	N	N
543	921	3/9/2018	Routine	Yes	No maintenance needed at this time.	N	N
544	268	3/9/2018	Routine	Yes	No maintenance needed at this time.	N	N
545	257	3/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
546	259	3/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
547	88	3/12/2018	Routine	No	Maintenance needed	Y	N
548	427	3/12/2018	Routine	No	Maintenance needed	Y	Y
549	66	3/12/2018	Routine	No	Maintenance needed	Y	N
550	966	3/14/2018	Routine	No	Maintenance needed	Y	N
551	334	3/15/2018	Routine	No	Maintenance needed	Y	N
552	667	3/15/2018	Routine	No	Maintenance needed	Y	N
553	406	3/15/2018	Routine	No	Maintenance needed	Y	N
554	425	3/15/2018	Routine	No	Maintenance needed	Y	Y
555	423	3/15/2018	Routine	No	Maintenance needed	Y	Y
556	798	3/15/2018	Routine	Yes	No maintenance needed at this time.	N	N
557	177	3/16/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
558	111	3/16/2018	Routine	No	Maintenance needed	Y	Y
559	436	3/16/2018	Routine	No	Maintenance needed	Y	Y
560	126	3/16/2018	Routine	No	Maintenance needed	Y	N
561	601	3/16/2018	Routine	No	Maintenance needed	Y	Y
562	252	3/16/2018	Routine	No	Maintenance needed	Y	N
563	333	3/16/2018	Routine	No	Maintenance needed	Y	Y
564	599	3/19/2018	Routine	No	Maintenance needed	Y	N
565	799	3/19/2018	Other	Yes	No maintenance needed at this time.	N	N
566	106	3/19/2018	Routine	No	Maintenance needed	N	Y
567	354	3/19/2018	Routine	No	Maintenance needed	Y	N
568	64	3/20/2018	Routine	No	Maintenance needed	Y	Y
569	969	3/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
570	970	3/20/2018	Routine	No	Maintenance needed	Y	Y

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
571	369	3/26/2018	Routine	No	Maintenance needed	Y	Y
572	370	3/26/2018	Routine	Yes	No maintenance needed at this time.	N	N
573	375	3/26/2018	Routine	No	Maintenance needed	Y	N
574	895	3/26/2018	Other	No	Maintenance needed	Y	N
575	896	3/26/2018	Other	No	Maintenance needed	Y	N
576	897	3/26/2018	Other	No	Maintenance needed	Y	N
577	951	3/27/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
578	697	3/27/2018	Routine	No	Maintenance needed	Y	N
579	11	3/27/2018	Routine	No	Maintenance needed	Y	Y
580	27	3/28/2018	Routine	No	Maintenance needed	Y	Y
581	453	3/29/2018	Other	No	Maintenance needed	Y	N
582	202	3/29/2018	Other	Yes	No maintenance needed at this time.	N	N
583	347	3/29/2018	Routine	No	Maintenance needed	Y	N
584	342	3/29/2018	Routine	No	Maintenance needed	Y	N
585	341	3/29/2018	Routine	No	Maintenance needed	Y	N
586	456	3/29/2018	Routine	No	Maintenance needed	Y	N
587	74	3/29/2018	Routine	No	Maintenance needed	N	Y
588	50	3/29/2018	Routine	No	Maintenance needed	Y	Y
589	2	3/29/2018	Routine	No	Maintenance needed	Y	Y
590	3	3/29/2018	Routine	No	Maintenance needed	Y	Y
591	316	3/29/2018	Routine	No	Maintenance needed	N	Y
592	4	3/29/2018	Routine	No	Maintenance needed	N	Y
593	335	3/29/2018	Routine	No	Maintenance needed	Y	Y
594	306	3/29/2018	Routine	No	Maintenance needed	Y	Y
595	305	3/29/2018	Routine	No	Maintenance needed	Y	Y
596	409	3/29/2018	Routine	Yes	No maintenance needed at this time.	N	N
597	698	3/29/2018	Routine	No	Maintenance needed	Y	Y
598	591	3/29/2018	Routine	Yes	No maintenance needed at this time.	N	N
599	683	3/29/2018	Routine	Yes	No maintenance needed at this time.	N	N
600	442	3/29/2018	Routine	No	Maintenance needed	Y	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
601	542	3/29/2018	Routine	Yes	No maintenance needed at this time.	N	N
602	809	4/2/2018	Routine	Yes	No maintenance needed at this time.	N	N
603	845	4/2/2018	Routine	Yes	No maintenance needed at this time.	N	N
604	886	4/2/2018	Routine	Yes	No maintenance needed at this time.	N	N
605	645	4/3/2018	Routine	No	Maintenance needed	N	Y
606	646	4/3/2018	Routine	No	Maintenance needed	Y	N
607	407	4/3/2018	Routine	No	Maintenance needed	Y	Y
608	408	4/3/2018	Routine	No	Maintenance needed	Y	N
609	22	4/3/2018	Routine	No	Maintenance needed	Y	N
610	192	4/4/2018	Routine	No	Maintenance needed	Y	N
611	236	4/4/2018	Routine	No	Maintenance needed	Y	N
612	546	4/4/2018	Routine	No	Maintenance needed	Y	N
613	849	4/4/2018	Routine	No	Maintenance needed	Y	N
614	695	4/4/2018	Routine	No	Maintenance needed	Y	N
615	311	4/5/2018	Routine	No	Maintenance needed	Y	N
616	103	4/5/2018	Routine	Yes	No maintenance needed at this time.	N	N
617	443	4/5/2018	Routine	Yes	No maintenance needed at this time.	N	N
618	330	4/5/2018	Routine	Yes	No maintenance needed at this time.	N	N
619	838	4/5/2018	Routine	No	Maintenance needed	Y	N
620	69	4/5/2018	Routine	No	Maintenance needed	Y	N
621	349	4/6/2018	Routine	No	Maintenance needed	Y	N
622	450	4/6/2018	Routine	Yes	No maintenance needed at this time.	N	N
623	448	4/6/2018	Routine	No	Maintenance needed	Y	N
624	348	4/6/2018	Routine	No	Maintenance needed	Y	N
625	447	4/6/2018	Routine	No	Maintenance needed	Y	N
626	449	4/6/2018	Routine	No	Maintenance needed	Y	N
627	160	4/6/2018	Routine	No	Maintenance needed	Y	N
628	472	4/6/2018	Routine	Yes	No maintenance needed at this time.	N	N
629	20	4/6/2018	Routine	No	Maintenance needed	Y	N
630	134	4/6/2018	Routine	Yes	No maintenance needed at this time.	N	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
631	892	4/10/2018	Routine	No	Maintenance needed	N	Y
632	883	4/10/2018	Routine	No	Maintenance needed	Y	N
633	939	4/10/2018	Routine	No	Maintenance needed	N	Y
634	519	4/10/2018	Routine	No	Maintenance needed	Y	N
635	642	4/10/2018	Routine	Yes	No maintenance needed at this time.	N	N
636	182	4/10/2018	Routine	No	Maintenance needed	Y	N
637	183	4/10/2018	Routine	No	Maintenance needed	Y	N
638	857	4/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
639	362	4/12/2018	Routine	No	Maintenance needed	Y	N
640	279	4/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
641	363	4/12/2018	Routine	No	Maintenance needed	Y	N
642	267	4/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
643	266	4/12/2018	Routine	No	Maintenance needed	Y	N
644	462	4/12/2018	Routine	No	Maintenance needed	Y	Y
645	261	4/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
646	260	4/12/2018	Routine	No	Maintenance needed	Y	Y
647	303	4/12/2018	Routine	No	Maintenance needed	Y	Y
648	264	4/12/2018	Routine	No	Maintenance needed	Y	N
649	302	4/12/2018	Routine	No	Maintenance needed	Y	Y
650	263	4/12/2018	Routine	No	Maintenance needed	Y	N
651	262	4/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
652	808	4/12/2018	Routine	No	Maintenance needed	Y	Y
653	218	4/12/2018	Routine	No	Maintenance needed	Y	Y
654	788	4/12/2018	Routine	Yes	No maintenance needed at this time.	N	N
655	127	4/13/2018	Routine	No	Maintenance needed	Y	Y
656	132	4/13/2018	Routine	No	Maintenance needed	Y	Y
657	271	4/13/2018	Routine	No	Maintenance needed	Y	N
658	617	4/13/2018	Routine	No	Maintenance needed	Y	Y
659	211	4/13/2018	Routine	No	Maintenance needed	N	Y
660	416	4/13/2018	Routine	No	Maintenance needed	Y	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
661	847	4/13/2018	Routine	No	Maintenance needed	Y	Y
662	326	4/13/2018	Routine	No	Maintenance needed	Y	Y
663	855	4/13/2018	Routine	Yes	No maintenance needed at this time.	N	N
664	856	4/13/2018	Other	Yes	No maintenance needed at this time.	N	N
665	647	4/17/2018	Routine	No	Maintenance needed	Y	N
666	79	4/17/2018	Routine	No	Maintenance needed	Y	Y
667	40	4/17/2018	Routine	No	Maintenance needed	Y	N
668	301	4/17/2018	Routine	No	Maintenance needed	Y	Y
669	282	4/17/2018	Routine	No	Maintenance needed	Y	Y
670	283	4/17/2018	Routine	Yes	No maintenance needed at this time.	N	N
671	109	4/17/2018	Routine	Yes	No maintenance needed at this time.	N	N
672	401	4/18/2018	Routine	No	Maintenance needed	Y	Y
673	180	4/18/2018	Routine	No	Maintenance needed	Y	N
674	429	4/18/2018	Routine	No	Maintenance needed	Y	N
675	658	4/18/2018	Routine	No	Maintenance needed	Y	N
676	659	4/18/2018	Routine	No	Maintenance needed	Y	N
677	696	4/18/2018	Routine	No	Maintenance needed	Y	N
678	65	4/18/2018	Routine	No	Maintenance needed	Y	N
679	24	4/18/2018	Routine	No	Maintenance needed	Y	N
680	534	4/18/2018	Routine	No	Maintenance needed	Y	Y
681	62	4/18/2018	Routine	No	Maintenance needed	Y	Y
682	168	4/20/2018	Routine	No	Maintenance needed	Y	Y
683	380	4/20/2018	Routine	No	Maintenance needed	Y	N
684	102	4/20/2018	Routine	No	Maintenance needed	Y	N
685	101	4/20/2018	Routine	No	Maintenance needed	Y	N
686	625	4/20/2018	Routine	No	Maintenance needed	Y	Y
687	615	4/20/2018	Routine	No	Maintenance needed	Y	N
688	620	4/20/2018	Routine	No	Maintenance needed	Y	Y
689	614	4/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
690	230	4/20/2018	Routine	No	Maintenance needed	Y	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
691	536	4/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
692	25	4/20/2018	Routine	No	Maintenance needed	N	Y
693	693	4/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
694	307	4/20/2018	Routine	No	Maintenance needed	Y	Y
695	231	4/20/2018	Routine	No	Maintenance needed	Y	Y
696	958	4/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
697	959	4/20/2018	Routine	Yes	No maintenance needed at this time.	N	N
698	344	4/20/2018	Routine	No	Maintenance needed	Y	Y
699	419	4/20/2018	Routine	No	Maintenance needed	Y	Y
700	76	4/20/2018	Routine	No	Maintenance needed	N	Y
701	77	4/23/2018	Routine	No	Maintenance needed	N	Y
702	320	4/23/2018	Routine	No	Maintenance needed	N	Y
703	319	4/23/2018	Routine	No	Maintenance needed	Y	N
704	9	4/23/2018	Routine	No	Maintenance needed	Y	Y
705	486	4/23/2018	Routine	No	Maintenance needed	Y	N
706	295	4/23/2018	Routine	No	Maintenance needed	Y	Y
707	891	4/23/2018	Routine	No	Maintenance needed	Y	Y
708	890	4/23/2018	Routine	No	Maintenance needed	Y	N
709	451	4/23/2018	Routine	Yes	No maintenance needed at this time.	N	N
710	26	4/23/2018	Routine	No	Maintenance needed	N	Y
711	864	4/23/2018	Routine	No	Maintenance needed	Y	N
712	485	4/23/2018	Routine	No	Maintenance needed	Y	N
713	487	4/23/2018	Routine	No	Maintenance needed	Y	N
714	300	4/23/2018	Routine	Yes	No maintenance needed at this time.	N	N
715	585	4/24/2018	Routine	No	Maintenance needed	N	Y
716	35	4/24/2018	Routine	No	Maintenance needed	N	Y
717	36	4/24/2018	Routine	No	Maintenance needed	Y	N
718	37	4/24/2018	Routine	No	Maintenance needed	N	Y
719	38	4/24/2018	Routine	No	Maintenance needed	Y	N
720	350	4/24/2018	Routine	No	Maintenance needed	Y	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
721	351	4/24/2018	Routine	No	Maintenance needed	Y	N
722	539	4/24/2018	Routine	No	Maintenance needed	N	Y
723	356	4/26/2018	Routine	No	Maintenance needed	Y	N
724	175	4/26/2018	Routine	No	Maintenance needed	Y	N
725	174	4/26/2018	Routine	No	Maintenance needed	Y	N
726	173	4/26/2018	Routine	No	Maintenance needed	Y	N
727	100	4/26/2018	Routine	No	Maintenance needed	Y	N
728	621	4/26/2018	Routine	Yes	No maintenance needed at this time.	N	N
729	597	4/26/2018	Routine	No	Maintenance needed	Y	N
730	332	4/26/2018	Routine	Yes	No maintenance needed at this time.	N	N
731	13	4/27/2018	Routine	No	Maintenance needed	N	Y
732	14	4/27/2018	Routine	No	Maintenance needed	Y	N
733	94	4/27/2018	Routine	Yes	No maintenance needed at this time.	N	N
734	93	4/27/2018	Routine	Yes	No maintenance needed at this time.	N	N
735	540	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
736	782	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
737	781	4/30/2018	Routine	No	Maintenance needed	Y	N
738	780	4/30/2018	Routine	No	Maintenance needed	Y	N
739	783	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
740	785	4/30/2018	Routine	No	Maintenance needed	Y	N
741	575	4/30/2018	Routine	No	Maintenance needed	Y	Y
742	779	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
743	738	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
744	739	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
745	737	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
746	736	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
747	735	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
748	734	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
749	733	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
750	732	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
751	730	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
752	729	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
753	880	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
754	731	4/30/2018	Routine	Yes	No maintenance needed at this time.	N	N
755	700	5/1/2018	Routine	No	Maintenance needed	Y	N
756	757	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
757	758	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
758	759	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
759	760	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
760	767	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
761	768	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
762	769	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
763	770	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
764	771	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
765	772	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
766	773	5/1/2018	Routine	No	Maintenance needed	Y	N
767	774	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
768	765	5/1/2018	Routine	Yes	No maintenance needed at this time.	N	N
769	8	5/2/2018	Routine	No	Maintenance needed	Y	N
770	7	5/2/2018	Routine	No	Maintenance needed	N	Y
771	172	5/2/2018	Routine	No	Maintenance needed	N	Y
772	473	5/2/2018	Routine	No	Maintenance needed	Y	N
773	761	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
774	764	5/3/2018	Routine	No	Maintenance needed	Y	Y
775	762	5/3/2018	Routine	No	Maintenance needed	Y	N
776	763	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
777	786	5/3/2018	Routine	No	Maintenance needed	Y	N
778	766	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
779	787	5/3/2018	Routine	No	Maintenance needed	Y	N
780	875	5/3/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N

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Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
781	740	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
782	743	5/3/2018	Routine	No	Maintenance needed	Y	N
783	755	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
784	756	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
785	744	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
786	428	5/3/2018	Other	No	Maintenance needed	Y	N
787	753	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
788	745	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
789	751	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
790	749	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
791	747	5/3/2018	Routine	Yes	No maintenance needed at this time.	N	N
792	754	5/4/2018	Routine	Yes	No maintenance needed at this time.	N	N
793	859	5/4/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
794	750	5/4/2018	Routine	Yes	No maintenance needed at this time.	N	N
795	746	5/4/2018	Routine	Yes	No maintenance needed at this time.	N	N
796	748	5/4/2018	Routine	Yes	No maintenance needed at this time.	N	N
797	23	5/7/2018	Complaint Based	No	Maintenance needed	N	Y
798	12	5/7/2018	Routine	No	Maintenance needed	Y	N
799	33	5/7/2018	Routine	No	Maintenance needed	N	Y
800	34	5/7/2018	Routine	No	Maintenance needed	Y	N
801	32	5/7/2018	Routine	No	Maintenance needed	N	Y
802	253	5/8/2018	Routine	Yes	No maintenance needed at this time.	N	N
803	399	5/8/2018	Routine	No	Maintenance needed	Y	N
804	376	5/8/2018	Other	No	Maintenance needed	Y	N
805	410	5/9/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
806	577	5/9/2018	Other	Yes	No maintenance needed at this time.	N	N
807	582	5/9/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
808	687	5/9/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
809	31	5/10/2018	Routine	Yes	No maintenance needed at this time.	N	N
810	480	5/10/2018	Routine	Yes	No maintenance needed at this time.	N	N

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
811	49	5/10/2018	Other	Yes	No maintenance needed at this time.	N	N
812	43	5/10/2018	Routine	No	Maintenance needed	N	Y
813	502	5/11/2018	Routine	No	Maintenance needed	Y	N
814	78	5/11/2018	Routine	Yes	No maintenance needed at this time.	N	N
815	962	5/13/2018	Routine	Yes	No maintenance needed at this time.	N	N
816	358	5/14/2018	Routine	Yes	No maintenance needed at this time.	N	N
817	304	5/14/2018	Routine	No	Maintenance needed	Y	N
818	371	5/15/2018	Routine	No	Maintenance needed	Y	Y
819	372	5/15/2018	Routine	No	Maintenance needed	Y	N
820	373	5/15/2018	Routine	Yes	No maintenance needed at this time.	N	N
821	374	5/15/2018	Routine	No	Maintenance needed	Y	N
822	433	5/15/2018	Routine	No	Maintenance needed	Y	N
823	920	5/15/2018	Other	Yes	No maintenance needed at this time.	N	N
824	432	5/15/2018	Routine	No	Maintenance needed	N	Y
825	42	5/16/2018	Routine	No	Maintenance needed	N	Y
826	274	5/16/2018	Routine	No	Maintenance needed	Y	N
827	194	5/16/2018	Routine	No	Maintenance needed	Y	N
828	420	5/17/2018	Routine	Yes	No maintenance needed at this time.	N	N
829	193	5/17/2018	Routine	No	Maintenance needed	Y	N
830	609	5/21/2018	Routine	No	Maintenance needed	N	Y
831	608	5/21/2018	Routine	No	Maintenance needed	N	Y
832	108	5/21/2018	Routine	No	Maintenance needed	Y	N
833	848	5/21/2018	Routine	No	Maintenance needed	Y	N
834	517	5/21/2018	Routine	No	Maintenance needed	Y	N
835	16	5/23/2018	Routine	Yes	No maintenance needed at this time.	N	N
836	17	5/23/2018	Routine	No	Maintenance needed	N	Y
837	345	5/23/2018	Routine	No	Maintenance needed	Y	N
838	346	5/23/2018	Routine	Yes	No maintenance needed at this time.	N	N
839	583	5/23/2018	Routine	No	Maintenance needed	Y	N
840	48	5/23/2018	Routine	Yes	No maintenance needed at this time.	N	N

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
841	475	5/23/2018	Routine	Yes	No maintenance needed at this time.	N	N
842	203	5/24/2018	Routine	Yes	No maintenance needed at this time.	N	N
843	203	5/24/2018	Routine	Yes	No maintenance needed at this time.	N	N
844	359	5/24/2018	Routine	No	Maintenance needed	Y	N
845	357	5/24/2018	Routine	Yes	No maintenance needed at this time.	N	N
846	273	5/24/2018	Routine	No	Maintenance needed	Y	N
847	355	5/24/2018	Routine	No	Maintenance needed	Y	N
848	275	5/24/2018	Routine	No	Maintenance needed	Y	N
849	881	5/25/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
850	603	5/25/2018	Other	Yes	No maintenance needed at this time.	N	N
851	114	5/29/2018	60-day reinspection	No	Maintenance needed	Y	Y
852	107	5/30/2018	60-day reinspection	No	Maintenance needed	Y	N
853	97	5/30/2018	60-day reinspection	No	Maintenance needed	Y	N
854	636	5/30/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
855	962	6/1/2018	Routine	No	Maintenance needed	Y	N
856	337	6/1/2018	Routine	No	Maintenance needed	Y	N
857	955	6/1/2018	Routine	No	Maintenance needed	Y	N
858	360	6/1/2018	Routine	No	Maintenance needed	Y	N
859	361	6/1/2018	Routine	No	Maintenance needed	Y	N
860	670	6/1/2018	Other	Yes	No maintenance needed at this time.	N	N
861	152	6/4/2018	Routine	No	Maintenance needed	Y	N
862	184	6/4/2018	Routine	No	Maintenance needed	Y	N
863	867	6/4/2018	Routine	No	Maintenance needed	Y	N
864	866	6/4/2018	Routine	No	Maintenance needed	N	Y
865	626	6/4/2018	Routine	No	Maintenance needed	Y	Y
866	938	6/5/2018	Routine	Yes	No maintenance needed at this time.	N	N
867	234	6/5/2018	Routine	No	Maintenance needed	Y	N
868	957	6/5/2018	Routine	No	Maintenance needed	Y	N
869	690	6/5/2018	Routine	No	Maintenance needed	Y	N
870	233	6/5/2018	Routine	No	Maintenance needed	Y	N

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
871	10	6/6/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
872	954	6/6/2018	Routine	No	Maintenance needed	Y	N
873	418	6/6/2018	Routine	No	Maintenance needed	Y	N
874	55	6/6/2018	Routine	No	Maintenance needed	N	Y
875	417	6/6/2018	Routine	No	Maintenance needed	Y	Y
876	788	6/6/2018	Routine	No	Maintenance needed	Y	N
877	381	6/6/2018	Routine	No	Maintenance needed	Y	N
878	287	6/6/2018	Routine	No	Maintenance needed	Y	N
879	54	6/7/2018	Routine	No	Maintenance needed	Y	N
880	846	6/7/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
881	635	6/7/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
882	656	6/7/2018	60-day reinspection	Yes	No maintenance needed at this time.	N	N
883	806	6/8/2018	60-day reinspection	No	Maintenance needed	Y	N
884	807	6/8/2018	30-day reinspection	No	Maintenance needed	Y	N
885	251	6/9/2018	30-day reinspection	Yes	No maintenance needed at this time.	N	N
886	336	6/9/2018	Complaint Based	No	Maintenance needed	Y	Y
887	562	6/9/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
888	549	6/12/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
889	187	6/12/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
890	488	6/12/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
891	550	6/12/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
892	438	6/12/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
893	437	6/12/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
894	292	6/12/2018	Complaint Based	Yes	No maintenance needed at this time.	N	N
895	276	6/14/2018	Routine	No	Maintenance needed	N	Y
896	701	6/19/2018	Routine	No	Maintenance needed	Y	N
897	702	6/19/2018	Routine	No	Maintenance needed	Y	N
898	703	6/19/2018	Routine	No	Maintenance needed	Y	N
899	705	6/19/2018	Routine	No	Maintenance needed	Y	N
900	704	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N

SWM/BMP - Public Facility Compliance Report

Count	Facility #	Date of Routine	Routine Type	Facility in Compliance	Comments	Maintenance Required	
						Minor	Major
901	709	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
902	708	6/19/2018	Routine	No	Maintenance needed	Y	N
903	708	6/19/2018	Routine	No	Maintenance needed	Y	N
904	707	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
905	706	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
906	716	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
907	717	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
908	722	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
909	721	6/19/2018	Routine	No	Maintenance needed	Y	N
910	720	6/19/2018	Routine	No	Maintenance needed	Y	N
911	719	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
912	713	6/19/2018	Routine	No	Maintenance needed	Y	N
913	715	6/19/2018	Routine	No	Maintenance needed	Y	N
914	712	6/19/2018	Routine	No	Maintenance needed	Y	N
915	710	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
916	711	6/19/2018	Routine	No	Maintenance needed	Y	N
917	714	6/19/2018	Routine	No	Maintenance needed	Y	N
918	776	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
919	777	6/19/2018	Routine	No	Maintenance needed	Y	N
920	778	6/19/2018	Routine	No	Maintenance needed	Y	N
921	752	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
922	742	6/19/2018	Routine	No	Maintenance needed	Y	N
923	741	6/19/2018	Routine	No	Maintenance needed	Y	N
924	728	6/19/2018	Routine	No	Maintenance needed	Y	N
925	727	6/19/2018	Routine	No	Maintenance needed	Y	N
926	726	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
927	725	6/19/2018	Routine	No	Maintenance needed	Y	N
928	724	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
929	784	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N
930	413	6/19/2018	Routine	Yes	No maintenance needed at this time.	N	N

SWM/BMP - Private Facility Compliance Report

Count	Facility ID	Inspection Date	Inspection Type	Facility In Compliance?	Notes	Owner 60 Day Ltr (Y/N)	CAO 30 Day Ltr	CAO 15 Day Ltr
1	6031	7/10/2017	Routine	Yes	No maintenance needed	N		
2	6032	7/10/2017	Routine	Yes	No maintenance needed	N		
3	6033	7/10/2017	Routine	Yes	No maintenance needed	N		
4	6034	7/10/2017	Routine	Yes	No maintenance needed	N		
5	6035	7/10/2017	Routine	Yes	No maintenance needed	N		
6	6036	7/10/2017	Routine	Yes	No maintenance needed	N		
7	6037	7/10/2017	Routine	Yes	No maintenance needed	N		
8	6023	7/10/2017	Routine	Yes	No maintenance needed	N		
9	6038	7/13/2017	Routine	Yes	No maintenance needed	N		
10	6030	7/25/2017	Routine	No	Maintenance needed	Y		
11	5013	8/1/2017	60-day reinspection	No	Maintenance needed	Y		
12	5014	8/1/2017	60-day reinspection	No	Maintenance needed	Y		
13	5015	8/1/2017	60-day reinspection	No	Maintenance needed	Y		
14	5722	8/1/2017	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
15	5723	8/1/2017	60-day reinspection	No	Maintenance needed	Y		
16	5718	8/2/2017	60-day reinspection	No	Maintenance needed	Y		
17	5720	8/2/2017	60-day reinspection	No	Maintenance needed	Y		
18	5717	8/2/2017	60-day reinspection	No	Maintenance needed	Y		
19	5716	8/2/2017	60-day reinspection	No	Maintenance needed	Y		
20	5012	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
21	5011	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
22	5010	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
23	5160	8/3/2017	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
24	5719	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
25	5932	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
26	5545	8/16/2017	Other	Yes	No maintenance needed / Complaint	N		
27	5749	8/21/2017	Routine	No	Maintenance needed	Y		
28	5692	8/23/2017	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
29	5691	8/23/2017	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
30	5823	9/6/2017	Routine	No	Maintenance needed	Y		
31	6040	9/13/2017	Routine	Yes	No maintenance needed	N		
32	5074	11/14/2017	Routine	No	Maintenance needed	Y		
33	5770	11/14/2017	Routine	No	Maintenance needed	Y		
34	5997	11/15/2017	60-day reinspection	Yes	No maintenance needed	N		
35	5757	11/16/2017	Routine	Yes	No maintenance needed	N		
36	5756	11/16/2017	Routine	Yes	No maintenance needed	N		
37	5759	11/16/2017	Routine	Yes	No maintenance needed	N		
38	5754	11/16/2017	Routine	Yes	No maintenance needed	N		
39	5753	11/16/2017	Routine	Yes	No maintenance needed	N		
40	5760	7/10/2017	Routine	Yes	No maintenance needed	N		
41	5760	7/10/2017	Routine	Yes	No maintenance needed	N		
42	5762	7/10/2017	Routine	Yes	No maintenance needed	N		

Count	Facility ID	Inspection Date	Inspection Type	Facility In Compliance?	Notes	Owner 60 Day Ltr (Y/N)	CAO 30 Day Ltr	CAO 15 Day Ltr
43	5761	7/10/2017	Routine	Yes	No maintenance needed	N		
44	5755	7/10/2017	Routine	Yes	No maintenance needed	N		
45	6042	7/10/2017	Routine	Yes	No maintenance needed	N		
46	6043	7/10/2017	Routine	Yes	No maintenance needed	N		
47	6041	7/10/2017	Routine	Yes	No maintenance needed	N		
48	6044	7/13/2017	Routine	Yes	No maintenance needed	N		
49	5335	7/25/2017	Routine	No	Maintenance needed	Y		
50	6005	8/1/2017	60-day reinspection	No	Maintenance needed	Y		
51	5977	8/1/2017	60-day reinspection	No	Maintenance needed	Y		
52	5216	8/1/2017	60-day reinspection	No	Maintenance needed	Y		
53	5002	8/1/2017	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
54	5004	8/1/2017	60-day reinspection	No	Maintenance needed	Y		
55	5017	8/2/2017	60-day reinspection	No	Maintenance needed	Y		
56	5656	8/2/2017	60-day reinspection	No	Maintenance needed	Y		
57	5660	8/2/2017	60-day reinspection	No	Maintenance needed	Y		
58	5659	8/2/2017	60-day reinspection	No	Maintenance needed	Y		
59	5041	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
60	5658	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
61	5657	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
62	5655	8/3/2017	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
63	5043	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
64	5059	8/3/2017	60-day reinspection	No	Maintenance needed	Y		
65	5067	8/16/2017	Other	Yes	No maintenance needed / Complaint	N		
66	5071	8/21/2017	Routine	No	Maintenance needed	Y		
67	5083	8/23/2017	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
68	5084	8/23/2017	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
69	5094	9/6/2017	Routine	No	Maintenance needed	Y		
70	5099	9/13/2017	Routine	Yes	No maintenance needed	N		
71	5992	11/14/2017	Routine	No	Maintenance needed	Y		
72	5993	11/14/2017	Routine	No	Maintenance needed	Y		
73	5158	11/15/2017	60-day reinspection	Yes	No maintenance needed	N		
74	6046	11/16/2017	Routine	Yes	No maintenance needed	N		
75	5355	11/16/2017	Routine	Yes	No maintenance needed	N		
76	5106	11/16/2017	Routine	Yes	No maintenance needed	N		
77	5130	11/16/2017	Routine	Yes	No maintenance needed	N		
78	5375	11/16/2017	Routine	Yes	No maintenance needed	N		
82	5097	1/31/2018	Routine	No	Maintenance needed	Y		
83	5066	2/1/2018	60-day reinspection	No	Maintenance needed / Need constr. estimate	Y	Y	
84	6047	2/6/2018	Routine	Yes	No maintenance needed	N		
85	6049	2/6/2018	Routine	Yes	No maintenance needed	N		
86	6050	2/6/2018	Routine	No	Maintenance needed	Y		
87	6053	2/6/2018	Routine	Yes	No maintenance needed	N		
88	6051	2/9/2018	Routine	Yes	No maintenance needed	N		
89	6048	2/9/2018	Routine	No	Maintenance needed	Y		

Count	Facility ID	Inspection Date	Inspection Type	Facility In Compliance?	Notes	Owner 60 Day Ltr (Y/N)	CAO 30 Day Ltr	CAO 15 Day Ltr
90	6057	2/14/2018	Routine	Yes	No maintenance needed	N		
91	6056	2/14/2018	Routine	Yes	No maintenance needed	N		
92	6054	2/14/2018	Routine	Yes	No maintenance needed	N		
93	6060	2/15/2018	Routine	Yes	No maintenance needed	N		
94	6061	2/15/2018	Routine	No	Maintenance needed	Y		
95	6059	2/16/2018	Routine	Yes	No maintenance needed	N		
96	5054	2/20/2018	Routine	No	Maintenance needed	Y		
97	5913	2/27/2018	Complaint Based	Yes	No maintenance needed	N		
98	6052	3/9/2018	Other	Yes	No maintenance needed	N		
99	6058	3/15/2018	Other	Yes	No maintenance needed	N		
100	6055	3/15/2018	Other	Yes	No maintenance needed	N		
101	5152	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
102	5269	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
103	5270	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
104	5165	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
105	5363	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
106	5371	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
107	5141	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
108	5268	3/16/2018	Routine	Yes	No maintenance needed	N		
109	5619	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
110	5976	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
111	5380	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
112	5373	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
113	5965	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
114	5971	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
115	5973	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
116	5969	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
117	5972	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
118	5970	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
119	5319	3/16/2018	Routine	No	Maintenance needed	Y		
120	5312	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
121	5320	3/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
122	6063	3/22/2018	Routine	No	Maintenance needed	Y		
123	5725	3/23/2018	60-day reinspection	No	Maintenance needed / Need constr. estimate	Y	Y	
124	6062	3/27/2018	Routine	No	Maintenance needed	Y		
125	6064	3/27/2018	Routine	No	Maintenance needed	Y		
126	5301	3/27/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
127	6071	3/27/2018	Routine	No	Maintenance needed	Y		
128	6065	3/27/2018	Routine	No	Maintenance needed	Y		
129	6066	3/27/2018	Routine	No	Maintenance needed	Y		
130	6067	3/27/2018	Routine	No	Maintenance needed	Y		
131	6068	3/27/2018	Routine	No	Maintenance needed	Y		
132	6069	3/27/2018	Routine	No	Maintenance needed	Y		
133	6070	3/27/2018	Routine	No	Maintenance needed	Y		

Count	Facility ID	Inspection Date	Inspection Type	Facility In Compliance?	Notes	Owner 60 Day Ltr (Y/N)	CAO 30 Day Ltr	CAO 15 Day Ltr
134	6072	3/27/2018	Routine	No	Maintenance needed	Y		
135	6073	3/27/2018	Routine	No	Maintenance needed	Y		
136	5060	3/28/2018	Routine	No	Maintenance needed	Y		
137	5197	4/2/2018	Routine	No	Maintenance needed	Y		
138	5061	4/2/2018	Routine	No	Maintenance needed	Y		
139	5062	4/2/2018	Routine	No	Maintenance needed	Y		
140	5707	4/2/2018	Routine	No	Maintenance needed	Y		
141	5047	4/2/2018	Routine	No	Maintenance needed	Y		
142	5712	4/2/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
143	5244	4/4/2018	Other	No	Maintenance needed / CAO is working on this case	Y		
144	5263	4/9/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
145	6008	4/9/2018	Complaint Based	Yes	No maintenance needed	N		
146	5098	4/13/2018	Routine	No	Maintenance needed	Y		
147	5608	4/20/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
148	5205	5/7/2018	Routine	No	Maintenance needed	Y		
149	5213	5/7/2018	Routine	No	Maintenance needed	Y		
150	5191	5/7/2018	Routine	No	Maintenance needed	Y		
151	5057	5/7/2018	Routine	No	Maintenance needed	Y		
152	5075	5/7/2018	Routine	No	Maintenance needed	Y		
153	5192	5/7/2018	Routine	No	Maintenance needed	Y		
154	5044	5/7/2018	Routine	No	Maintenance needed	Y		
155	5146	5/7/2018	Routine	No	Maintenance needed	Y		
156	5147	5/7/2018	60-day reinspection	No	Maintenance needed / Need constr. estimate	Y	Y	
157	5204	5/8/2018	Routine	No	Maintenance needed	Y		
158	5211	5/8/2018	Routine	No	Maintenance needed	Y		
159	5122	5/8/2018	Routine	No	Maintenance needed	Y		
160	5346	5/13/2018	Routine	No	Maintenance needed	Y		
161	5232	5/13/2018	Routine	No	Maintenance needed	Y		
162	5230	5/13/2018	Routine	No	Maintenance needed	Y		
163	5150	5/13/2018	Routine	No	Maintenance needed	Y		
164	5231	5/13/2018	Routine	No	Maintenance needed	Y		
165	5746	5/13/2018	Routine	No	Maintenance needed	Y		
166	5272	5/14/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
167	5580	5/14/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
168	5578	5/14/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
169	5579	5/14/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
170	5577	5/14/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
171	5186	5/15/2018	Routine	No	Maintenance needed	Y		
172	5218	5/15/2018	Routine	No	Maintenance needed	Y		
173	5196	5/15/2018	Routine	Yes	No maintenance needed	N		
174	5144	5/15/2018	Routine	No	Maintenance needed	Y		
175	5185	5/15/2018	Routine	No	Maintenance needed	Y		
176	5018	5/15/2018	Routine	No	Maintenance needed	Y		
177	5005	5/15/2018	Routine	No	Maintenance needed	Y		

Count	Facility ID	Inspection Date	Inspection Type	Facility In Compliance?	Notes	Owner 60 Day Ltr (Y/N)	CAO 30 Day Ltr	CAO 15 Day Ltr
178	5378	5/15/2018	Routine	No	Maintenance needed	Y		
179	5471	5/15/2018	Routine	No	Maintenance needed	Y		
180	5345	5/15/2018	Routine	No	Maintenance needed	Y		
181	5576	5/16/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
182	5937	5/16/2018	Routine	No	Maintenance needed	Y		
183	5344	5/16/2018	Routine	No	Maintenance needed	Y		
184	5561	5/21/2018	60-day reinspection	No	Maintenance needed / Need constr. estimate	Y	Y	
185	5714	5/21/2018	Routine	No	Maintenance needed	Y		
186	5369	5/21/2018	Routine	No	Maintenance needed	Y		
187	5095	5/21/2018	Routine	No	Maintenance needed	Y		
188	5093	5/21/2018	Routine	No	Maintenance needed	Y		
189	5715	5/21/2018	Routine	No	Maintenance needed	Y		
190	5382	5/21/2018	Routine	No	Maintenance needed	Y		
191	5236	5/21/2018	Routine	No	Maintenance needed	Y		
192	5237	5/21/2018	Routine	No	Maintenance needed	Y		
193	5503	5/21/2018	Routine	No	Maintenance needed	Y		
194	5476	5/21/2018	Routine	No	Maintenance needed	Y		
195	5504	5/21/2018	Routine	No	Maintenance needed	Y		
196	5381	5/21/2018	Routine	No	Maintenance needed	Y		
197	5342	5/22/2018	Routine	No	Maintenance needed	Y		
198	5480	5/22/2018	Routine	Yes	No maintenance needed	N		
199	5479	5/22/2018	Routine	No	Maintenance needed	Y		
200	5481	5/22/2018	Routine	Yes	No maintenance needed	N		
201	5478	5/22/2018	Routine	No	Maintenance needed	Y		
202	5326	5/22/2018	Routine	No	Maintenance needed	Y		
203	5470	5/22/2018	Routine	Yes	No maintenance needed	N		
204	5398	5/22/2018	Routine	No	Maintenance needed	Y		
205	5419	5/22/2018	Routine	No	Maintenance needed	Y		
206	5079	5/31/2018	Other	Yes	No maintenance needed	N		
207	5732	6/2/2018	Routine	No	Maintenance needed	Y		
208	5734	6/2/2018	Routine	No	Maintenance needed	Y		
209	5731	6/2/2018	Routine	No	Maintenance needed	Y		
210	5157	6/5/2018	Routine	No	Maintenance needed	Y		
211	5324	6/5/2018	Routine	No	Maintenance needed	Y		
212	6028	6/5/2018	60-day reinspection	Yes	No maintenance needed / Punch list complete	N		
213	5594	6/9/2018	Routine	No	Maintenance needed	Y		
214	5388	6/9/2018	Routine	No	Maintenance needed	Y		
215	5852	6/9/2018	Routine	Yes	No maintenance needed	N		
216	5051	6/9/2018	Routine	No	Maintenance needed	Y		
217	5474	6/9/2018	Routine	No	Maintenance needed	Y		
218	5249	6/9/2018	Routine	No	Maintenance needed	Y		
219	5735	6/9/2018	Routine	Yes	No maintenance needed	N		
220	5554	6/9/2018	Routine	No	Maintenance needed	Y		
221	5962	6/9/2018	Routine	No	Maintenance needed	Y		

Technical Manual

MS4 Delineation & Stormwater Tool

Prepared for:



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Prince William, Virginia

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Project No. 151270001

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1 Introduction

Prince William County (the County) hired Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) to analyze geospatial data depicting the County's stormwater network in order to delineate the total area drained by their Municipal Separate Stormsewer System (MS4). This process involved the identification of regulated MS4 outfalls – that is, stormwater outfalls owned or operated by Prince William County that discharge to waters of the United States. Amec Foster Wheeler assigned one of five ownership classes to each outfall: County, Homeowners, Commercial entities, Virginia Department of Transportation (VDOT), and Other owners. Typically, regulated MS4 outfalls were placed at the terminus of infrastructure (e.g. stormsewers, BMPs) and ownership was assigned using classification codes stored within the attribute tables of the spatial data provided by the County. Stormsewer ownership was determined using the coded values within the "SYM" field, while BMP ownership was determined using the "MAINT" field values. Regulated MS4 outfalls were placed before the terminus of the infrastructure if terminal placement would result in drainage area delineations that erroneously captured jurisdictional waters and their riparian areas (rather than solely MS4 service area). Secondly, parcel ownership and easement records were used to determine ownership if existing infrastructure data was not available.

Over 4,800 outfalls were identified, 3,495 of which were assigned County ownership. Based on this regulated MS4 outfall determination, the County's MS4 service area totals 23,156 acres. These regulated MS4 outfalls serve as a crucial input for the Stormwater Tool to function. The Stormwater Tool delineates the pervious and impervious drainage area to each outfall, creating a dataset that can be analyzed by the user to determine the County's MS4 service area as infrastructure is added to the County's database. Specifically, the Stormwater Tool provides the necessary information to meet *Part I.B.2.h) 3-4* of the County's MS4 Permit (Permit No: VA0088595).

2 Purpose and Objectives

This manual provides a guide for using the Stormwater Tool to delineate Prince William County's MS4 service area. The following sections of the report explain:

- 1) The structure of the Stormwater Tool and pertinent spatial data;
- 2) The three scripts composing the Stormwater Tool;
- 3) Maintaining the data utilized by the Stormwater Tool allowing for future integration in stormwater planning activities as the County's network expands;
- 4) An example exercise for a small region of the County's stormwater network.

The objective of this document is to provide any potential user with basic GIS experience the ability to use the Stormwater Tool and receive an output of the MS4 drainage area for selected outfalls. Users with a stronger background in GIS and geospatial processing will be able to further

customize the Stormwater Tool, if desired, by modifying the source code provided to the County. Amec Foster Wheeler has provided a functional, efficient tool that automates a laborious, yet critical step in ensuring the County meets its regulatory requirements and ultimately improves water quality within the Chesapeake Bay.

3 Stormwater Tool Structure

Amec Foster Wheeler provided the finished tool to the County on a flashdrive. A folder titled “MS4” houses the complete Stormwater Tool. The ArcGIS processing component of the Stormwater Tool consists of three scripts stored in the “Stormwater Tool” toolbox. The folder also contains the primary geodatabase, “MS4.gdb”, and a scratch geodatabase, “scratch.gdb”.

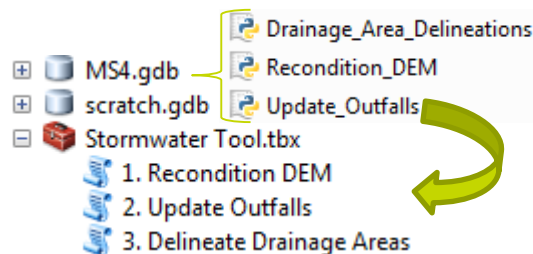


Figure 1 Python Script Storage Location

Note that scratch.gdb is created upon running any of the three scripts in the Stormwater Tool. Three source code python scripts are stored within MS4.gdb and are utilized by scripts in the toolbox. The location of the source code scripts is paramount because the scripts rely on relative pathname connections to interact with relevant data stored in the MS4 geodatabase. Moving the scripts to a new location without further modification to the source code will cause the Stormwater Tool to fail.

Users can interact with the three scripts in the Stormwater Tool toolbox directly in ArcMap. The scripts open like native ArcGIS tools and should be run in sequential order:

1. Recondition DEM
2. Update Outfalls
3. Delineate Drainage Areas

NOTE: This document will refer to the Stormwater Tool, which is the suite of ArcGIS tools developed by Amec Foster Wheeler for the County to delineate their MS4 Service Area. The three scripts within this suite will be referred to as “components”. Also, one should not confuse the Stormwater Tool or its components with the native ArcGIS tools alluded to further on in this manual.

4 Geodatabase Setup

There are two geodatabases contained within the Stormwater Tool folder:

- **MS4.gdb** contains the necessary inputs (both native and user-specified) as well as the final outputs of the Stormwater Tool. Contained within MS4.gdb are several feature datasets and feature classes the user should familiarize themselves with before using the Stormwater Tool:

- **Interconnected** contains areas that should not be included in the County's MS4 area because they are either excluded per the DEQ Guidance Memo No 15-2005 or regulated under a separate MS4 permit.
 - *VPDES* – Parcels that are regulated under General or individual VPDES permits.
 - *VDOT* – Right-of-way that VDOT claimed as their MS4 area within the County.
 - *GMU* – George Mason University parcel which is regulated by a separate MS4 permit.
 - *Schools* – Parcels owned by Prince William County Public Schools, which are regulated by a separate MS4 permit.
 - *NOVA* – Northern Virginia Community College parcel which is regulated by a separate MS4 permit.
 - *Forested* - Forested lands excluded from the MS4 regulated area. These were delineated from 4-band multispectral imagery at 1 meter spatial resolution. See Appendix B for further information.

NOTE: There are other interconnected MS4s (City of Manassas, Marine Corps Base Quantico, et al.) whose MS4 service area was not available. These can be incorporated into the tool at a later date. Amec Foster Wheeler determined that the County MS4 Service Area did not capture any significant area that would be “double counted”.

- **LandUse** contains the impervious surface area for the County. These areas are used to calculate the percent of delineated MS4 drainage areas that are impervious.
 - *Impervious2009* – Impervious surface feature class for Prince William County as of June 30th, 2009. This feature class should be used to meet Phase 1 of the Chesapeake Bay TMDL.
 - *Impervious2012* – Current impervious surface feature class available for Prince William County. This feature class could be used in MS4 service area delineations for future TMDL action plans, as needed.
- **Network** contains two polyline files: the County stormwater network and customized NHD Flowlines. Both of these polylines are used to recondition the DEM and form a unified drainage network.
 - *Amec_Single_Network* – Modified County stormsewer feature class that establishes hydrologic connectivity between the County stormsewer

system and the stream network. It includes both the County stormsewer system and hydrologic connections to the stream network, both of which were edited by Amec Foster Wheeler under direction from the County. MS4 and BMP outfalls are snapped to this feature class.

- *NHD_flowlines* – Modified version of the NHD high-resolution (24K) flowlines. This feature class serves as the unidirectional stream network for Prince William County. Each segment of the NHD contains a unique identifier, or “REACHCODE” as it is stored within the attribute table, which is identified as the downstream receiving waterbody in the “2. Update Outfalls” script. Modification of the original NHD flowlines involved deleting specific segments that were either buried or heavily modified with BMPs during development. The position of NHD flowlines were occasionally adjusted to reflect more accurate flow patterns apparent within the LiDAR DEM.
- **Outfalls** contains feature classes that can be used as drainage delineation points for delineating drainage areas. The Stormwater Tool will update the attribute data for each outfall to include a unique ID, its latitude and longitude in decimal degrees, the local watershed (WTRSHD_ID), the 5th and 6th order VA HUC, the HUC12, and the waterbody receiving outflow (listed as a REACHCODE). Outfalls also contain ownership and maintenance responsibility information.
 - *ms4_outfalls* – Feature class consisting of points demarcating where MS4 discharges to waters of the United States. Outfall ownership and “origin” (referring to the infrastructure or data that characterized the point as an MS4 outfall, ex. rip-rap ditch) are assigned upon creation by the user according to preset domains.
 - *BMPs* – Feature class containing the outfalls for the County’s legacy BMPs. While the Stormwater Tool was designed for determining the MS4 Service Area, it can also be used for determining drainage areas for each historic BMP. Care should be taken when using the Stormwater Tool for the BMPs to ensure proper drainage area delineation.
- **Polygons** contains several feature classes including MS4 drainage areas and watersheds. Important outputs can be stored in this feature dataset.
 - *Subwatersheds* – Input for the “2. Update Outfalls” script that provides the local watershed draining each outfall (WTRSHD_ID).
 - *HUC12* – Input for the “2. Update Outfalls” script that provides the HUC 12 from the NHD draining each outfall.

- *BMP_da* – Pervious and impervious drainage area for each BMP. Note that several BMPs capture entire stream valleys which would not be considered regulated MS4 service area.
- *MS4_Service_Area* – Total MS4 service area in the County attributed to the five ownership & maintenance classes. Each delineated MS4 area includes: ownership, origin, corresponding outfall ID, HUC12, local watershed (WTRSHD_ID), total drainage area (acres), pervious drainage area (acres), and impervious drainage area (acres).
- **Raster data** contains inputs and outputs (in raster format) utilized for delineating drainage areas.
 - *burned* – Hydrologically conditioned 3-meter resolution DEM. NHD_flowlines and Amec_Single_Network are “burned” into this DEM to enforce proper hydrologic routing of the stormsewer network. This process is explained in Section 5.1.
 - *Dem_3 meter* – 3-meter resolution digital elevation model for the County obtained from the National Elevation Dataset (NED). The NED is a seamless mosaic of best-available elevation data that is maintained by the USGS. This high-resolution elevation data provides a realistic depiction of the County’s topography and serves as the basis for hydrologic routing in the Stormwater Tool.
 - *Flow_acc* – Flow accumulation raster based on the burned, hydrologically reconditioned DEM created during the “1. Recondition DEM” script. Information stored within each cell provides the accumulated flow upstream of that point.
 - *Flow_dir* - Flow direction raster based on the burned, hydrologically reconditioned DEM created during the “1. Recondition DEM” script. The D8 flow algorithm is used to assign flow direction to each cell. The resulting flow direction grid is used to assign drainage areas to each outfall.
- **Scratch.gdb** contains intermediate outputs of the Stormwater Tool, and can be cleared out after each run if desired. This serves as a “background” where these intermediate outputs can be accessed by the Stormwater Tool without creating clutter within MS4.gdb.

5 Stormwater Tool Components

5.1 DEM Reconditioning

A digital elevation model (DEM) is a 3-D representation of the Earth's surface. DEMs have been used for a number of geospatial applications, including modeling surface water hydrology. Surface water hydrology is relatively easy to model in natural environments; however, urban environments present additional challenges. Namely, manmade infrastructure (i.e. stormwater pipes, curb inlets, and drainage ditches) substantially alters the natural drainage network and can transfer water between subwatersheds.

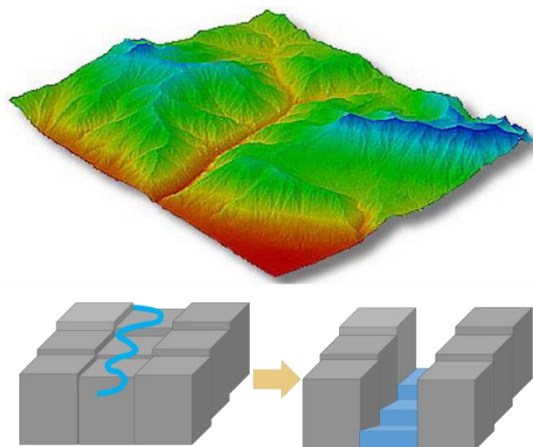


Figure 2 Burning in Hydrologic Network

Since a DEM depicts the Earth's surface using a rectangular grid of cells, it struggles to depict the below ground stormwater network and small hydrologic features that often drain urban environments. Consequently, it's necessary to lower the elevation of cells in the DEM containing urban hydrologic features to ensure accurate flowpaths are reflected across the County. This elevation modification is often referred to as "burning".

This DEM reconditioning process can be achieved using the "1. Recondition DEM" component in the Stormwater Tool toolbox. It merges the vector NHD flowlines and Amec Single Network to create a rasterized version of this contiguous hydrologic network. The rasterized hydrologic network serves as a mask, and each hydrologic network grid cell is lowered (-3000 feet for stream cells and -2000 feet for Amec Single Network cells) in the DEM relative to neighboring cells that are not within the hydrologic network (i.e. land not within a streamchannel). Essentially, this process cuts a network of canyons into the DEM surface along cells coincident with the merged hydrologic network, which then serves to redirect local drainage into these digitally carved hydrologic network channels.

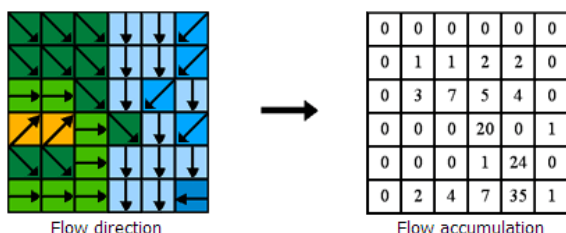


Figure 3 Source: ArcGIS Resources

Depressions and flat areas are then removed using a depression filling technique to create a hydrologically corrected DEM. The corrected DEM reflects a continuously, monotonically descending flowpath connecting each grid cell to the data edge, with burned-in canyons coincident with the mapped hydrologic network. The hydrologically corrected

DEM is then used to determine local drainage direction and flow accumulation (upslope drainage area). The local drainage direction, or flow direction, is calculated using an algorithm, which

directs flow from each cell to its steepest downslope neighboring cell. This flow algorithm uses information about local surface gradient and orientation, calculated from the DEM, to model spatial patterns of flow direction. Flow accumulation is then calculated for each cell by summing the number of cells that flow into each downslope cell. This component creates three outputs: a flow direction raster, a flow accumulation raster, and a hydrologically corrected DEM. These outputs are all stored in MS4.gdb and are used by subsequent components in the Stormwater Tool toolbox.

5.2 Update Outfalls

The County is responsible for mapping the MS4 service area and each MS4 outfall in accordance with *Part I.B.2.h*) of MS4 Permit No. VA0088595. Specifically, the County must track the information contained in Figure 4 for each MS4 outfall and its corresponding drainage area. The “2. Update Outfalls” component in the Stormwater Tool toolbox updates this information for each outfall and stores the data in the attribute table as shown below.

Figure 4 Outfall Attribution

Reporting Requirement	Field Name in Attribute Table
Individual Identification Number	“Outfall_ID”
Local Watershed	“WTRSHD_ID”
Sixth Order HUC	“VAHU6”
Receiving Water	“REACHCODE”
Latitude in Decimal Degrees	“Lat_DD”
Longitude in Decimal Degrees	“Long_DD”

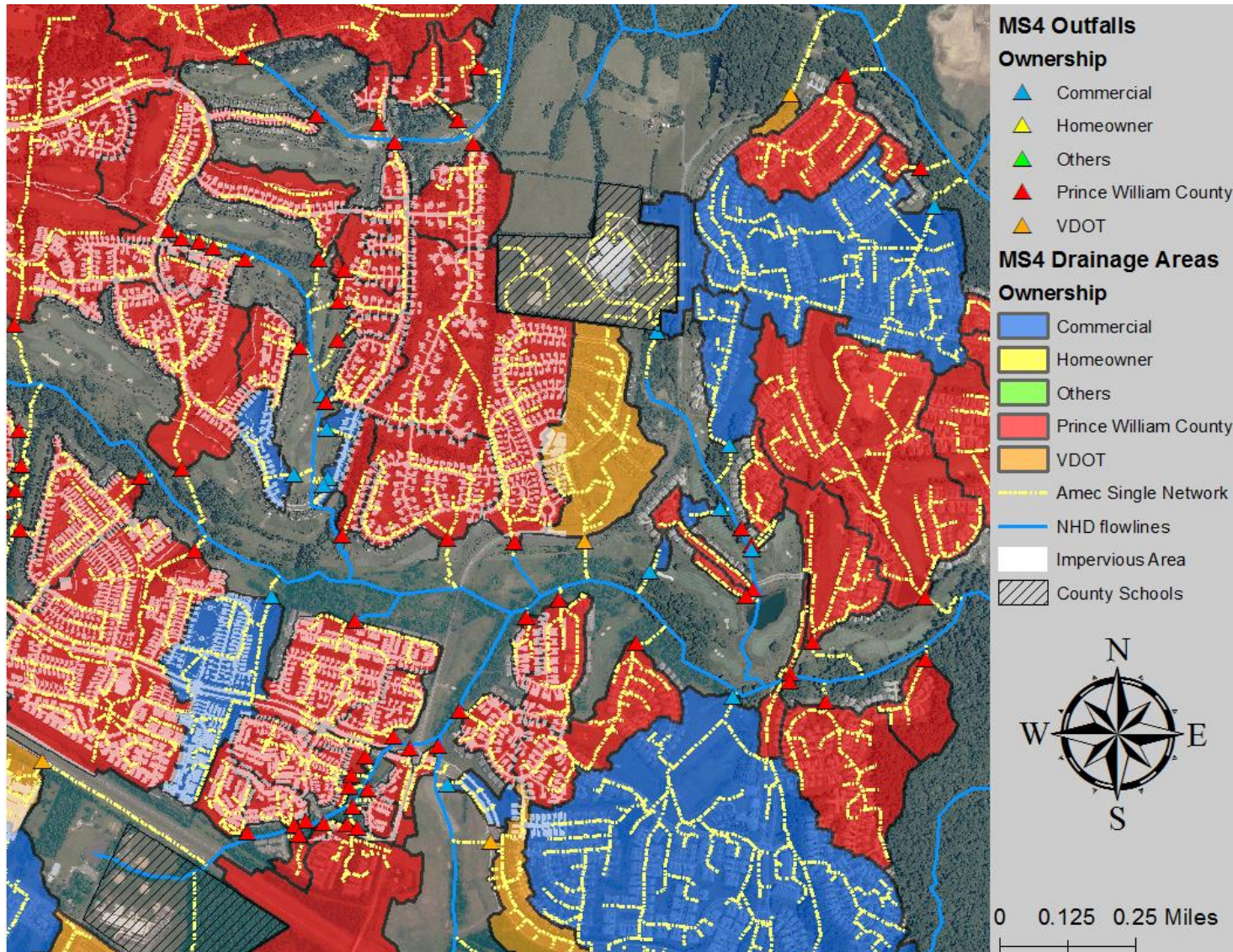


Figure 5 MS4 Outfall Drainage Area Delineation

5.3 Delineate Drainage Areas

Drainage areas for each MS4 outfall can be delineated once the DEM is hydrologically corrected and the outfall information is updated. Each outfall point location is adjusted using the Snap Pour Point tool to be coincident with the neighboring cell with the largest flow accumulation value. Snap distance is set according to DEM resolution, so outfalls can only be moved to a cell in the surrounding 3 meter x 3 meter cell window. Once the adjacent cell with the largest flow accumulation value is identified, the outfall point feature is converted to a raster and given a value based on the outfall's Individual Identification Number. The Watershed tool then calculates the upslope drainage area contributing flow to a common outlet as concentrated drainage (in the case of the Stormwater Tool, each MS4 outfall). Flow is routed from the upslope area to each outfall using the flow direction grid created in the "1. Recondition DEM" component. Unique raster drainage areas are then delineated for each outfall and converted to vector polygons.

Polygon drainage areas are dissolved based on their outfall identification number ("Outfall_ID"), to eliminate tiny, illegitimate watersheds that are a relic of the raster-vector conversion process. The Calculate Field Management tool then calculates the total drainage area, in acres, via field geometry. Next, impervious surface data (represented by *Impervious2009*) is removed from the dissolved polygon drainage areas with the Erase tool, which produces pervious surface polygons. Interconnected MS4s can then optionally be erased from the drainage areas, as well, if the user chooses. The interconnected MS4s are first merged and then erased from the pervious surface area. Then the pervious surface area is calculated in acres with the Calculate Field Management tool. The pervious acres field is then joined back to the dissolved drainage area polygons with the Add Join Management tool. Fields with each drainage area's local watershed and sixth order HUC are also added. Impervious surface area is then determined for each drainage area by subtracting attribute data for pervious acreage from total acreage. The resulting polygon feature class contains the impervious, pervious, and total acreage for each MS4 drainage area stored within attribute data. Additionally, the feature class contains pertinent information for *Part I.B.2.h) 4)* of the County's MS4 permit as of June 30th, 2009, displayed below.

Figure 6 Drainage Area Attribution

Reporting Requirement	Field Name in Attribute Table
Total MS4 Acres Served	"TotAcres"
Pervious MS4 Acres Served	"PervAcres"
Impervious MS4 Acres Served	"ImpAcres"
Individual Identification Number	"Outfall_ID"
Local Watershed	"WTRSHD_ID"
Sixth Order HUC	"VAHU6"
Receiving Water	"REACHCODE"
Individual Identification Number	"Outfall_ID"

5.4 Data Maintenance & Updates

Data can be updated to incorporate area added from new development within the County. The County's existing procedures for cataloging stormwater infrastructure are thorough; however, they will need to be supplemented to accommodate the Stormwater Tool. Specifically, three feature classes will require updates, which should be conducted as follows:

1. *Amec_Single_Network*¹ – New County stormsewer lines should be loaded into the *Amec_Single_Network* feature class in ArcCatalog. Users should then connect the new features to the existing *NHD_flowlines* using a DEM to determine the downslope flowpath to the stream. Additionally, there are several considerations to make when adding segments to the Amec Single Network:
 - a. Avoid hydrologic loops (i.e. flow should travel downstream in a single path and avoid braiding).
 - b. Do not create *Amec_Single_Network* segments that are closer to each other than the DEM resolution you plan to use in the Stormwater Tool. For instance if you plan to use a 10 foot resolution DEM (~3 meter), segments should be at least 10.1 feet away from one another.
 - c. Check that all *Amec_Single_Network* segments are connected and snapped to the *NHD-flowlines*, otherwise they will be filled during the “1. Recondition DEM” component run. This can be verified using the Topology toolset within ArcGIS.
2. *ms4_outfalls*² - MS4 outfalls should be added when new manmade infrastructure is integrated into the County's stormsewer lines data. The outfalls should be placed at the end of manmade infrastructure (i.e. new stormsewer lines), but far enough away (3.5 times the DEM resolution) from the *NHD_flowlines* to avoid being snapped to the stream network during the processing for the “3. Delineate Drainage Areas” component. The “Ownership” and “Origin” fields need to be input as well. “Ownership” is assigned based on the “MAINT” code for each terminal segment of new infrastructure (i.e. the last stormsewer segment) and “Origin” is determined by the terminal segment's “SYM” code.

1 This is a modified County stormsewer feature class that establishes hydrologic connectivity between the County stormsewer system and the stream network. It includes both the County modified stormsewer system and user-created hydrologic connections to the stream network.

2 A feature class containing points demarcating where the municipal separate stormsewer (MS4) discharges to waters of the United States. Outfall ownership and origin (origin refers to the infrastructure or data that identified the point as an MS4 outfall, ex. rip-rap ditch) are assigned upon creation by the user according to preset domains.

3. *BMPs*³ - BMP outfalls need to be added when new stormwater management facilities are added to the existing inventory. Outfalls should be placed at the terminus of the BMP and snapped to either Amec Single Network or the NHD flowlines.

5.5 Demonstration: Expanding the Infrastructure Network

The Stormwater Tool operates using its own geodatabase, which was based on the County's existing stormwater data, as its data source. As development occurs in the County, new stormwater infrastructure will continue to be integrated into the County's data through the existing data entry tool. **This new data still needs to be incorporated into the Stormwater Tool's geodatabase.** This section provides a step-by-step illustration of how to: 1) load new stormwater infrastructure into the Stormwater Tool's geodatabase, 2) add and assign MS4 outfalls, and 3) run the Stormwater Tool. This process will compliment the County's robust data entry tool and also allow the County to produce an updated MS4 service area throughout permit phases.

5.5.1 Loading New Infrastructure into the Stormwater Tool's Geodatabase

Amec Foster Wheeler received stormwater infrastructure data from the County in October of 2015. Existing stormsewer data from this time served as the basis for the creation of the Amec Single Network⁴. Since the County's existing stormsewer system lacked hydrologic connections to the stream network, Amec Foster Wheeler edited the stormsewer system to create hydrologic connections between the stream network and stormwater infrastructure.



Figure 7 New Urban Development

Additional data editing - such as eliminating hydrologic loops, clarifying flowpaths, etc. - further modified the County's existing stormsewer network. The result of these efforts was the creation of the Amec Single Network, which represents a contiguous, hydrologically connected stormsewer system.

New areas of stormwater infrastructure should be added to the Amec Single Network by replicating this process. The first step in replicating this process is to load newly entered stormwater infrastructure data into the Stormwater Tool's geodatabase. Note that this data was first entered into the County's system using the data entry tool. Figures below demonstrate how to complete the loading process in ArcCatalog.

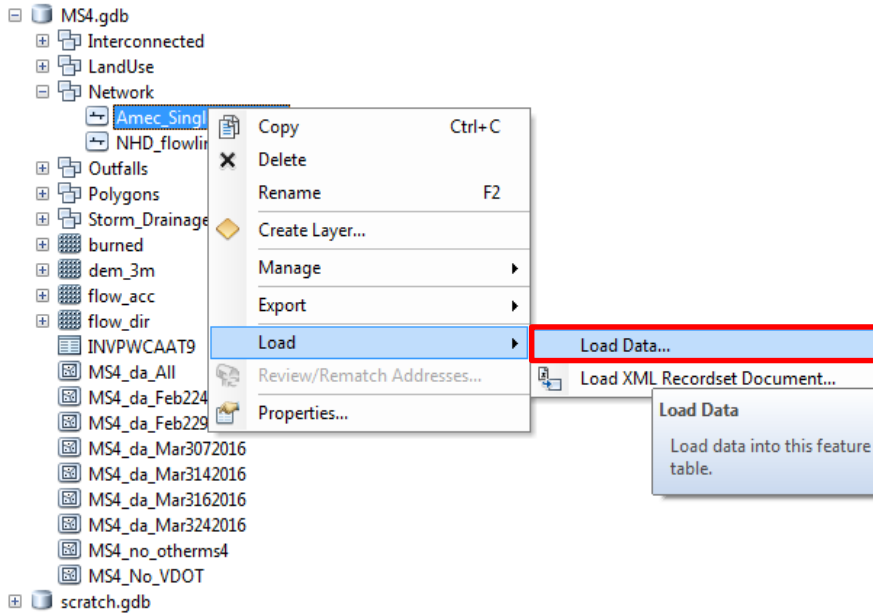
3 A feature class containing the outfalls for the historic best management practices (BMPs) in Prince William County.

4 Modified County stormsewer feature class that establishes hydrologic connectivity between the County stormsewer system and the stream network. It includes both the County stormsewer system and hydrologic connections to the stream network, both of which were edited by Amec Foster Wheeler under direction from the County. MS4 and BMP outfalls are snapped to this feature class.

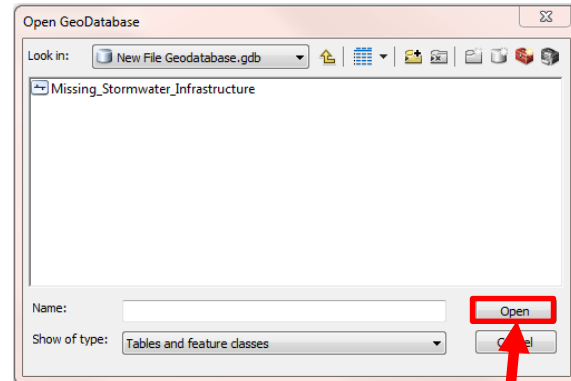
Beginning: Open ArcCatalog and navigate to MS4.gdb



1



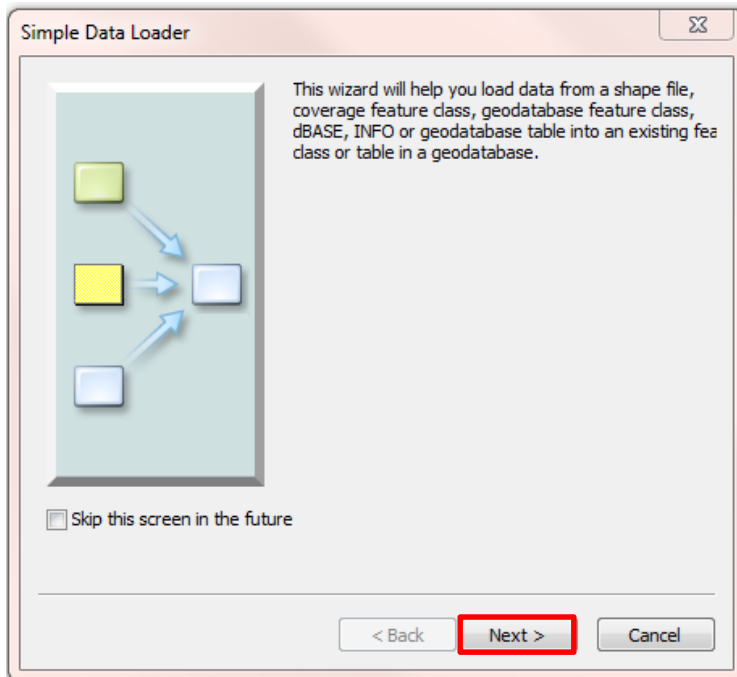
4



Navigate to the file pathname of the new or missing data you would like to load into the existing feature class. Select the data and then click 'Open'.

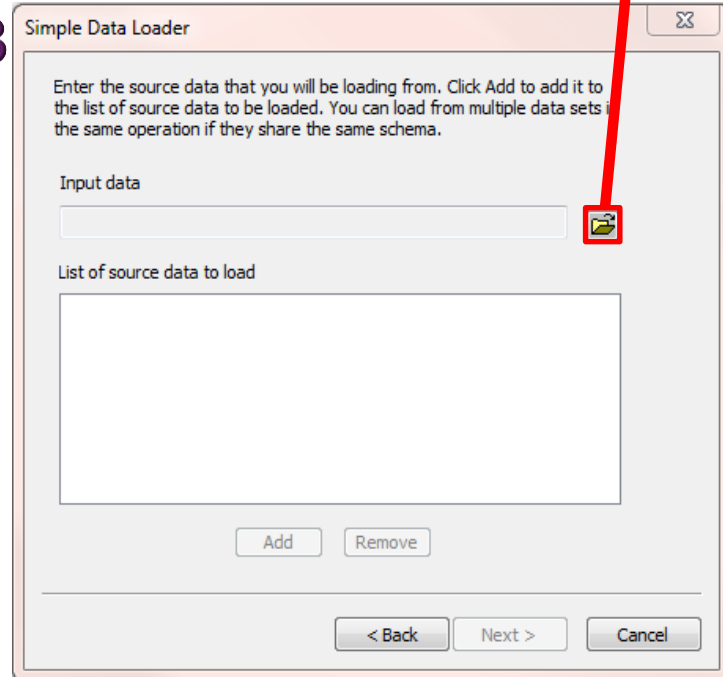
Load the new stormwater infrastructure data into the appropriate feature class in ArcCatalog. For instance for new stormsewer lines data, right click on Amec_Single_Network, then select "Load" and then follow the navigation arrow to "Load Data..."

2



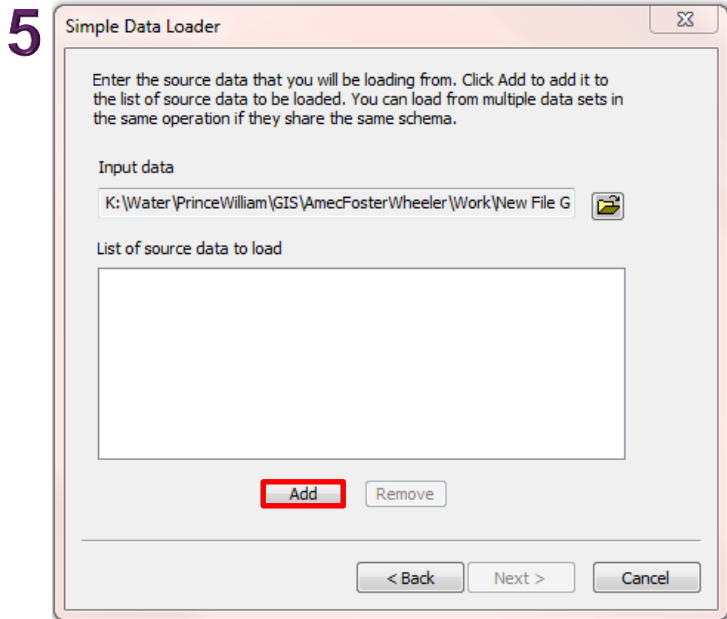
Simple Data Loader wizard opens, click 'Next >'.

3

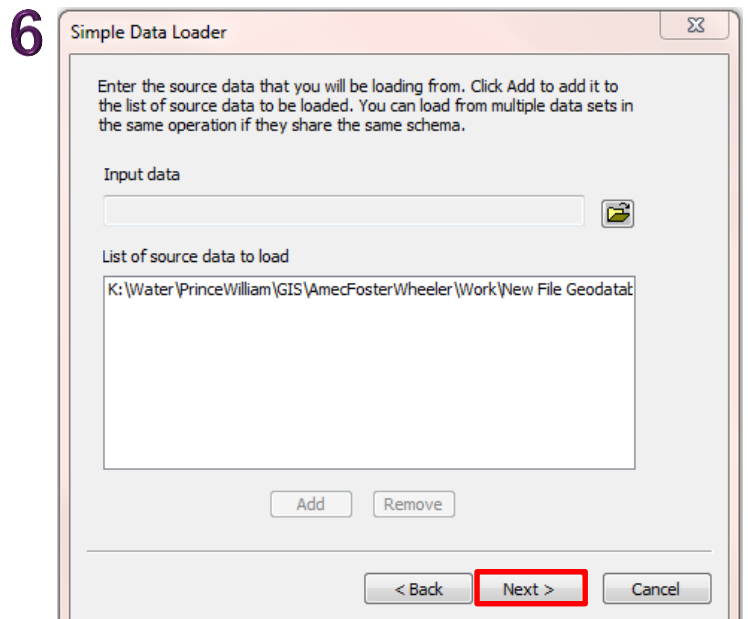


Under 'Input Data' click the open folder button.

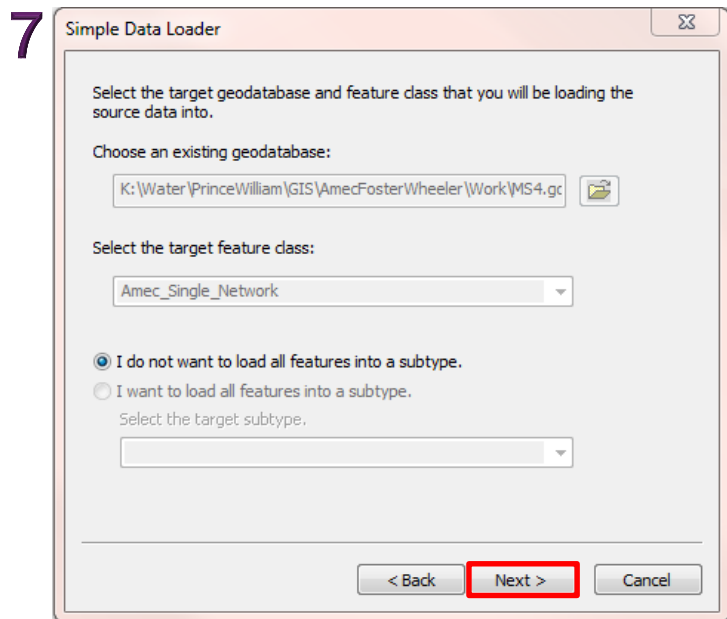
Amec Foster Wheeler Environment & Infrastructure, Inc.



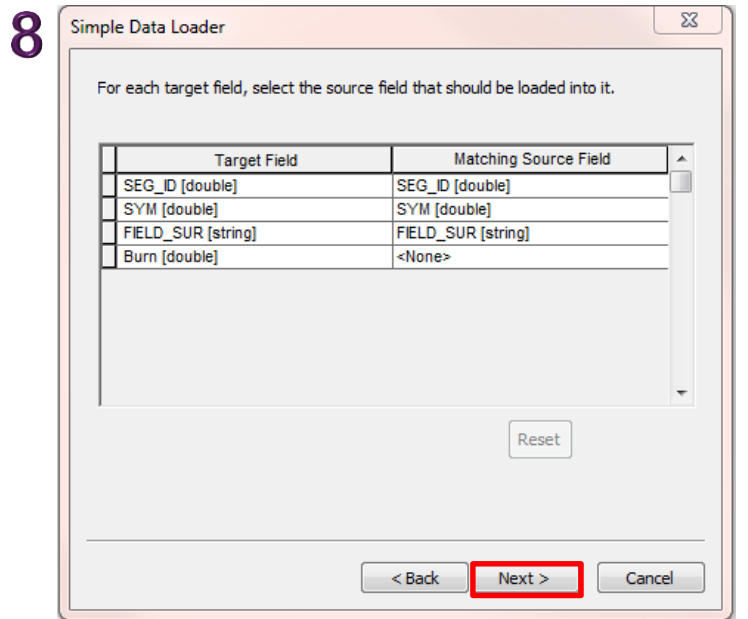
If the “Input Data” file pathname is correct, click the “Add” button.



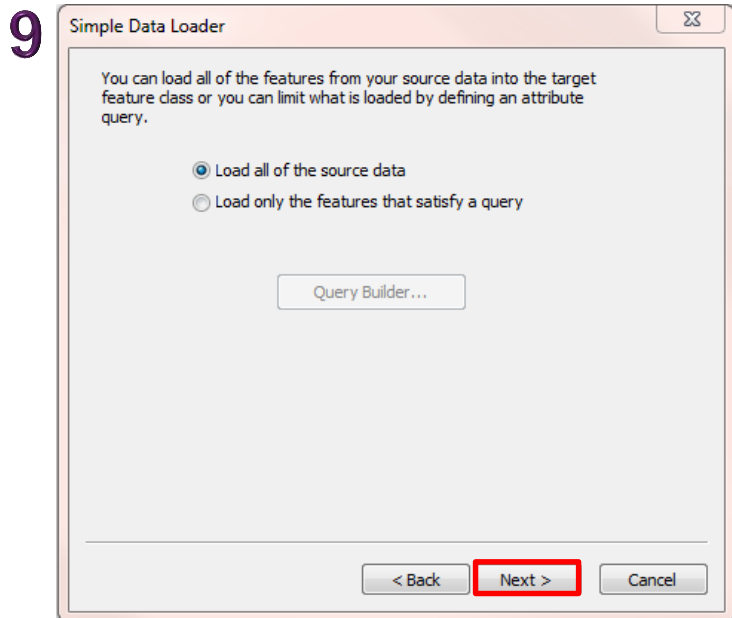
The pathname to the new or missing data should now be listed under ‘List of source data to load’. More than one data class source can be loaded into an existing feature class by repeating steps 3 - 5.



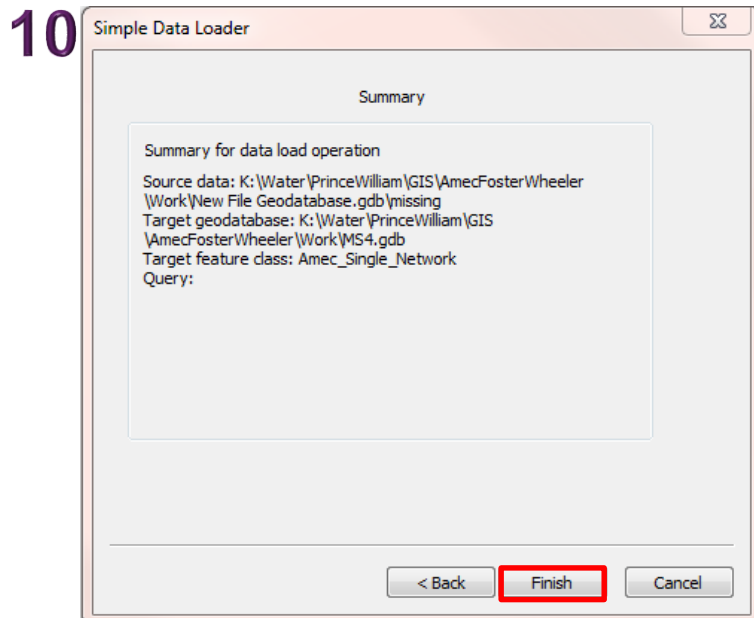
Select ‘Next’.



Make sure that the relevant fields from the new or missing data (‘Matching Source Field’) match the existing feature class (‘Target Field’).



Click the 'Load all of the source data' radio button. Then select 'Next >'.



Select 'Finish'.

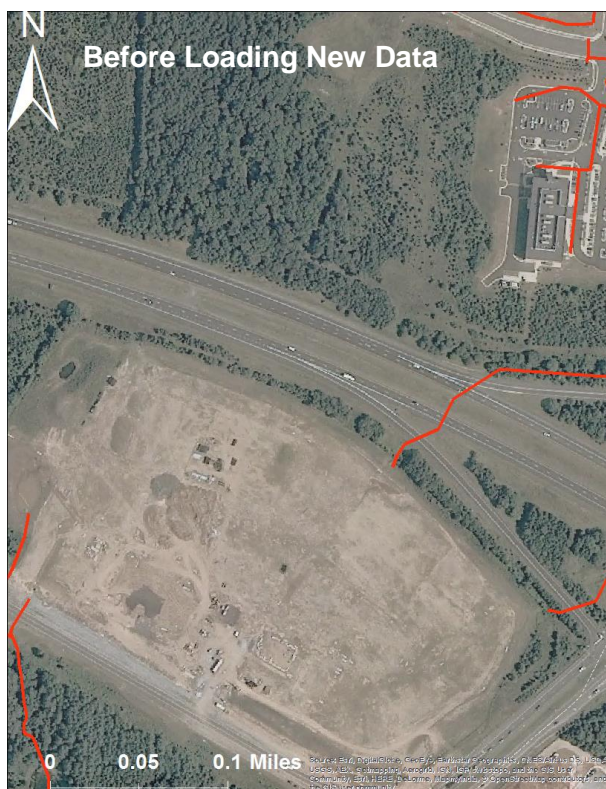
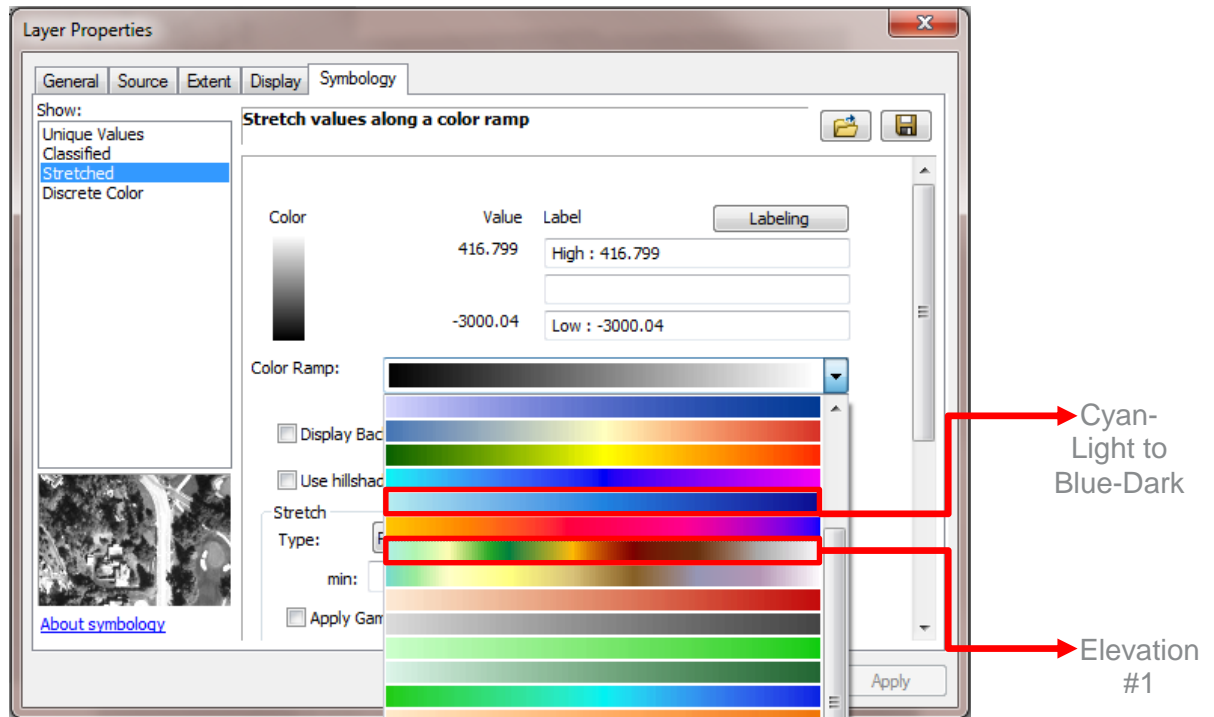
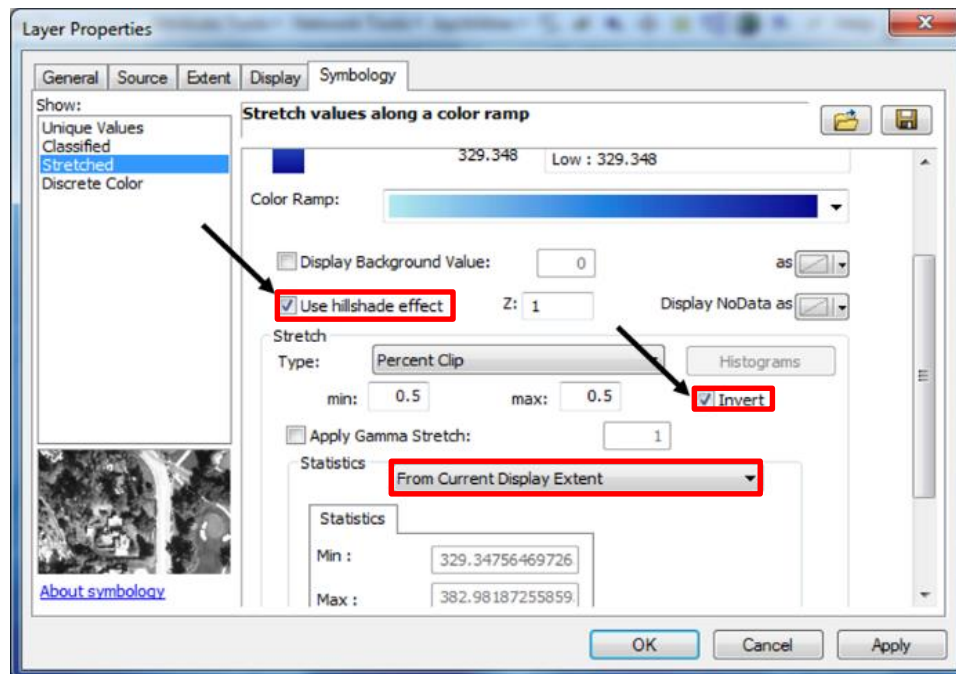


Figure 8. Depicts post-2009 development along Highway 15 and I-66 in Haymarket, VA. The image on the left shows the location in 2009, while the image on the right shows the area in 2015 after loading the new data into the Amec Single Network. Newly added segments still require editing to create a hydrologic connection. Editing procedures for creating this hydrologic connection are described below.

5.5.1 Recommendations for Setting DEM Symbology Prior to Editing

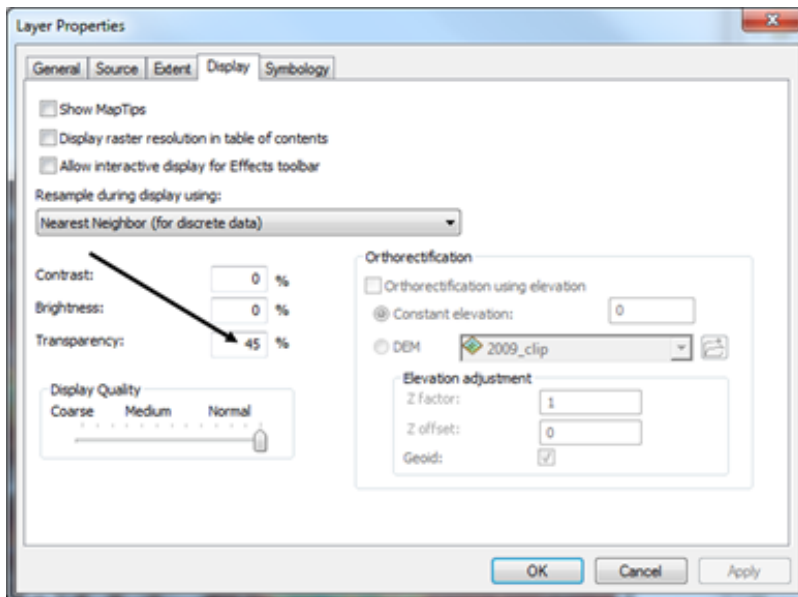


Under the Symbology tab, select the Elevation #1 color ramp. Alternatively, using the Cyan-Light to Blue-Dark color ramp is helpful when visualizing river valleys.

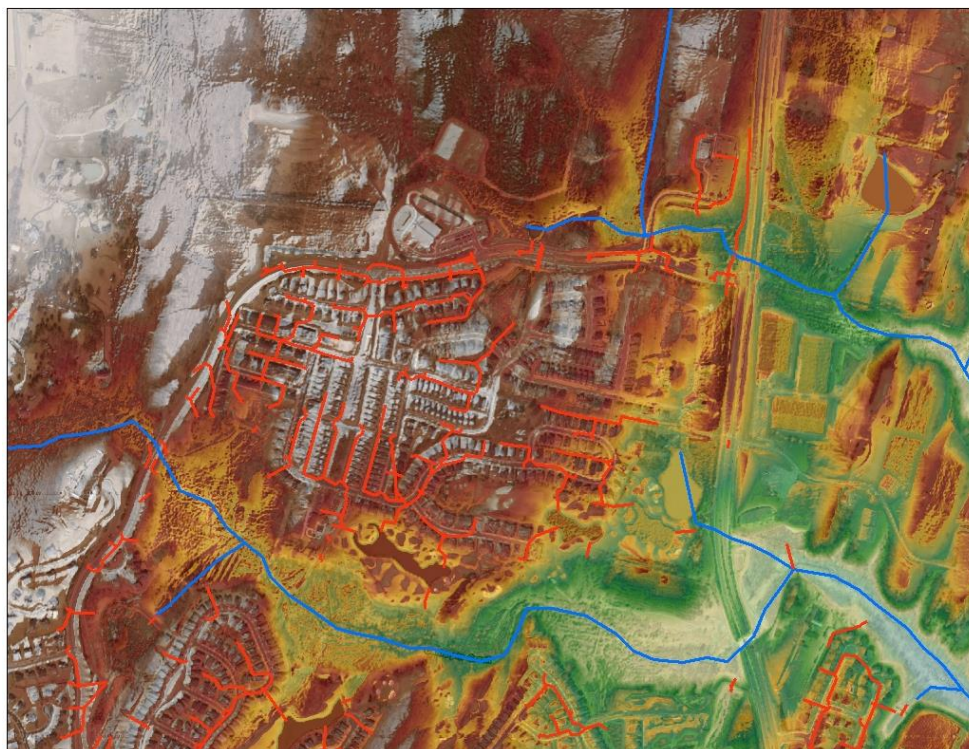


Scrolling down within the window of the Symbology tab will bring up the 'Stretch' menu. Under 'Statistics', select 'From Current Display Extent'. This will create a dynamic DEM display within

the map document, allowing for easier visualization of local flow patterns. Additionally, select the check boxes for “Use hillshade effect”. If using the blue color ramp, select “Invert”.



Adjusting the transparency of the DEM makes the layer a useful overlay to get a sense of the topography in relation to what’s displayed in the aerial imagery. Within the Display tab, set the Transparency level to a value that allows for the aerial imagery to be clearly visible through the DEM surface (45% is recommended, see above). The resulting DEM symbology should be similar to what is shown below.



5.5.2 Assign Jurisdictional Outfalls



Figure 9. This view shows what the user would see after loading in a new set of stormwater infrastructure into the geodatabase. MS4 outfalls and hydrologic connections still need to be added by the user. Note the stormwater infrastructure is a discontinuous network within itself, but also lacks continuity with the NHD Flowlines.

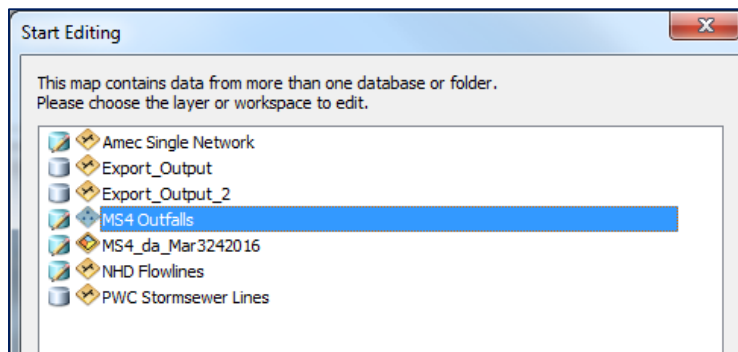
The first step in preparing the newly loaded infrastructure for analysis within the Stormwater Tool is identifying jurisdictional outfalls and assigning proper ownership. The following examples illustrate two common situations a user may encounter where a jurisdictional outfall must be assigned: BMPs (Figure 10) and grass swales or ditches extending from subsurface pipes (Figure 11). Before we add outfalls, we must begin an editing session that will allow us to add to the infrastructure network.

Starting an editing session

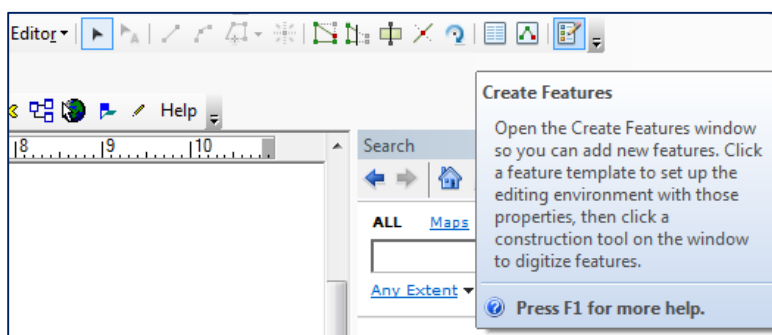
From the top ribbon within ArcMap, select Customize → Toolbars → Editor. The Editor Toolbar will appear. Click on the Editor drop down menu and select “Start Editing”.



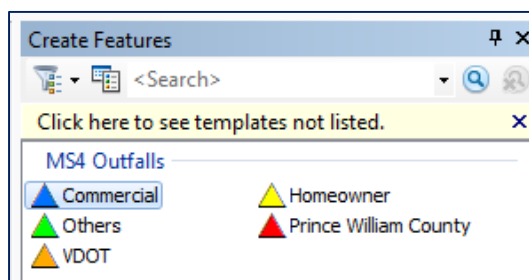
Within the Start Editing window, select the layer you will be editing. For the next session, you will be adding outfalls, so select MS4 Outfalls (or the name of the layer as it appears in the ArcMap window). You will be adding new outfalls to the layer of outfalls that have been already mapped by Amec Foster Wheeler.



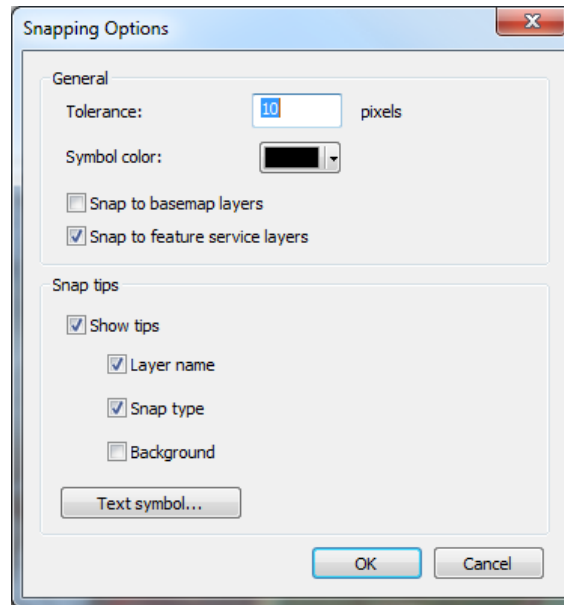
Returning to the Editor drop down menu, select Editing Windows → Create Features. The Create Features window can also be accessed from the Editor Toolbar.



Within the Create Features window, you can select which type of outfall you would like to add, by Ownership. This is explained in greter detailed previously in this document. The first outfall we will be assigning is for a commercial BMP, so select “Commercial”.



It is important to check that the points are snapping to stormwater infrastructure segments. You can access Snapping Options from the Editor drop down menu (Editor → Snapping → Snapping Options). Verify that “Snap to feature service layers” is selected.



You can now assign the commercial outfall for the BMP of interest.

Outfall Addition Example 1: BMPs

Consider the position of the BMP within the stormwater drainage network. There are two stormwater pipes draining to the pond, with flow direction heading south. This infrastructure will be connected at a later step, but for now we are concerned with assigning the outfall at the terminus of this system. Examining the NHD confirms that flow is draining south of the BMP, and an outfall is added (Figure 9).

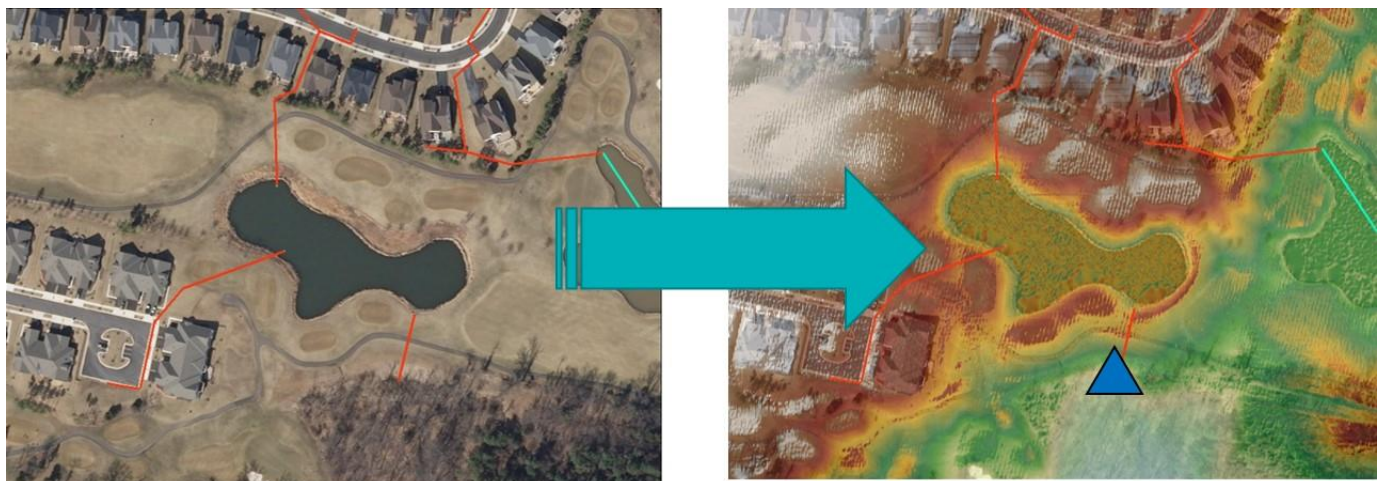


Figure 10. BMP outfall assignment. Note that the two upstream segments are not assigned outfalls, as they do not lie at the terminus of the stormsewer system.

Outfall Addition Example 2: Ditches

While the rationale behind this assignment is straightforward (the outfall is placed at the end of the line segment), it is important to note that line segments within the Stormsewer Lines or Amec

Single Network layers are not all representative of 'solid' infrastructure, such as pipes, grates, and culverts, but can represent the drainage ditches that were excavated out of the sides of hillslopes for facilitating storm drainage to river valleys. Further aerial imagery analysis can assist in clarifying any uncertain areas.

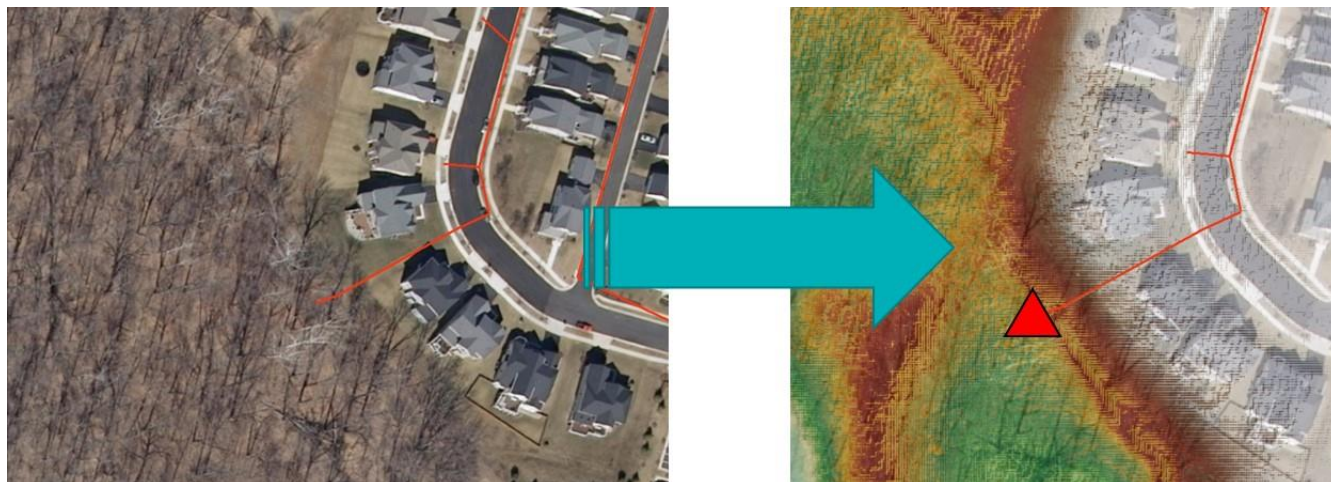


Figure 11 Rip rap ditch outfall assignment. Note that the outfall has been placed at the end of the line segment. Outfall location can be verified using other aerial imagery services, such as Bing or Google Maps.

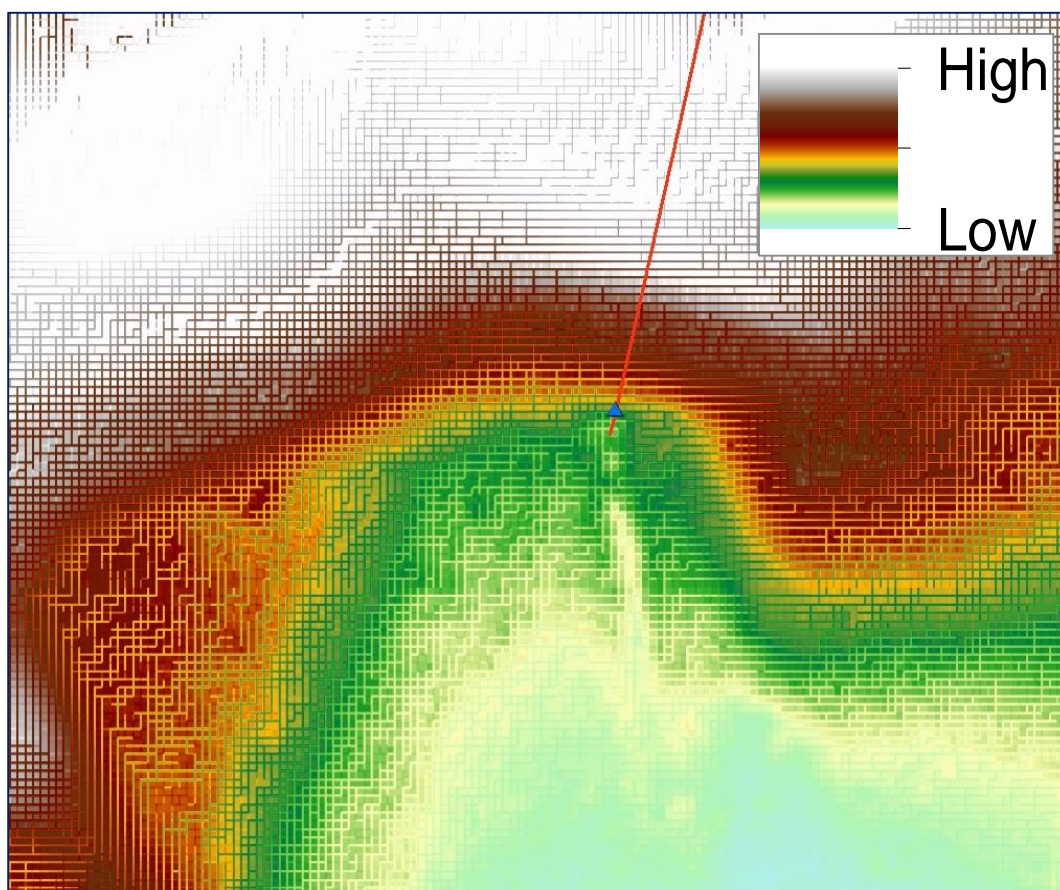


Figure 12 Enhanced view of Figure 10. It is critical to understand the rationale behind outfall placement.

Figure 12 illustrates an important point in placing outfalls. The user must not place an outfall where it will capture upstream flow that does not originate from the MS4 (i.e. river valleys). Figure 12 is an enlarged image from Example 1 from this exercise: at the terminal point of the commercial BMP drainage system. Careful outfall placement will provide the most precise results.

5.5.3 Add Hydrologic Connection

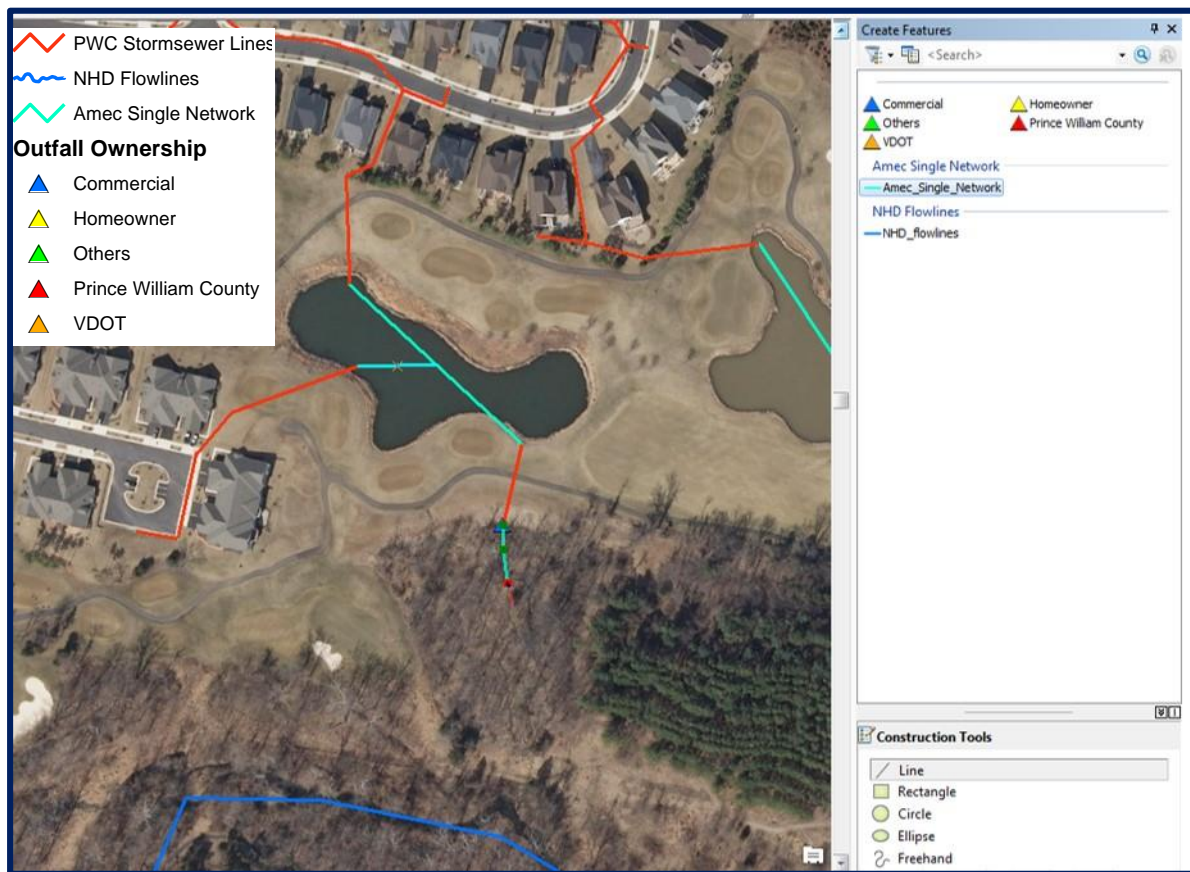


Figure 13 Opening the Create Features Toolbar will allow the user to draw segments connecting the infrastructure to NHD flowlines.

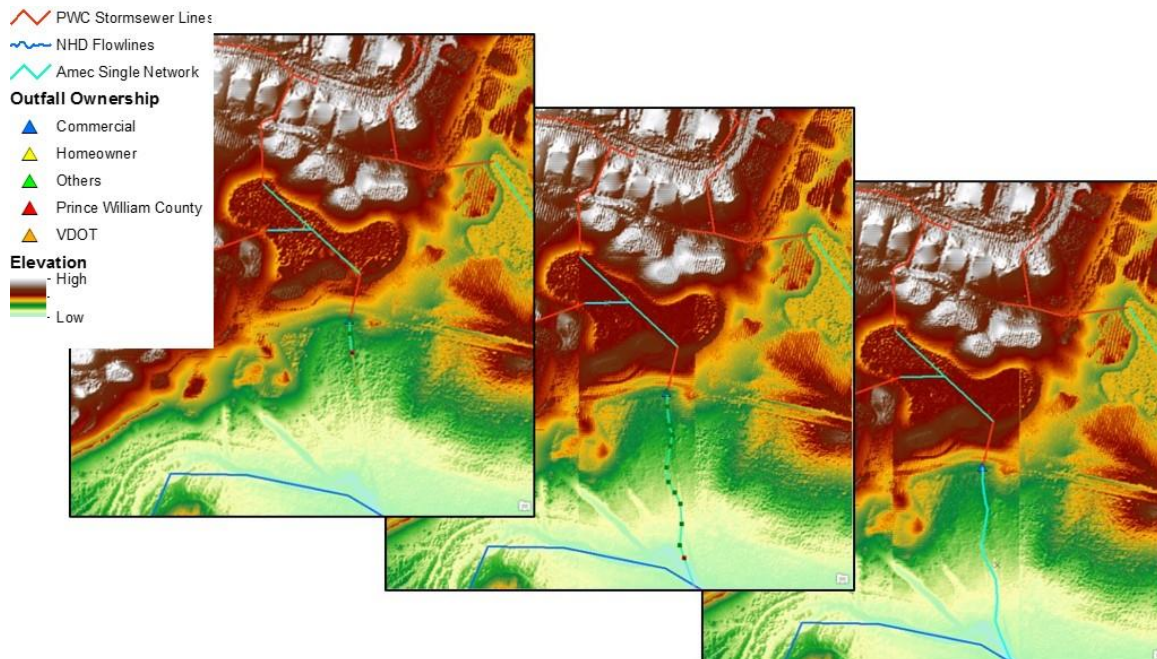


Figure 14 Addition of hydrologic connection segment originating from a BMP.

Maintaining a contiguous network of stormwater flow patterns is necessary for reconditioning the DEM in a later processing step. These concepts are further explained in Sections 5.1 and 5.3. Check that the Spatial Analyst extension for your ArcMap license is enabled (Customize → Extensions → Spatial Analyst) and the Editor Toolbar is open (Customize → Toolbars → Editor). Start editing Amec_Single_Network by adding new segments connecting stormwater infrastructure to the NHD Flowlines. Use the 1 meter DEM as a reference to check that the new network is reflecting local hydrologic flow patterns. Results can be seen in Figures 14 and 15.

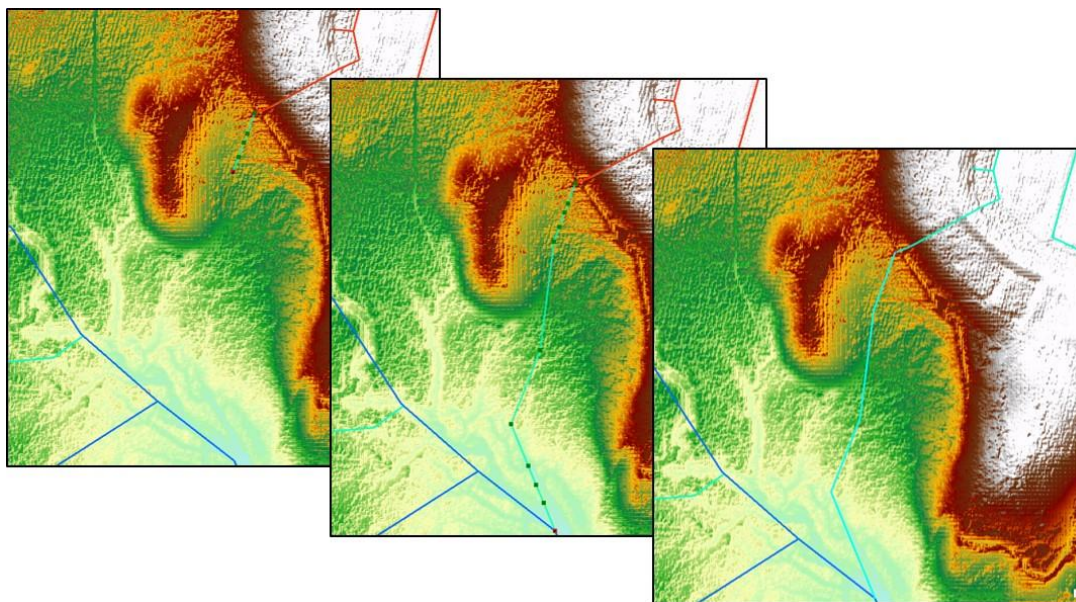


Figure 15 Addition of hydrologic connection segment originating from a drainage ditch.

5.6 Demonstration: Running the Stormwater Tool

Open a new map document without loading in any layers. Any layers that are in use during the time of the Stormwater Tool run will create a schema lock and prevent it from functioning. Navigate to “Stormwater Tool.tbx” within the catalog, and open up the first component script, “1. Recondition DEM”.

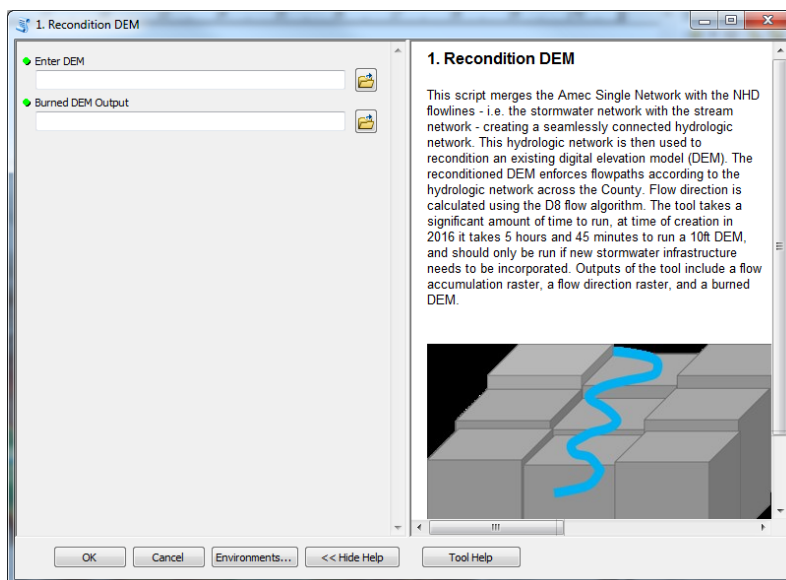
5.6.1 Recondition DEM

This component merges the stormwater network with the NHD flowlines, creating a contiguous network in order to accurately capture localized flow patterns in the reconditioned DEM. This allows for the Stormwater Tool to effectively model stormwater flow at a county-wide scale using simple surface flow hydrology principles.

Enter DEM: Specifies the DEM to be reconditioned. Any DEM

can be used; however, the resolution should be at least 10 feet (or 3 meters). Increases in resolution will result in longer processing time. A suitable 3 meter DEM of the County is included in the MS4.gdb.

Burned DEM Output: Specifies the output location for the reconditioned DEM. Select “scratch.gdb” and name the output “burned”. Alternatively, it can be stored wherever the user desires. After the desired input and output locations are specified, click ‘OK’ to begin processing. The reconditioned DEM should display a network of cells that overlaps with the NHD and



Stormwater Network polylines. Overlaying the 'burned' DEM with the demonstration area will show a similar visual as seen below:

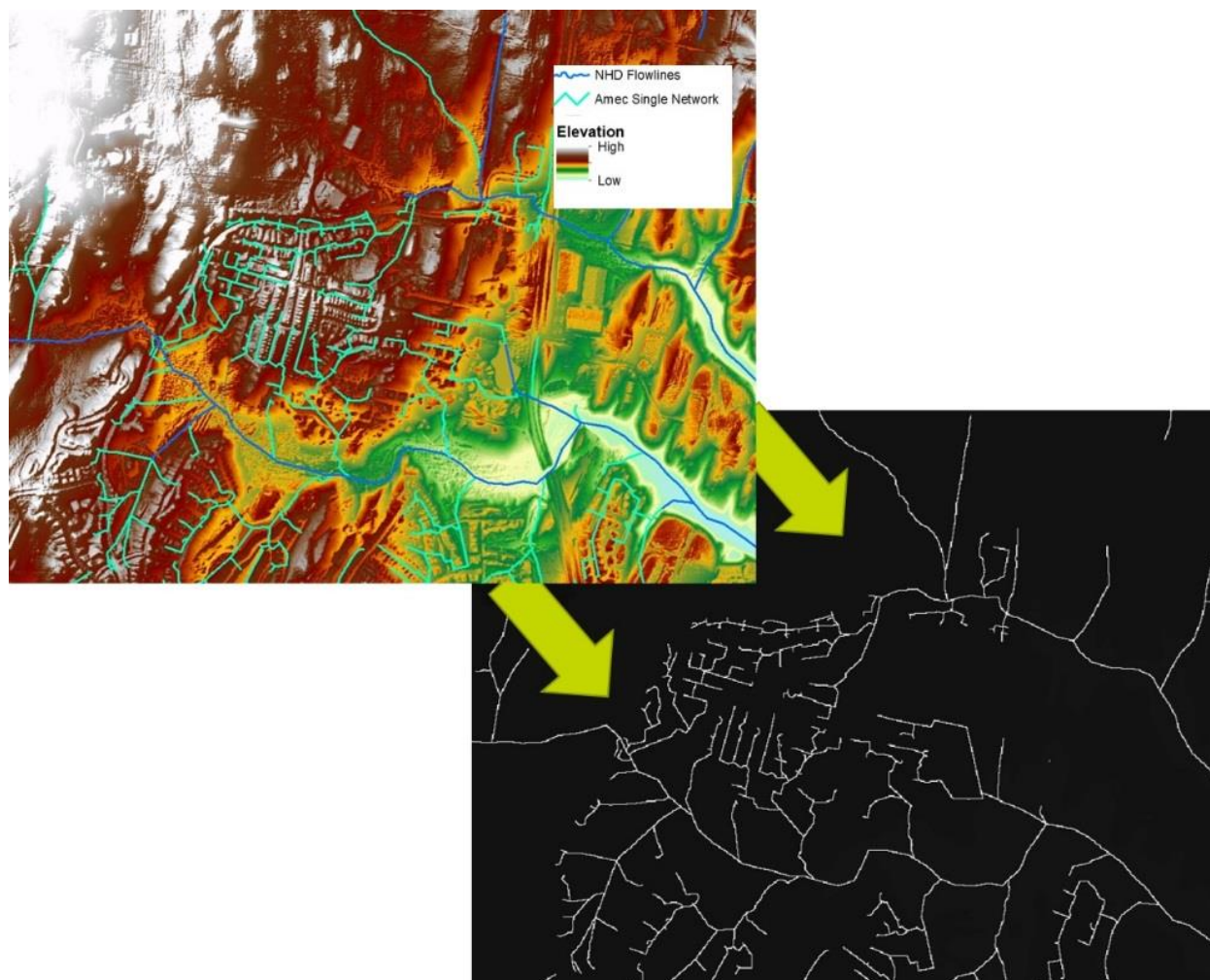


Figure 16 The DEM displays the merged stormwater infrastructure and hydrologic connection networks and NHD Flowlines (collectively known as the Amec Single Network) that were burned into the DEM raster surface. The stark contrast in elevation shows the 'canyons' created by the DEM reconditioning. Using this reconditioned DEM ensures the calculated flow accumulation captures accurate storm flow overland into stormwater conveyances.

5.6.2 Update Outfalls

This component does not produce any new layers that can be observed. Outfall attribute data are being updated to serve in the County's record keeping as required by *Part I.B.2.h) 4)* of their VSMP Permit.

This component uses "joins" to update the attribute table for "ms4_outfalls" so that the Stormwater Tool outputs contain information required by the County's MS4 permit.

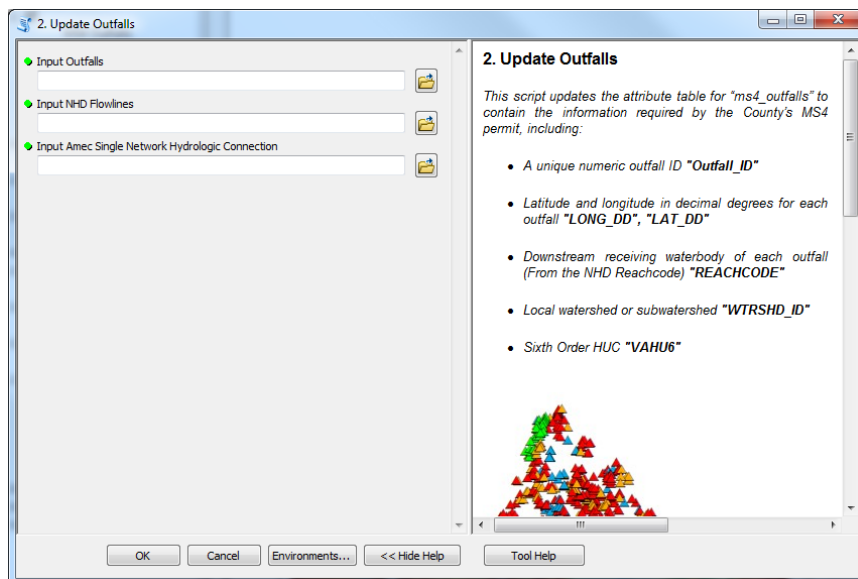
- It assigns a unique outfall ID to each point for use in later tool functions
- It finds the points of intersection between the County's stormwater network and NHD flowlines to identify receiving waterbodies for each outfall, performs a watershed delineation to these points, and then spatially joins the Reach Code for each relevant branch with its outfall.
- It identifies the lat/long for each outfall
- It identifies the HUC12 and Local Watershed (fifth and sixth order) that each outfall discharges stormwater

Input Outfalls: Input the outfall point feature class to assign information. To input the County's MS4 outfalls, navigate to the "Outfalls" feature dataset in the MS4.gdb and select "ms4_outfalls"

Input NHD Flowlines: Specifies the NHD flowlines used to assign receiving waterbody information. Navigate to the "Network" feature dataset and select "NHD_flowlines".

Input Amec Single Network Hydrologic Connection: Specifies the stormwater network to be used. Navigate to the "Network" feature dataset and select "Amec_Single_Network".

The following information has been added to the attribute data for "ms4_outfalls": receiving waterbody, local watershed (Virginia Sixth Order), HUC12, and latitude/longitude coordinates. You can verify this by opening the attribute table (Figure 17).



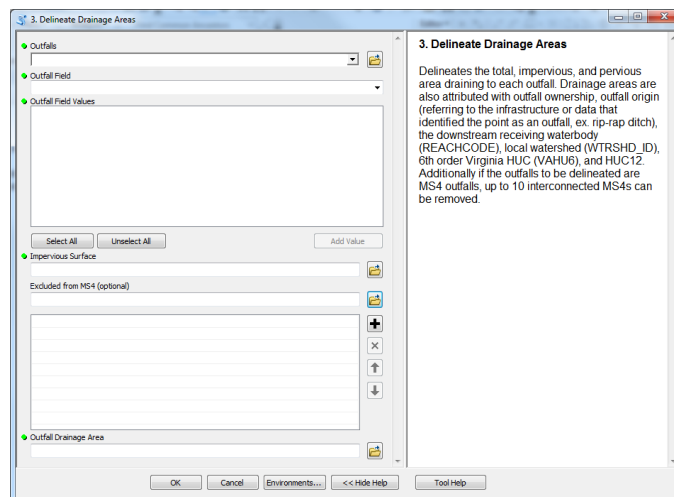
OBJECTID *	SHAPE *	Ownership	Origin	Outfall_ID	REACHCODE	VAHU5	VAHU6	HUC_12
1	Point	Prince William County	BMP	1	02070010003058	PL-O	PL41	020700100801
2	Point	Commercial	RRD	2	02070010001992	PL-N	PL42	020700100701
3	Point	Prince William County	GD	3	02070010001981	PL-N	PL42	020700100701
4	Point	Prince William County	GD	4	02070010001977	PL-N	PL42	020700100701
5	Point	Prince William County	GD	5	02070010002023	PL-N	PL42	020700100701
6	Point	Prince William County	GD	6	02070010000835	PL-N	PL42	020700100701
7	Point	Commercial	BMP	7	02070010000835	PL-N	PL42	020700100701
8	Point	Others	STP	8	02070010000849	PL-N	PL42	020700100701
9	Point	VDOT	STP	9	02070010002060	PL-N	PL42	020700100701
10	Point	Commercial	BMP	10	02070010000848	PL-N	PL42	020700100701
11	Point	Commercial	BMP	11	02070010000848	PL-N	PL42	020700100701

Figure 17 Attribute table for resulting updated outfall information.

5.6.3 Delineate Drainage Areas

This component delineates the drainage area to each outfall, and then assigns the relevant data mentioned in 'Update Outfalls' tool from the corresponding outfalls.

- After performing the watershed delineation for each outfall in `ms4_outfalls`, it converts the resulting rasters to polygons
- It calculates the total pervious area contributing runoff within each drainage area by erasing the impervious area from the total drainage area
- It calculates the total impervious area contributing runoff by subtracting the pervious area from the total area for each drainage area polygon
- It spatially joins the attribute information from “`ms4_outfalls`” to the drainage area polygons by identifying each polygons’ corresponding outfall that lies “within” the polygon.



Note that use of this component will cause the Frequency tool to concurrently run as the user makes a selection of Field categories to select outfall ownership types. This is due to validation Python code that interacts with ArcMap and updates field values to be selectable for the user.

Input Outfall Points: Requires the drainage delineation point input file. Attribute information for “ms4_outfalls” has now been updated. Navigate to the “Outfalls” feature dataset and select it.

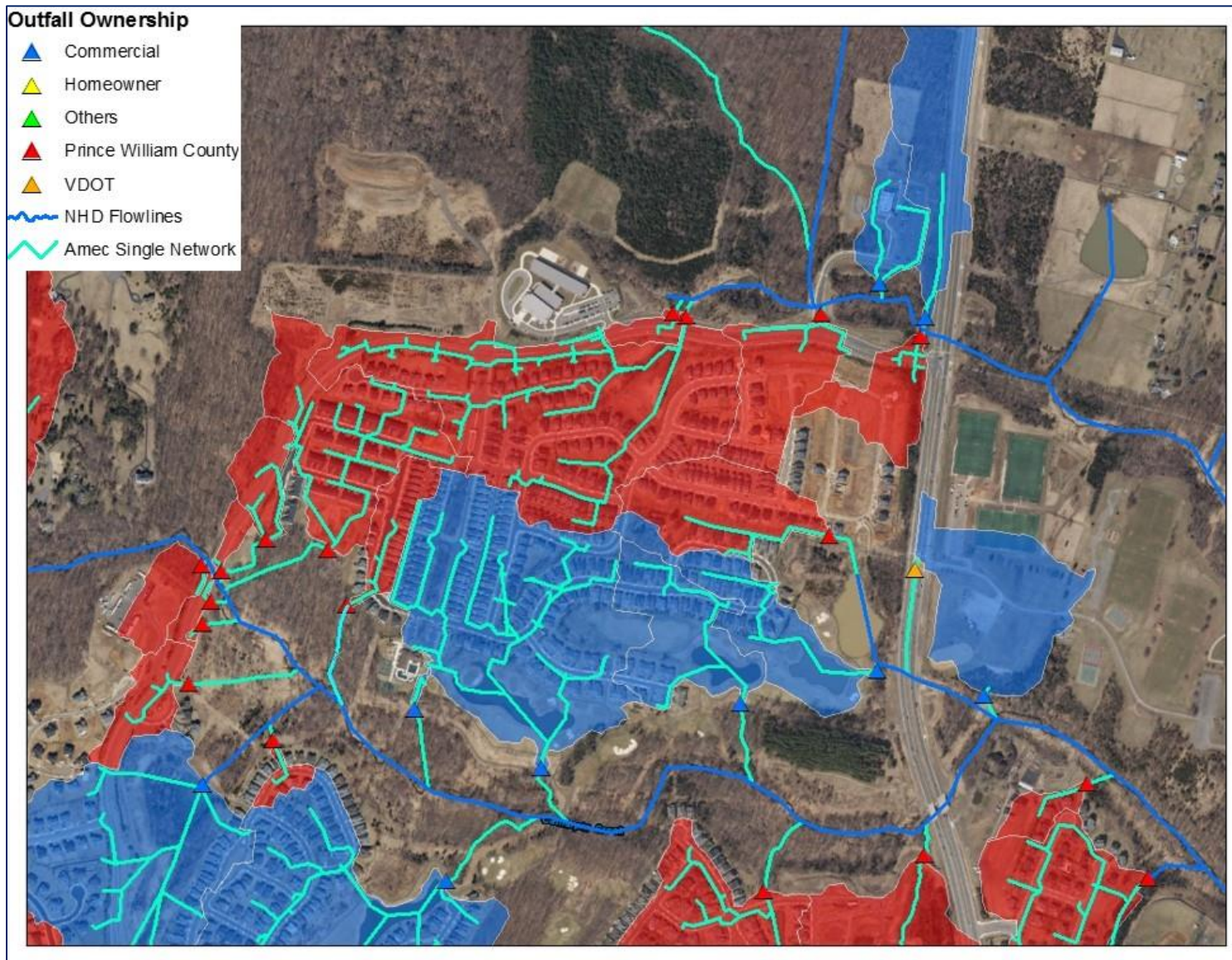
Outfall Field: Specifies the field from the attribute table that the MS4 drainage area selection will use. Choose “Ownership” from the drop-down menu.

Outfall Field Values: Allows the user to select which values to select from the specified field in the “ms4_outfalls” attribute table. The subarea for this exercise only contains outfalls owned and maintained by the County and Other entities. Select “County” and “Other”.

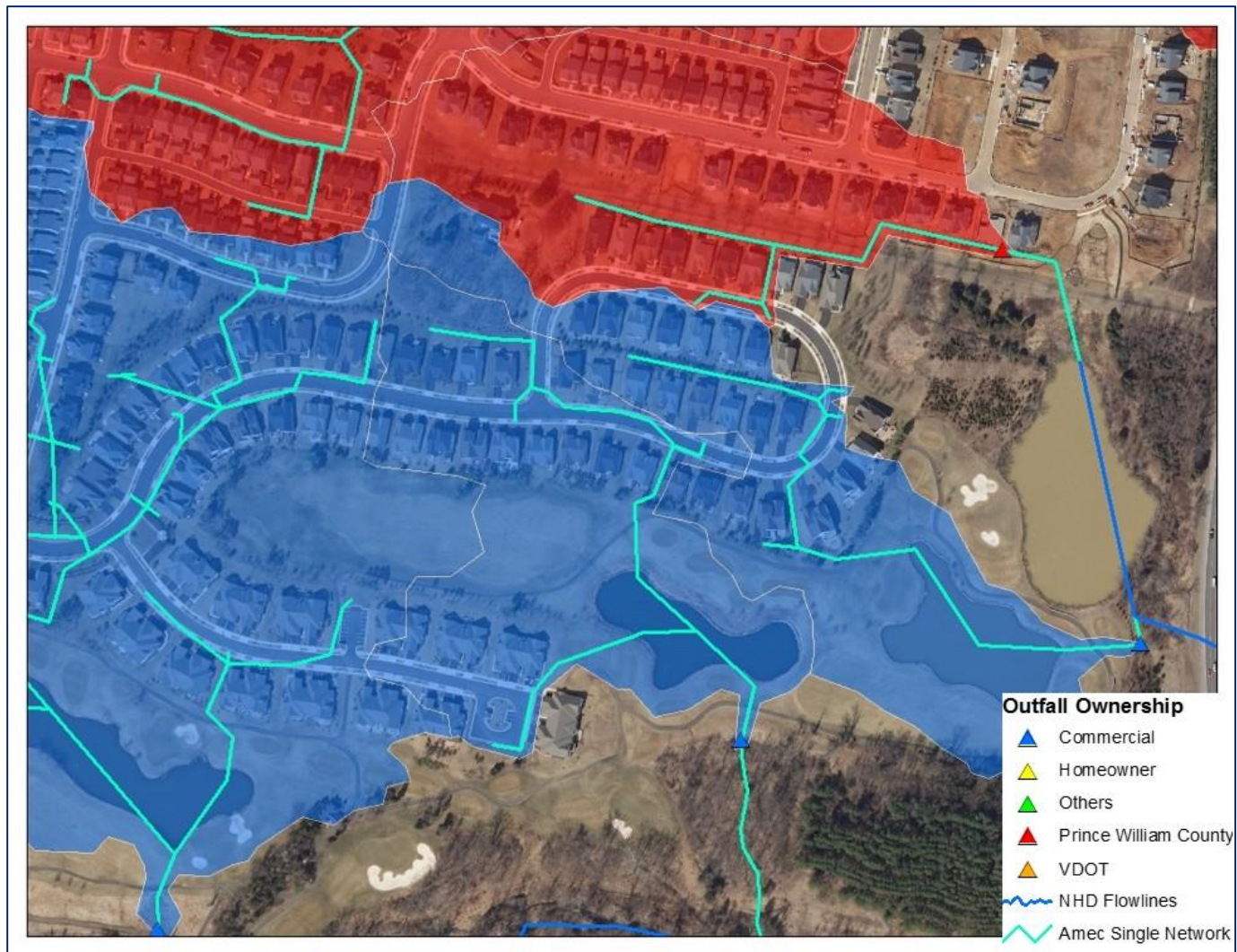
Impervious Surface: Lets the user specify which impervious surface data to use to determine the impervious area for each drainage area. This allows the County to update their drainage areas with each permit cycle (impervious data from 2009 will be used in phase 1 of the cycle).

Excluded from MS4: Permits the user to remove areas that should be excluded from the MS4 drainage area calculations. This includes interconnected MS4s (e.g. VDOT) and areas specifically excluded from regulated urban impervious and pervious cover, such as forested lands. These are all contained in the feature dataset “Interconnected”.

Outfall Drainage Area: Specifies the file name and location for the output of the component. Once a filename is specified, the ‘Delineate Drainage Areas’ tool may be run.



Focusing in on a familiar area can reveal more about the particular details of the contributing stormsewer system. Notice that the area drained by the Amec Single Network and the NHD flowlines are flowing to the outfalls, which serve as accumulation nodes for those upstream networks of pipes, streams, and BMPs.



Finally, users attempting to determine the MS4 service area should remove all excluded lands contained in the 'Interconnected' feature dataset. This can be achieved in the 'Delineate Drainage Areas' component in the 'Excluded from MS4' parameter. The result of removing these areas from the MS4 service area (undeveloped forested land, interconnected MS4s, and VPDES permitted entities) is depicted below.

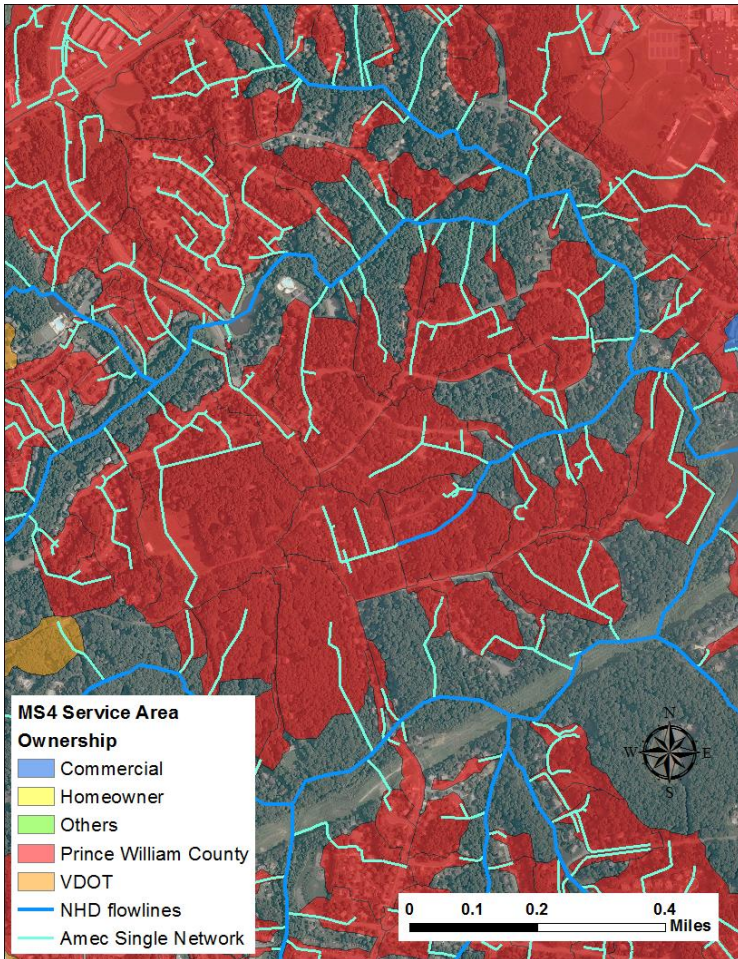


Figure 18 MS4 Service Area Before Removing Excluded Areas

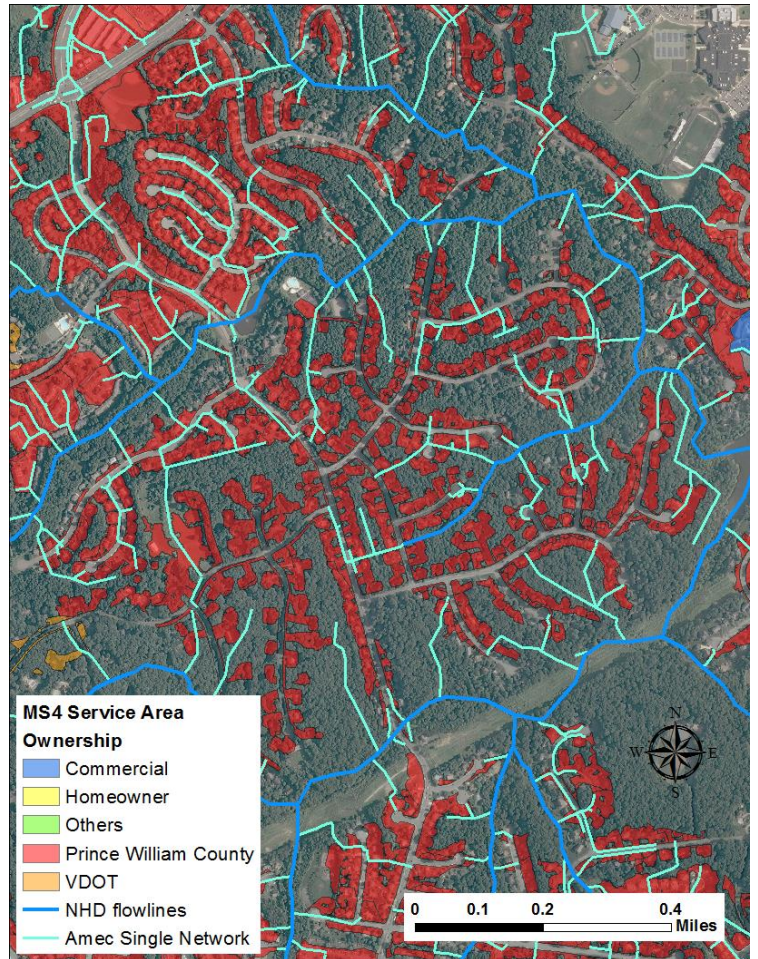


Figure 19 MS4 Service Area After Removing Excluded Areas

6 Appendix A: Source Code

```
# -----  
# Name: Recondition_DEM.py  
# Purpose: This tool reconditions a digital elevation model (DEM) to include new  
           segments of the stormwater network.  
# Author: John P. Miller  
# Copyright:(c) Amec Foster Wheeler | Prince William County, Virginia  
# ArcGIS Version: 10.2  
# Python Version: 2.7.3  
# -----  
  
# Import the Modules  
import arcpy, sys, os  
from arcpy import env  
from arcpy.sa import *  
  
# Checkout Spatial License (Required!)  
arcpy.CheckOutExtension("spatial")  
  
# Overwrite Existing Files!  
arcpy.env.overwriteOutput = True  
  
# Get Relative Paths  
rootWS = os.path.dirname(sys.path[0])  
MS4 = os.path.join(rootWS,'MS4.gdb')  
  
# Set Env Variables  
arcpy.env.workspace = MS4  
arcpy.env.scratchWorkspace = rootWS  
  
# Prompt User for DEM Pathname  
DEM = arcpy.GetParameterAsText(0)  
if (not DEM):  
    arcpy.AddMessage("Select your DEM")  
    DEM = raw_input("Enter the DEM File Pathway")  
  
# Project DEM to "NAD_1983_StatePlane_Virginia_North_FIPS_4501_Feet"  
DEM_proj = os.path.join(arcpy.env.scratchGDB,"DEM_proj")  
spatialRef =  
"PROJCS['NAD_1983_StatePlane_Virginia_North_FIPS_4501_Feet',GEOGCS['GCS_North_America  
n_1983',DATUM['D_North_American_1983',SPHEROID['GRS_1980',6378137.0,298.257222101]],PRI  
MEM['Greenwich',0.0],UNIT['Degree',0.0174532925199433]],PROJECTION['Lambert_Conformal_Co  
nic'],PARAMETER['False_Easting',11482916.666666666],PARAMETER['False_Northing',6561666.666  
666666],PARAMETER['Central_Meridian',-  
78.5],PARAMETER['Standard_Parallel_1',38.03333333333333],PARAMETER['Standard_Parallel_2',
```

```
39.2],PARAMETER['Latitude_Of_Origin',37.66666666666666],UNIT['Foot_US',0.3048006096012192]"]
```

```
arcpy.ProjectRaster_management(DEM, DEM_proj, spatialRef, "BILINEAR")
```

```
# Set Raster Environment Settings
```

```
arcpy.env.snapRaster = DEM_proj
```

```
arcpy.env.cellSize = DEM_proj
```

```
arcpy.env.mask = DEM_proj
```

```
# Local Variables:
```

```
Network = os.path.join(MS4,'Network')
```

```
NHD_flowlines = os.path.join(Network,"NHD_flowlines")
```

```
Amec_Single_Network = os.path.join(Network,"Amec_Single_Network")
```

```
merged_network = os.path.join(arcpy.env.scratchGDB, "merged_network")
```

```
merged_stormwater_raster = os.path.join(arcpy.env.scratchGDB, "merge_storm")
```

```
assignmentType = "Maximum_Combined_Length"
```

```
priorityField = "Shape_Length"
```

```
DEM_resolution = arcpy.Describe(DEM_proj).meanCellHeight
```

```
# Geoprocessing
```

```
# Add "Burn" Field and Calculate Burn Depth for Amec_Single_Network
```

```
arcpy.AddField_management(Amec_Single_Network, 'Burn', 'Double') # Add 'Burn' field to
```

```
Amec_Single_Network
```

```
arcpy.CalculateField_management(Amec_Single_Network, "Burn", -2000) # Calculate 'Burn' value of -2000 feet for stormsewer infrastructure and hydrologic connections
```

```
# Add "Burn" Field and Calculate Burn Depth for NHD_flowlines
```

```
arcpy.AddField_management(NHD_flowlines, 'Burn', 'Double') # Add 'Burn' field to
```

```
NHD_flowlines
```

```
arcpy.CalculateField_management(NHD_flowlines, "Burn", -3000) # Calculate 'Burn' value of -2000 feet for streams
```

```
# Merge Amec_Single_Network with the Modified NHD_flowlines
```

```
arcpy.Merge_management([Amec_Single_Network, NHD_flowlines], merged_network)
```

```
# Convert Merged Network to Raster with Burn Depth as the Value and the Cellsize Based on the DEM
```

```
arcpy.PolylineToRaster_conversion(merged_network, "Burn", merged_stormwater_raster,
```

```
assignmentType, priorityField, DEM_resolution)
```

```
# Reclassify NoData Cells to Zero
```

```
reclass_dem = Reclassify(merged_stormwater_raster, "Value",
```

```
RemapValue([[-3000,-3000],[-2000,-
```

```
2000],[ "NODATA", 0])) # NHD Flowlines at -3000, Amec_Single_Network at -2000 and Everything Else (land cells) at 0
```

```
reclass_dem.save(os.path.join(arcpy.env.scratchGDB,"reclass_dem"))
```

```
# Save reclassified DEM as "reclass_dem" in scratchGDB
```


Technical Manual

MS4 Delineation & Stormwater Tool

Prince William County, Virginia

Burn the Streams into the Original DEM by Dropping the Stream and Stormsewer Network

Burned_DEM = arcpy.GetParameterAsText(1) # Set the

hydrologically reconditioned DEM as the second parameter

if (not Burned_DEM): # If

statement to prompt for file pathway to save the hydrologically reconditioned DEM

arcpy.AddMessage("Enter Output Location for Burned DEM") # Python message to appear when
running as standalone script

Burned_DEM = raw_input("Enter Burned DEM Output") # Prompts second parameter

outPlus = Plus(DEM_proj, reclass_dem) # Use raster math

to add the burned DEM with the original DEM. Results in a hydrologically reconditioned DEM

outPlus.save(Burned_DEM) # Save the

hydrologically reconditioned DEM

Fill DEM

Fill_DEM = Fill(outPlus) # Fill pits

and depressions

Fill_DEM.save(os.path.join(arcpy.env.scratchGDB,"fill")) # Save filled DEM as "fill" in scratchGDB

Flow Direction

Flow_Dir = FlowDirection(Fill_DEM,"NORMAL") # Calculate the flow direction of each cell using the
D8 algorithm from O'Callaghan & Mark, 1984

Flow_Dir.save(os.path.join(MS4,"flow_dir")) # Save flow direction as "flow_dir" in MS4.gdb

Flow Accumulation

Flow_Acc = FlowAccumulation(Flow_Dir) # Calculate the number of upstream cells that flow
into each cell using the flow accumulation tool

Flow_Acc.save(os.path.join(MS4,"flow_acc")) # Save flow accumulation as "flow_acc" in

MS4.gdb

Name: Update_Outfalls.py

Purpose: This tool updates the latitude, longitude, unique ID, receiving waterbody,
local watershed, and 6th order HUC

for each outfall.

Author: John P. Miller

Copyright:(c) Amec Foster Wheeler | Prince William County, Virginia

ArcGIS Version: 10.2

Python Version: 2.7.3

Import the Modules

import arcpy, sys, os

from arcpy import env

from arcpy.sa import *

Checkout Spatial License (Required!)

arcpy.CheckOutExtension("spatial")

Overwrite Existing Files!

Technical Manual
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arcpy.env.overwriteOutput = True

Get Relative Paths

rootWS = os.path.dirname(sys.path[0])
MS4 = os.path.join(rootWS,'MS4.gdb')

Set Environment Variables

arcpy.env.workspace = MS4
arcpy.env.scratchWorkspace = rootWS

Set Globals Variables

inFlowDirection = os.path.join(MS4,"flow_dir")
inFlowAccum = os.path.join(MS4,"flow_acc")
Outfalls = os.path.join(MS4,"Outfalls")
DEM_proj = os.path.join(arcpy.env.scratchGDB,"DEM_proj")
DEM_resolution = arcpy.Describe(DEM_proj).meanCellHeight
InputFeatureClass_copy = os.path.join(arcpy.env.scratchGDB, "InputFeatureClass_copy")
outfall_WB = os.path.join(arcpy.env.scratchGDB, "outfall_WB")
outfall_ReceivingWB = os.path.join(arcpy.env.scratchGDB, "Outfall_ReceivingWB")
ReceivingWB_Pts = os.path.join(arcpy.env.scratchGDB, "ReceivingWB_Pts")
WB_pourpoints = os.path.join(arcpy.env.scratchGDB,"WB_pourpoints")
WB_outfall_poly = os.path.join(arcpy.env.scratchGDB, "WB_outfall_poly")
WB_outfall_da_ras = os.path.join(arcpy.env.scratchGDB,"WB_outfall_da_ras")
WB_sheds = os.path.join(arcpy.env.scratchGDB, "WB_sheds")
WB_da = os.path.join(arcpy.env.scratchGDB, "WB_da")
Polygons = os.path.join(MS4,"Polygons")
HUC12 = os.path.join(Polygons,"HUC12")
outfall_HUC = os.path.join(arcpy.env.scratchGDB,"outfall_HUC")
Subwatersheds = os.path.join(Polygons,"Subwatersheds")
outfall_sheds = os.path.join(arcpy.env.scratchGDB,"outfall_sheds")
outfall_layer = os.path.join(arcpy.env.scratchGDB,"outfall_layer")

Prompt User for Outfalls Pathname

InputFeatureClass = arcpy.GetParameterAsText(0)

Set outfalls as first parameter

if (not InputFeatureClass):

If statement to prompt for outfall feature class

arcpy.AddMessage("Select the points you want to delineate")

Python message to appear when running as standalone script

InputFeatureClass = raw_input("Enter the File Pathway for Your Delineation Points") # Prompts first parameter

Prompt User for NHD Flowline Pathname

nhdInput = arcpy.GetParameterAsText(1)

Set NHD_flowlines as second parameter

if (not nhdInput):

If statement to prompt for

polyline feature class

arcpy.AddMessage("Select NHD Flowlines")

Python message to appear when running as

standalone script

```
nhdInput = raw_input("Enter NHD Flowlines") # Prompts second parameter

# Prompt User for Stormwater Network Pathname
networkInput = arcpy.GetParameterAsText(2) # Set
Amec_Single_Network as third parameter
if (not networkInput): # If
statement to prompt for polyline feature class
    arcpy.AddMessage("Select Stormwater Network") # Python message to
appear when running as standalone script
    networkInput = raw_input("Enter Amec Single Network") # Prompts third parameter

# Add Unique IDs to Drainage Points Using "Outfall_ID" Field Name, Sequentially Created
existingFields = [] # Empty list
for field in arcpy.ListFields(InputFeatureClass): # Iterate over fields
    existingFields.append(field.name) # Add the attribute name to list for each
field

# Create String to Use as Field Name
Outfall_ID = "Outfall_ID"
if Outfall_ID not in existingFields: #
Verify if field "Outfall_ID" exists
    arcpy.AddField_management(InputFeatureClass, 'Outfall_ID', 'LONG') # If field "Outfall_ID" doesn't
exists, create it
else:
    # If above statement is false, then
    print "Outfall_ID field already exists, no need to add" # If field "Outfall_ID" does
exist, do nothing

# Calculate a Unique Identifier for Each Outfall Missing an ID in the 'Outfall_ID' Field (1, 2, 3, etc.)
with arcpy.da.UpdateCursor(InputFeatureClass, Outfall_ID) as rows: # Create an update cursor
to go through each row in the Outfall_ID field
    for i, row in enumerate(rows, start=1): # For each value in row, a tuple is produced
with (counter, row); the for loop binds that to variable 'i' and row respectively
        if row[0] is None: # If an outfall ID has not been assigned (in attribute
table as <NULL>)
            row[0] = i # Substitute the index counter value (1, 2, 3, etc.) for
Outfall_ID value in each row
        elif row[0] is not None: # If an outfall ID has already been assigned (i.e. not
<NULL>)
            print "No IDs to add" # Do nothing
            rows.updateRow(row) # Update this row in the table

# Create Points at the Intersection of the Stormwater and Stream Network
arcpy.Intersect_analysis([nhdInput, networkInput], ReceivingWB_Pts, "No_FID", DEM_resolution,
"point")

# Add Unique IDs to the Intersection Points Using "WB_Pt_ID" Field Name
WB_Fields = [] # Empty list
```

```
for field in arcpy.ListFields(ReceivingWB_Pts):      # Iterate over fields
    WB_Fields.append(field.name)                    # Add the attribute name to list for each
field

WB_Pt_ID = "WB_Pt_ID"
    # Create field name as string
if WB_Pt_ID not in WB_Fields:
    # Check if an ID number for the intersection points exists
    arcpy.AddField_management(ReceivingWB_Pts, 'WB_Pt_ID', 'LONG') # If ID number does not
exist already, create field in attribute table
else:
    # Otherwise
    print "WB_Pt_ID exists"
    # If field already exists skip

# Calculate a Unique Value for Each Receiving Waterbody Point (ReceivingWB_Pts) Starting with 1
(1, 2, 3, etc.)
with arcpy.da.UpdateCursor(ReceivingWB_Pts, WB_Pt_ID) as rows:      # Create an update
cursor to go through each row in the Outfall_ID field
    for i, row in enumerate(rows,1):                                # For each
value in row, a tuple is produced with (counter, row); the for loop binds that to variable 'i' and row
respectively
        row[0] = i
        # Substitute the index counter value (1, 2, 3, etc.) for Outfall_ID value in each row
        rows.updateRow(row)
        # Update this row in the table

# Snap Intersecting Points to Flow Accumulation Pathway to Ensure Proper Delineation
if arcpy.Exists(WB_pourpoints):      # Check if this snap pour points raster already
exists
    arcpy.Delete_management(WB_pourpoints) # If it already exists, delete it
else:      # Otherwise
    print "Snap pour points"          # Do nothing

# Snap the points created from intersecting the Amec_Single_Network and NHD_flowlines to the
adjacent cell in the 3 x 3 cell window with the highest flow accumulation value
WB_outSnapPour = SnapPourPoint(ReceivingWB_Pts, inFlowAccum, DEM_resolution, "WB_Pt_ID")
WB_outSnapPour.save(WB_pourpoints) # Save output as WB_pourpoints

# Delineate Drainage Area to WB Points
if arcpy.Exists(WB_outfall_da_ras):      # Check if the
drainage area raster for the intersecting points exists
    arcpy.Delete_management(WB_outfall_da_ras) # If it already exists, delete
it
else:
    # Otherwise
    print "Delineate Receiving Water Body Drainage Areas" # Do nothing
```

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Delineate the upstream watersheds for each downstream receiving waterbody

WB_outfall_da_ras = Watershed(inFlowDirection, WB_outSnapPour, "VALUE")

WB_outfall_da_ras.save(os.path.join(arcpy.env.scratchGDB,"WB_outfall_da_ras")) # Save output as WB_outfall_da_ras

Convert Raster Drainage Areas to Polygons

arcpy.RasterToPolygon_conversion(WB_outfall_da_ras, WB_outfall_poly, "SIMPLIFY", "VALUE")

Dissolve Watersheds by Gridcode to Eliminate Tiny Watersheds

arcpy.Dissolve_management(WB_outfall_poly, WB_da, ["gridcode"], "", "MULTI_PART", "DISSOLVE_LINES")

Add Receiving Waterbody information to the Waterbody Drainage Area

arcpy.MakeFeatureLayer_management(WB_da, "Waterbody_area") # Create feature

layer for dissolved polygon upstream watersheds for receiving waterbodies

arcpy.MakeFeatureLayer_management(ReceivingWB_Pts, "WB_points") # Create feature layer for receiving waterbody points

arcpy.JoinField_management("Waterbody_area", "gridcode", "WB_points", "WB_Pt_ID") # Join receiving waterbody point IDs to receiving waterbody drainage areas based on "gridcode"

arcpy.CopyFeatures_management("Waterbody_area", WB_sheds)

Save a copy of the feature layer as a feature class named "WB_sheds"

Create a Copy MS4 Outfalls to Facilitate Join

arcpy.CopyFeatures_management(InputFeatureClass, InputFeatureClass_copy) # Create a copy of the outfalls

arcpy.MakeFeatureLayer_management(InputFeatureClass_copy, "CopyLayer") # Make feature layer from copy of outfalls

arcpy.DeleteField_management(InputFeatureClass_copy, ["REACHCODE"]) # In feature class that is a copy of the outfalls

#Use Spatial Join to Add Waterbody Drainage Area to User Selected Outfall Points

arcpy.SpatialJoin_analysis(InputFeatureClass_copy, WB_sheds, outfall_WB, "", "", "", "COMPLETELY_WITHIN") # Join attribute table from receiving waterbody drainage areas to the copy of the outfalls

arcpy.JoinField_management(outfall_WB, "WB_Pt_ID", "CopyLayer", "Outfall_ID")

Join Outfall ID field from feature layer of outfalls

#Delete Unnecessary Fields

fields = arcpy.ListFields(outfall_WB)

Create a list with all of the fields in new outfalls feature class that contains the receiving waterbody "REACHCODE"

WBkeepFields = ["SHAPE", "OBJECTID", "Ownership", "Origin", "Outfall_ID", "REACHCODE"] # Create list with these relevant field names. "Shape" and "OBJECTID" required!

WBdropFields = [x.name for x in fields if x.name not in WBkeepFields]

Identify fields in outfall_WB that are not in the WBkeepFields list created above.

arcpy.DeleteField_management(outfall_WB, WBdropFields)

Delete fields in outfall_WB not listed in WBkeepFields


```
# Use Spatial Join to Add 6th Order HUC Data
arcpy.SpatialJoin_analysis(outfall_WB, HUC12, outfall_HUC, "", "", "", "WITHIN")

# Remove Unnecessary Fields
arcpy.DeleteField_management(HUC12, ["Join_Count", "TARGET_FID"])

# Use Spatial Join to Add Local Watershed
arcpy.SpatialJoin_analysis(outfall_HUC, Subwatersheds, outfall_sheds, "", "", "", "WITHIN")

# Remove Unnecessary Fields
arcpy.DeleteField_management(outfall_sheds, ["Join_Count", "TARGET_FID", "Join_Count_1",
"TARGET_FID_1", "OBJECTID_1", "AREA", "PERIMETER", "SUBAREA", "SUBAREA_",
"SUBAREA_ID", "SYMBOL", "WMPPLAN", "ACRES", "MAJSHED", "SHAPE_LENG", "SHD_NAME" ])

# Overwrite Initial Outfalls Feature Class (First Parameter)
arcpy.CopyFeatures_management(outfall_sheds, InputFeatureClass)

# Add Latitude and Longitude Fields to Outfalls
LONG_DD = "LONG_DD"

if LONG_DD in existingFields:
    # If LONG_DD field exists
    arcpy.DeleteField_management(InputFeatureClass, ["LONG_DD", "LAT_DD"]) # Delete Lat/Long
    Fields
else:
    # Otherwise
    print "Need to add Lat/Long"
    # Do nothing

# Add Outfall Location in Decimal Degrees
arcpy.AddField_management(InputFeatureClass, 'LONG_DD', 'FLOAT', 7, 5) # Add field for
longitude in decimal degrees
LAT_DD = "LAT_DD"
# Create string for field
arcpy.AddField_management(InputFeatureClass, 'LAT_DD', 'FLOAT', 7, 5) # Add field for
latitude in decimal degrees

# Calculate Latitude and Longitude Decimal Degree Coordinates for the Outfall Points
dsc = arcpy.Describe(InputFeatureClass)
# Use "Describe" function to determine the shape type
prjFile = os.path.join(arcpy.GetInstallInfo()["InstallDir"],
r"Coordinate Systems\Geographic Coordinate Systems\World\WGS 1984.prj") # Datum of
data for spatial reference
spatialRef = arcpy.SpatialReference(prjFile)
# Coordinate system that defines what map projection options are used to
define horizontal coordinates
```

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```
updCursor = arcpy.UpdateCursor(InputFeatureClass,"", spatialRef)      # Establish read-write
access for outfalls
for row in updCursor:
    # Loop through each row in the outfall feature class
    shape = row.getValue(dsc.shapeFieldName)                          # Create
geometry object 'shape'
    geom = shape.getPart(0)
    # Read geometry of each point
    x = geom.X
    # Store x from spatial reference
    y = geom.Y
    # Store y from spatial reference
    row.setValue('LONG_DD', x)
    # Add x value from spatial reference to the point in the field LONG_DD
    row.setValue('LAT_DD', y)                                         # Add
y value from spatial reference to the point in the field LAT_DD
    updCursor.updateRow(row)
    # Updates the current row in the outfalls table

del updCursor, row # Close loop and delete cursor
```

```
# -----
# Name:          Drainage_Area_Delineations.py
# Purpose:       This tool delineates the upstream area to a set of user defined points
                 and determines the percent of the
                 drainage area that is pervious and impervious
# Author:        John P. Miller
# Copyright:(c)  Amec Foster Wheeler | Prince William County, Virginia
# ArcGIS Version: 10.2
# Python Version: 2.7.3
# -----
```

```
# Import the Modules
import arcpy, sys, os
from arcpy import env
from arcpy.sa import *
```

```
# Checkout Spatial License (Required!)
arcpy.CheckOutExtension("spatial")
```

```
# Overwrite Existing Files!
arcpy.env.overwriteOutput = True
```

```
# Get Relative Paths
rootWS = os.path.dirname(sys.path[0])
MS4 = os.path.join(rootWS,'MS4.gdb')
```

```
# Set Environment Variables
```

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arcpy.env.workspace = MS4

arcpy.env.scratchWorkspace = rootWS

Set Globals Variables

inFlowDirection = os.path.join(MS4,"flow_dir")

inFlowAccum = os.path.join(MS4,"flow_acc")

Polygons = os.path.join(MS4,"Polygons")

Outfalls = os.path.join(MS4,"Outfalls")

Interconnected = os.path.join(MS4,"Interconnected")

DEM_proj = os.path.join(arcpy.env.scratchGDB,"DEM_proj")

DEM_resolution = arcpy.Describe(DEM_proj).meanCellHeight

outfall_poly = os.path.join(arcpy.env.scratchGDB,"outfall_poly")

dis_outfall_da = os.path.join(arcpy.env.scratchGDB,"dis_outfall_da")

LandUse = os.path.join(MS4,"LandUse")

GMU = os.path.join(Interconnected,"GMU")

NOVA = os.path.join(Interconnected,"NOVA")

Schools = os.path.join(Interconnected,"Schools")

VDOT = os.path.join(Interconnected,"VDOT")

VPDES = os.path.join(Interconnected,"VPDES")

interconnected_ms4 = os.path.join(arcpy.env.scratchGDB,"interconnected_ms4")

Phase1_MS4 = os.path.join(arcpy.env.scratchGDB,"Phase1_MS4")

pervious_da = os.path.join(arcpy.env.scratchGDB,"pervious_da")

pervious_layer = os.path.join(arcpy.env.scratchGDB,"pervious_layer")

drainage_area = os.path.join(arcpy.env.scratchGDB,"drainage_area")

drainage_area_layer = os.path.join(arcpy.env.scratchGDB,"da_layer")

join_da = os.path.join(arcpy.env.scratchGDB,"join_da")

outfall_layer = os.path.join(arcpy.env.scratchGDB,"outfall_layer")

area_layer = os.path.join(arcpy.env.scratchGDB,"area_lyr")

all_areas = os.path.join(arcpy.env.scratchGDB,"all_areas")

drainage_area_selection = os.path.join(arcpy.env.scratchGDB,"drainage_area_selection")

Set Raster Environment Settings

arcpy.env.snapRaster = DEM_proj

arcpy.env.cellSize = DEM_proj

arcpy.env.extent = DEM_proj

Prompt User for Outfalls Pathname

InputFeatureClass = arcpy.GetParameterAsText(0) # Set outfalls as first parameter

if (not InputFeatureClass): # If statement to prompt for outfall feature class

 arcpy.AddMessage("Select your the points you want to delineate") # Python message to appear when running as standalone script

 InputFeatureClass = raw_input("Enter the File Pathway for Your Delineation Points") # Prompts first parameter

Prompt User for Attribute Field

InputField = arcpy.GetParameterAsText(1) # Set 'user' selected field name as second parameter

if (not InputField): # If statement to prompt users to decide which field they would like to select outfalls by

```
    arcpy.AddMessage("Select Input Field") # Python message to appear when running as
standalone script
    InputField = raw_input("Enter Input Field") # Prompts second parameter

# This Choice List is Populated Dynamically from Unique Values in the Input Field Defined in the
Second Parameter (InputField)
InputValue = arcpy.GetParameterAsText(2) # Select field values for the third parameter
if (not InputValue): # If statement to prompt for values
    arcpy.AddMessage("Select Areas to Delineate") # Python message to appear when running
as standalone script
    InputValue = raw_input("Enter Subset") # Prompts third parameter

# The Selected Value of Parameter 2 is Passed to Set Parameter 3 Output
arcpy.SetParameter(3, InputValue)

# Prompt User for Representative Impervious Cover (i.e. 2009 for Phase 1)
impervious_area = arcpy.GetParameterAsText(4) # Select impervious cover dataset for the fifth
parameter
if (not impervious_area): # If statement to prompt for feature class
    arcpy.AddMessage("Select the impervious cover") # Python message to appear when running as
standalone script
    impervious_area = raw_input("Enter the File Pathway for Your Impervious Area") # Prompts fifth
parameter

# Prompt User for Interconnected MS4s
other_ms4s = arcpy.GetParameterAsText(5) # Select impervious cover dataset for the fifth parameter
if (not other_ms4s): # If statement to prompt for feature class
    arcpy.AddMessage("Select all other MS4s from 'Interconnected' folder") # Python message to
appear when running as standalone script
    other_ms4s = raw_input("Enter interconnected MS4s") # Prompts sixth parameter

# Prompt User for Delineated Areas Output Location
outfall_area = arcpy.GetParameterAsText(6) # Select output location for the fifth parameter
if (not outfall_area): # If statement to prompt for pathname
    arcpy.AddMessage("Add Delineated Areas Output Location") # Python message to appear when
running as standalone script
    outfall_area = raw_input("Enter Output Location") # Prompts seventh parameter

# Snap Drainage Delineation Points to Flow Accumulation Pathway to Ensure Proper Delineation
Outfall_ID = "Outfall_ID" # Create Outfall_ID string for field name
outSnapPour = SnapPourPoint(InputFeatureClass, inFlowAccum, DEM_resolution, Outfall_ID) # Snap
outfalls to the adjacent cell in the 3 x 3 cell window with the highest flow accumulation value
outSnapPour.save(os.path.join(arcpy.env.scratchGDB, "pourpoints")) # Save snap pour points output
as "pourpoints"

# Delineate Drainage Area to MS4 Outfalls
outfall_da_ras = Watershed(inFlowDirection, outSnapPour, "VALUE") # Delineate upstream
contributing area to each snapped outfall
```

```
outfall_da_ras.save(os.path.join(arcpy.env.scratchGDB,"outfall_da")) # Save drainage areas
```

```
# Convert Raster Drainage Areas to Polygons
```

```
arcpy.RasterToPolygon_conversion(outfall_da_ras, outfall_poly, "SIMPLIFY", "VALUE")
```

```
# Dissolve Watersheds by Gridcode to Eliminate Tiny Watersheds
```

```
arcpy.Dissolve_management(outfall_poly, drainage_area, ["gridcode"], "", "MULTI_PART",  
"DISSOLVE_LINES")
```

```
# Merge Interconnected MS4s.
```

```
splitMS4s = other_ms4s.split(";")
```

```
if splitMS4s ==[""]:
```

```
    z = 0
```

```
else :
```

```
    z = len(splitMS4s)
```

```
if z == 0 : # If no interconnected MS4s are selected
```

```
    Phase1_MS4 = drainage_area # Skip merging interconnected MS4 polygons
```

```
elif z == 1: # If there is 1 other MS4
```

```
    arcpy.Merge_management([splitMS4s[0]], interconnected_ms4)
```

```
elif z == 2: # If there are 2 other MS4s
```

```
    arcpy.Merge_management([splitMS4s[0], splitMS4s[1]], interconnected_ms4)
```

```
elif z == 3: # If there are 3 other MS4s
```

```
    arcpy.Merge_management([splitMS4s[0], splitMS4s[1], splitMS4s[2]], interconnected_ms4)
```

```
elif z == 4: # If there are 4 other MS4s
```

```
    arcpy.Merge_management([splitMS4s[0], splitMS4s[1], splitMS4s[2], splitMS4s[3]],  
interconnected_ms4)
```

```
elif z == 5: # If there are 5 other MS4s
```

```
    arcpy.Merge_management([splitMS4s[0], splitMS4s[1], splitMS4s[2], splitMS4s[3], splitMS4s[4]],  
interconnected_ms4)
```

```
elif z == 6: # If there are 6 other MS4s
```

```
    arcpy.Merge_management([splitMS4s[0], splitMS4s[1], splitMS4s[2], splitMS4s[3], splitMS4s[4],  
splitMS4s[5]], interconnected_ms4)
```

```
elif z == 7: # If there are 7 other MS4s
```

```
    arcpy.Merge_management([splitMS4s[0], splitMS4s[1], splitMS4s[2], splitMS4s[3], splitMS4s[4],  
splitMS4s[5], splitMS4s[6]], interconnected_ms4)
```

```
elif z == 8: # If there are 8 other MS4s
```

```
    arcpy.Merge_management([splitMS4s[0], splitMS4s[1], splitMS4s[2], splitMS4s[3], splitMS4s[4],  
splitMS4s[5], splitMS4s[6], splitMS4s[7]], interconnected_ms4)
```

```
elif z == 9: # If there are 9 other MS4s
```

```
    arcpy.Merge_management([splitMS4s[0], splitMS4s[1], splitMS4s[2], splitMS4s[3], splitMS4s[4],  
splitMS4s[5], splitMS4s[6], splitMS4s[7], splitMS4s[8]], interconnected_ms4)
```

```
else:
```

```
    print "Other MS4s not selected"
```

```
    arcpy.AddError("No other MS4s selected, output will not reflect interconnected MS4s")
```

```
# Erase Interconnected MS4's from MS4 Area
```

```
if z > 0: # If there are interconnected ms4s
```



```
arcpy.Erase_analysis(drainage_area, interconnected_ms4, Phase1_MS4) # Erase them from the
outfall drainage area
else: # If there are not interconnected ms4s
    print "No interconnected MS4s" # Skip this step
    arcpy.AddError("No other MS4s selected, output will not reflect interconnected MS4s")

# Calculate Total Acres in Each Drainage Area
arcpy.AddField_management(Phase1_MS4, 'TotAcres', 'DOUBLE') # Add field for total acres in each
drainage area
arcpy.CalculateField_management(Phase1_MS4, 'TotAcres', '!shape.area@acres!', 'PYTHON') #
Calculate total drainage area in acres and store in 'TotAcres' field

# Erase Impervious Area from Drainage Area
arcpy.Erase_analysis(Phase1_MS4, impervious_area, pervious_da)

# Add Pervious Acres Field and Calculate Geometry
arcpy.AddField_management(pervious_da, 'PervAcres', 'DOUBLE') # Add field for pervious acres in
each drainage area (i.e. area remaining after erasing impervious area from each drainage area)
arcpy.CalculateField_management(pervious_da, 'PervAcres', '!shape.area@acres!', 'PYTHON') #
Calculate pervious drainage area in acres and store in 'PervAcres' field

# Create Feature Layers for Join
arcpy.MakeFeatureLayer_management(Phase1_MS4, drainage_area_layer) # Create feature layer of
total drainage areas for each outfall
arcpy.MakeFeatureLayer_management(pervious_da, pervious_layer) # Create feature layer of
pervious drainage areas for each outfall

# Join Pervious Area to the Dissolved MS4 Drainage Areas
arcpy.AddJoin_management(drainage_area_layer, "gridcode", pervious_layer, "gridcode") # Join
pervious area feature layer to total drainage area layer based on gridcode
arcpy.CopyFeatures_management(drainage_area_layer, join_da) # save joined pervious/total
drainage feature layer as feature class named 'join_da'

# Remove Attribute Table Fields That Are Not Necessary
arcpy.DeleteField_management(join_da, ["pervious_da_OBJECTID", "pervious_da_gridcode",
"pervious_da_TotAcres"])

# Remove Any <Null> Values and Replace with 0
codeblock = """def calc(pervious_da_PervAcres):
    if pervious_da_PervAcres is None:
        return 0
    else:
        return pervious_da_PervAcres"""
arcpy.CalculateField_management(join_da, 'pervious_da_PervAcres',
"calc(!pervious_da_PervAcres!)", 'PYTHON', codeblock) # Inserts codeblock SQL statement to
change any Null pervious area value to 0 to facilitate impervious area calculation

# Calculate Impervious Area
```

```
arcpy.AddField_management(join_da, 'ImpAcres', 'DOUBLE') # Add field for impervious acres named 'ImpAcres'
```

```
arcpy.CalculateField_management(join_da, 'ImpAcres', '!Phase1_MS4_TotAcres!-!pervious_da_PervAcres!', 'PYTHON') # Calculate impervious area by subtracting pervious drainage area from the total drainage area for each outfall
```

```
# Create Feature Layers for Join
```

```
arcpy.MakeFeatureLayer_management(InputFeatureClass, outfall_layer) # Create feature layer from outfall feature class
```

```
arcpy.MakeFeatureLayer_management(join_da, area_layer) # Create feature layer from drainage area polygon feature class containing total, impervious, and pervious for each outfall
```

```
# Join Outfall Ownership and Origin Information
```

```
arcpy.JoinField_management(area_layer, "Phase1_MS4_gridcode", outfall_layer, Outfall_ID, InputField + ";Origin;Outfall_ID;VAHU6;HUC_12;WTRSHD_ID;REACHCODE") # Join outfall information to the drainage area feature class and keep relevant field for the permit
```

```
arcpy.CopyFeatures_management(area_layer, all_areas) # Create a feature class for drainage area feature class containing all relevant information for outfalls and drainage areas
```

```
arcpy.DeleteField_management(all_areas, "Phase1_MS4_gridcode") # Delete unnecessary field that resulted from join
```

```
# Split User Input Into List
```

```
InputString = str(InputValue) # Create string from the third parameter to be parsed through statement below
```

```
SaveSplit = InputString.split(";") # Split string from the third parameter, so that each value in the field is it's own string
```

```
# Create Variable to be Used in Logical Statement to Build SQL statement
```

```
x = len(SaveSplit) # Calculate how many unique values are in the field from parameter 3 (e.g. if Ownership is the field and it has County, Homeowner, & Commercial as possible values the length would be 3)
```

```
exp1 = str(InputField) + " = " + str(SaveSplit[0]) + "" # SQL statement that selects the first value (SaveSplit[0]) from the field selected in parameter 3
```

```
# Logical Sequence Building SQL Expression, Based upon Number of User Inputs for the Third Parameter (GetParameterAsText(2)) (x)
```

```
if x < 2 : # if the number of unique values selected by the user is 1
```

```
    sql_exp = exp1 # SQL selection statement takes the selected field (second parameter) and selects the first field value (third parameter)
```

```
elif 3 > x > 1: # if the number of unique values selected by the user is 2
```

```
    sql_exp = exp1 + " OR " + str(InputField) + " = " + str(SaveSplit[1]) + "" # SQL selection statement takes the selected field (second parameter) and selects the first and second field value (third parameter)
```

```
elif 4 > x > 2: # if the number of unique values selected by the user is 3
```

```
    sql_exp = exp1 + " OR " + str(InputField) + " = " + str(SaveSplit[1]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[2]) + "" # SQL selection statement takes the selected field (second parameter) and selects the first, second, & third field value (third parameter)
```

```
elif 5 > x > 3: # if the number of unique values selected by the user is 4
```

```
sql_exp = exp1 + " OR " + str(InputField) + " = " + str(SaveSplit[1]) + "" + " OR " + str(InputField) +  
" = " + str(SaveSplit[2]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[3]) + "" # SQL selection  
statement takes the selected field (second parameter) and selects the first, second, third, & fourth  
field value (third parameter)  
elif 6> x >4: # if the number of unique values selected by the user is 5  
    sql_exp = exp1 + " OR " + str(InputField) + " = " + str(SaveSplit[1]) + "" + " OR " + str(InputField) +  
" = " + str(SaveSplit[2]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[3]) + "" + " OR " +  
str(InputField) + " = " + str(SaveSplit[4]) + "" # SQL selection statement takes the selected field  
(second parameter) and selects the first, second, third, fourth, & fifth field value (third parameter)  
elif 7> x >5: # if the number of unique values selected by the user is 6  
    sql_exp = exp1 + " OR " + str(InputField) + " = " + str(SaveSplit[1]) + "" + " OR " + str(InputField) +  
" = " + str(SaveSplit[2]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[3]) + "" + " OR " +  
str(InputField) + " = " + str(SaveSplit[4]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[5]) + ""  
elif 8> x >6: # if the number of unique values selected by the user is 7  
    sql_exp = exp1 + " OR " + str(InputField) + " = " + str(SaveSplit[1]) + "" + " OR " + str(InputField) +  
" = " + str(SaveSplit[2]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[3]) + "" + " OR " +  
str(InputField) + " = " + str(SaveSplit[4]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[5]) + ""  
+ " OR " + str(InputField) + " = " + str(SaveSplit[6]) + ""  
elif 9> x >7: # if the number of unique values selected by the user is 8  
    sql_exp = exp1 + " OR " + str(InputField) + " = " + str(SaveSplit[1]) + "" + " OR " + str(InputField) +  
" = " + str(SaveSplit[2]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[3]) + "" + " OR " +  
str(InputField) + " = " + str(SaveSplit[4]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[5]) + ""  
+ " OR " + str(InputField) + " = " + str(SaveSplit[6]) + "" + " OR " + str(InputField) + " = " +  
str(SaveSplit[7]) + ""  
elif 10> x >8: # if the number of unique values selected by the user is 9  
    sql_exp = exp1 + " OR " + str(InputField) + " = " + str(SaveSplit[1]) + "" + " OR " + str(InputField) +  
" = " + str(SaveSplit[2]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[3]) + "" + " OR " +  
str(InputField) + " = " + str(SaveSplit[4]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[5]) + ""  
+ " OR " + str(InputField) + " = " + str(SaveSplit[6]) + "" + " OR " + str(InputField) + " = " +  
str(SaveSplit[7]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[8]) + ""  
elif 10> x >8: # if the number of unique values selected by the user is 10  
    sql_exp = exp1 + " OR " + str(InputField) + " = " + str(SaveSplit[1]) + "" + " OR " + str(InputField) +  
" = " + str(SaveSplit[2]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[3]) + "" + " OR " +  
str(InputField) + " = " + str(SaveSplit[4]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[5]) + ""  
+ " OR " + str(InputField) + " = " + str(SaveSplit[6]) + "" + " OR " + str(InputField) + " = " +  
str(SaveSplit[7]) + "" + " OR " + str(InputField) + " = " + str(SaveSplit[8]) + "" + " OR " + str(InputField)  
+ " = " + str(SaveSplit[9]) + ""  
elif x > 10: # if the number of unique values is more than 10, all values will be selected.  
    sql_exp = InputField  
else:  
    print "Too many unique values to select"  
    arcpy.AddError("No outfalls selected, output will be empty")
```

```
# Select Choice List Selections from the Input Feature Class  
arcpy.Select_analysis(all_areas, drainage_area_selection, sql_exp)
```

```
arcpy.CopyFeatures_management(drainage_area_selection, outfall_area) # Save output of drainage  
areas with user selected field values (e.g. County owned outfalls)
```

7 Appendix B: Forested Lands Delineation Process

PURPOSE

In order to support service area delineation and the land use change BMP, forested areas were quickly delineated from 4-band multispectral imagery at 1 meter spatial resolution. Existing available land cover information for Prince William County is available from the Multi-Resolution Land Characteristics Consortium (MRLC), National Land Cover Database (NLCD). However, the NLCD products were derived at 30m spatial resolution, limiting detail and potentially including a very large amount of estimation error when considering BMP's at a local scale. For example, when considering 900m² contiguous forested area, 2 pixel results at 30m resolution would be identified as a forested area from the NLCD dataset. Unfortunately, most remote sensing processes may take effort in reducing such small classification results as anomalous, and therefore remove small, but in this case, significant contiguous pixel results. By utilizing 1 meter resolution imagery products tree canopy detection was rapidly delineated, and higher resolution allowed multiple pixel clusters to be identified meeting the 900m² minimum mapping unit with higher confidence. Image processing was conducted using ERDAS Imagine, ArcGIS, and Feature Analyst software packages.

IMAGERY

The United States Department of Agriculture (USDA), National Agricultural Inventory Program (NAIP) provides ortho-corrected multispectral imagery with 1 meter spatial resolution at no cost over most of the United States. The multispectral imagery consists of typical blue, green, and red imagery bands for natural color representation, along with 4th band that covers the near infrared part of the electromagnetic spectrum. The near infrared band allows rapid vegetation detection through indices and classification techniques due to its sensitive response to chlorophyll from plant material. Healthy plants absorb red, green, and blue light, and reflects higher levels of infrared energy. Additionally, the near infrared bands allows the ability to segregate healthy from stressed vegetation by detecting different levels of near infrared reflection after identifying the presence of chlorophyll initially.

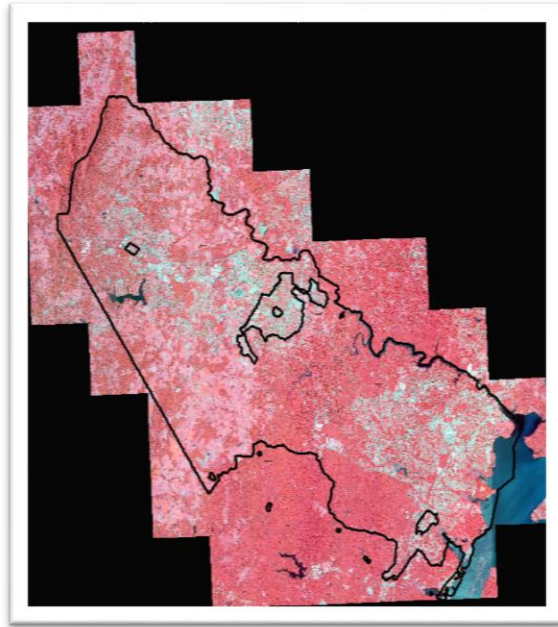
PROCESSING

The image processing used for this delineation consisted of three primary steps: 1) Image Pre-Processing, 2) Image Processing, and 3) Image Post-Processing. The area of interest (AOI) utilized consisted of areas within the Prince William County service area alone. No other MS4 areas were included in this delineation.

7.0.1 Image Pre-Processing

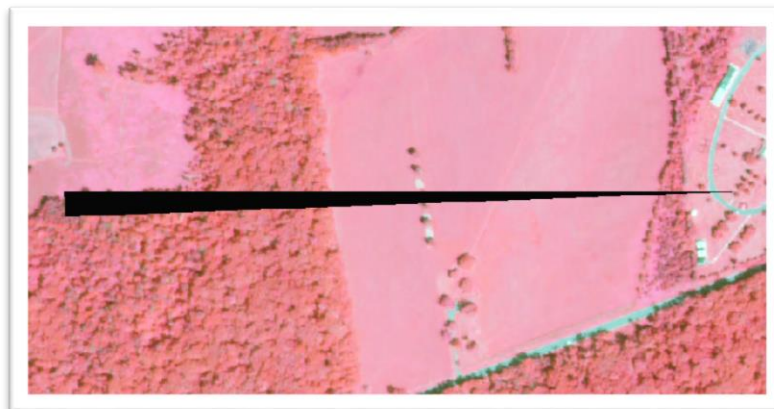
Pre-Processing tasks include AOI delineation, image collection, imagery quality review, and initial vegetation extraction. A buffer of 500ft around the study AOI prior to image processing in order to account for edge detection anomalies that typically occur with automated image extraction. Once complete, NAIP imagery was collected at the extent of the buffer to ensure complete coverage as

available. NAIP imagery at 4-band resolution is provided at DOQQ extents and readily available from the USGS EarthExplorer website (<http://earthexplorer.usgs.gov/>). A total of 43 NAIP tiles were downloaded and produced into a seamless mosaic product covering the AOI, and were collected in August, 2014:



(Mosaic NAIP imagery with Color Infrared Representation)

The mosaic product was reviewed for seamlines and raw data anomalies such as band striping or dropped pixels. No band striping or seamlines were found in the mosaic dataset, and only minor areas of dropped pixels were identified. However, the areas with dropped pixels were not covering vast areas and did not require additional image datasets to rectify; dropped pixels were accounted for in the post processing phase due to limited impact on initial classification:



The final step of the pre-processing phase utilized the Normalized Difference Vegetation Index (NDVI) to segregate the image between vegetation and non-vegetation features. This is rapidly done due to

the way chlorophyll reflects energy in the near infrared band by using band math which results in a new raster data set with pixels containing values ranging from -1 to 1. Pixels with values closer to 1 represent vegetation, while those closer to -1 are non-vegetation.



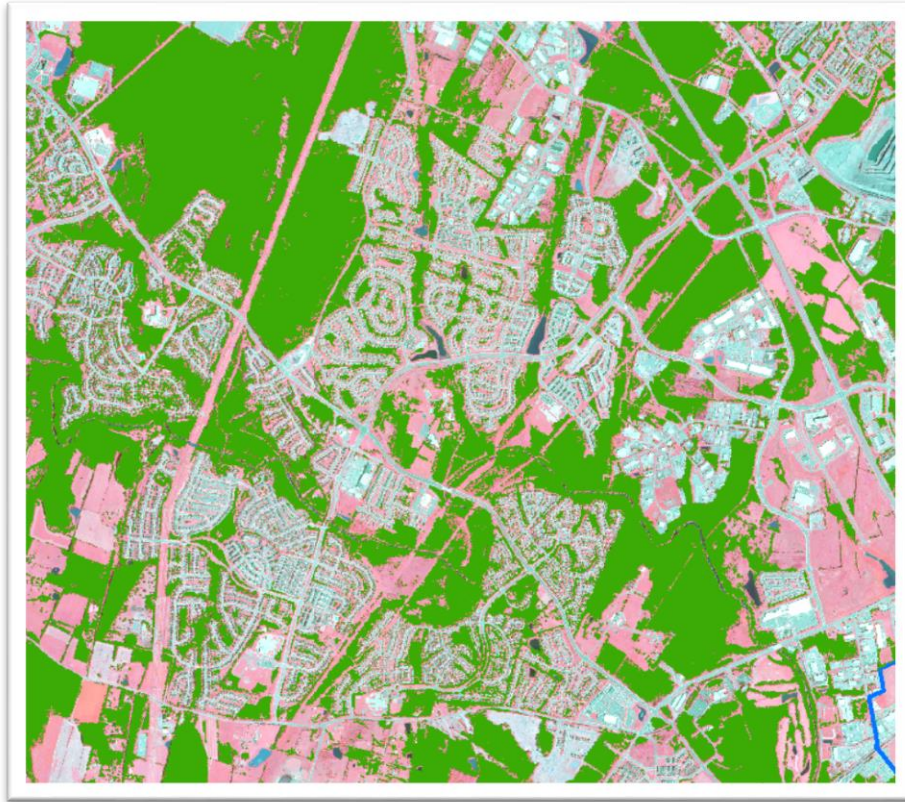
(NDVI Result showing vegetation and non-vegetation)

The NDVI result was then reviewed to locate the correct threshold where a representative split between vegetation and non-vegetation could be identified. Once determine, the NDVI dataset was rendered to a 2-class result, where vegetation pixels were utilized as an analysis mask where tree canopy could be identified. The threshold was set a bit higher for this study since trees tend to reflect much higher values (i.e. much closer to 1) given their height and foliage. This result also reduces false detections within open fields, dry grasslands, and shorter shrub areas:



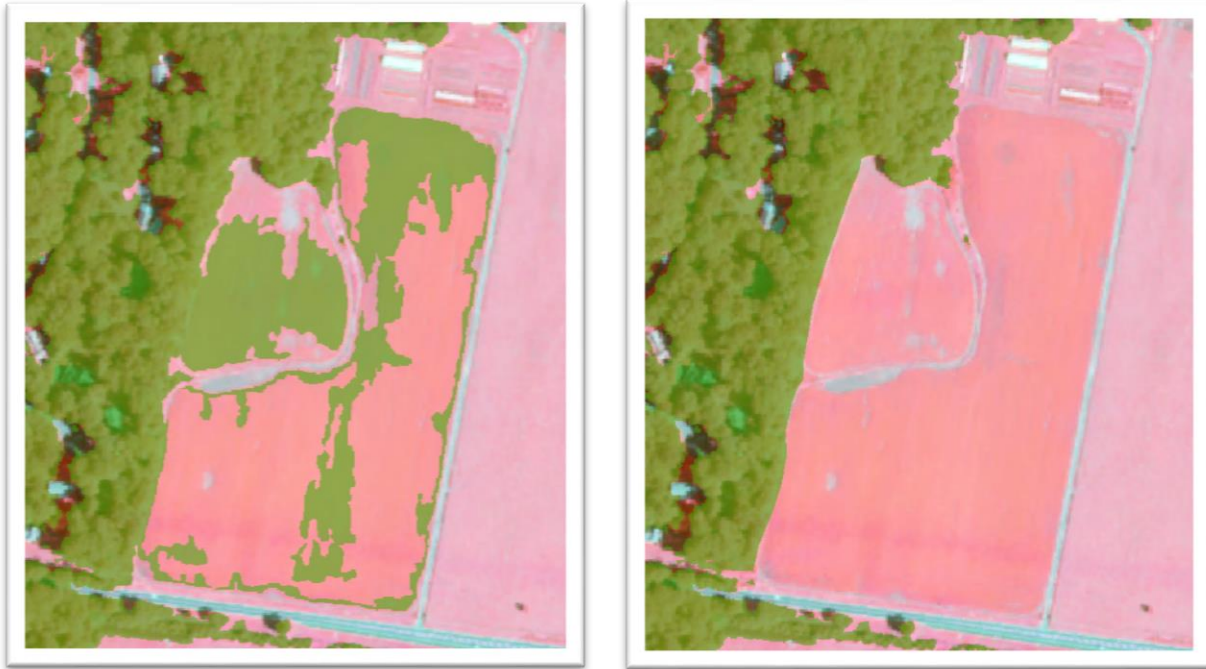
7.0.2 Image Processing

In order to identify tree canopy in Prince William County, multiple processing techniques and software packages were used to gain the best possible results. Initially, unsupervised image classification was performed, segregating the raw image into 50 different classes of statistically similar pixels. The 50 class clusters were reviewed and identified as belonging to tree canopy, water, grass, impervious surfaces, and unclassified (shadow) areas. The tree canopy clusters were then saved as new AOI's within ERDAS Imagine, and augmented with digitized samples in all locations of the study area. These samples were then supplied in the Maximum Likelihood Supervised Classification algorithm, with 2 – class fuzzy results and distance layers being produced. “Fuzzy” pixel results showed similarity between 2 possible land cover classes, and the distance result was utilized to effectively place the fuzzy pixels in the more statistically correct class. Feature Analyst is a separate classification algorithm that focuses more on feature shape along with spectral variability. Training samples were then applied to Feature Analyst, where iterations of results were performed to obtain the cleanest results. By utilizing shape as a detection method, similar patterns can be segregated in the image, also allowing for the reduction in misclassification from shadows. Once complete, all results were then merged into a single layer and clipped to the NDVI vegetation results and non-buffered MS4 AOI.



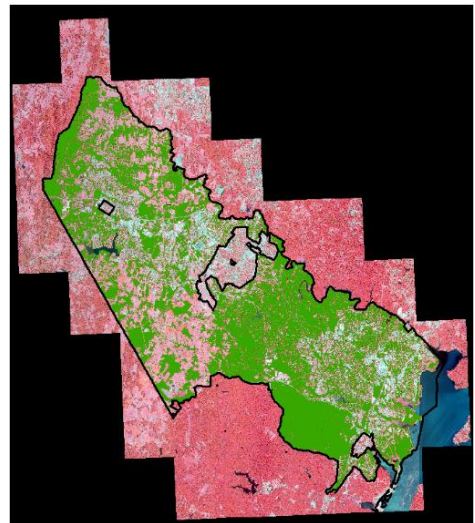
7.0.3 Image Post-Processing

Post processing tasks included image result aggregation and manual QA/QC procedures. Image processing result aggregation is a procedure used to fill small holes in otherwise continuous features and remove salt-and-pepper results by defining an arbitrary minimum mapping unit. The results from this process further clean extracted features of interest which can substantially improve estimations and metrics performed across the dataset. The manual QA/QC period performed looked for final anomalies in the resulting dataset that should not exist. Such anomalies include misclassification of commission and omission. In these cases, either polygons were added to fill in a missing area or polygons were trimmed to remove unnecessary features. Typical errors of omission exist in the middle of large forests, where trees cast shadows amongst each other. Typical errors of commission tend to exist in agricultural areas and golf courses where grasses and fields are very lush and mowed with varying patterns.



7.0.4 FINAL DATA SET DESCRIPTION AND ACCURACY STATEMENT

The final data set was produced using remote sensing techniques, which represent target features with a reasonable estimation or approximation. This is due to the possibility of remaining errors of omission and commission, spatial resolution limitations, and temporal capabilities. The estimations and representation of these results is based on the surface conditions at the time of imagery collection (8/2014). Polygon features are dissolved and exploded to ensure continuous feature representation, while maintaining topology with non-multipart feature representation. Estimated accuracy of the forest area delineation is approximately 80-85%. This is reasonable for the purposes of the service area delineation and land use BMP study. It is recommended that additional manual QA/QC be performed if this dataset is needed for official UTC classification, along with a minimum of 5-Class land cover computation



Appendix I – County Facilities



DEPARTMENT OF FINANCE

Prince William County, Virginia

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09/13/2017

**Subject: ILLICIT DISCHARGE
ELIMINATION AND MS4
PERMIT COMPLIANCE**

No:
25-RSK-400-030

Supersedes:
N/A

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100 INTRODUCTION

Pursuant to the federal Clean Water Act, 33 U.S.C. § 1251, *et seq.*, the Virginia Stormwater Management Act, Va. Code § 62.1-44.15:24, *et seq.*, and Prince William County Code of Ordinances Chapter 23.2 and regulations adopted pursuant thereto, Prince William County is authorized to discharge in accordance with the effluent limitations, monitoring requirements, and other conditions set forth in state permit No. VA0088595.

100.1 PURPOSE

This policy establishes methods for controlling the discharge of pollutants from the municipal separate storm sewer system (MS4) into state waters, in compliance with requirements of Virginia Stormwater Management Program permit issued to Prince William County government (PWC).

100.2 SCOPE

The following written illicit discharge policy has been established for all County locations and applies to any potential discharge or pollutant which could be generated during the normal course of business.

100.3 AUTHORIZATION

This policy is authorized by the County Executive.


100.4 APPLICABILITY

This policy applies to all County agencies/departments including those with Independent Boards, with the exception of the Prince William County Schools and Prince William County Service Authority.

100.5 RESPONSIBILITY

Agency/Department Directors or designees shall:

- Ensure department specific standard operating procedures (SOPs) are developed, implemented and maintained for activities impacted by this policy.
- Ensure all MS4 SOPs are internally approved by the Department of Public Works, Environmental Services Division.
- Ensure all applicable policies, procedures and internal SOPs are available to impacted agencies and personnel responsible for monitoring and ensuring compliance.

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- Assign roles and responsibilities as applicable, for all policies, procedures and SOPs under the “control” or “ownership” of his/her individual agency/department,
- Ensure all training requirements are met.
- Report any noncompliance issues including any spill or discharge.

Department of Public Works, Environmental Services Division shall:


- Provide support to departments and agencies in the implementation of this policy.
- Submit annual reports and any other formal communications that reference MS4 activities to regulatory bodies.
- Disseminate information, updates, and responsibilities to departments and agencies concerning compliance with permit requirements.
- Approve department specific SOPs pertaining to MS4 compliance.
- In conjunction with Risk Management periodically inspect high-risk facilities.
- Respond to specific departmental compliance inquiries and provide technical knowledge.
- Notify impacted departments of annual reporting requirements

Risk Management shall:

- Ensure that all departments are aware of and comply with this policy through inspection and program audits.
- Provide technical assistance to departments and agencies for all aspects of this policy when requested.
- Assist agencies and departments in facilitating pertinent training.
- Notify Environmental Services of any reported noncompliance issues at County facilities including fuel spills and illicit discharges, along with any follow up actions taken.

Employees shall:

- Comply with this policy and SOPs set forth by department management.
- Attend all required training.
- Inform supervisor of spills and discharges.

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100.6 EXCEPTIONS

Exceptions to this policy must be approved in writing by the County Executive or designee.

100.7 DEFINITIONS

Allowable Discharge - any direct or indirect discharge that is authorized by the MS4 permit.

Contractor - an individual or company, including a subcontractor, hired by PWC government to perform services within PWC.

Clean Water Act (CWA)- the federal Clean Water Act (33 U.S.C. §1251 et seq.) and any subsequent amendments thereto

Discharge - allowable liquid, gas, or other substances that enter a storm drainage system.


Hazardous Material Personnel- County personnel responsible for responding to incidents related to hazardous materials.

Illicit Discharge- any direct or indirect non-stormwater discharge into the storm drain system not authorized by the MS4 permit.

Illicit Connections- either of the following: (1) any drain or conveyance, whether on the surface or subsurface, which allows an illicit discharge to enter the storm drain system including but not limited to any conveyances which allow any non-stormwater discharge including sewage, process waste water, and wash water to enter the storm drain system and any connections to the storm drain system from indoor drains to sinks, regardless of whether said drain or connection had been previously allowed, permitted, or approved, by the County or, (2) any drain or conveyance connected from a commercial or industrial land use to the storm drain system which has not been documented in plans, maps, or equivalent records and approved by the County.

MS4 (Municipal Separate Storm Sewer System) - a conveyance or system of conveyances, otherwise known as a municipal separate storm sewer system or "MS4" including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains, designed or used for collecting and conveying stormwater.

MS4 Permit- a permit issued to Prince William County that authorizes the discharge of stormwater from all existing and new municipal separate stormsewer point source discharges to surface waters of the State and includes a comprehensive planning process involving public participation and intergovernmental coordination, to reduce the discharge of pollutants to the maximum extent practicable, to protect water quality, and to satisfy the appropriate water quality requirements of the CWA and regulations, and this article and its

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attendant regulations, using management practices, control techniques, and system, design, and engineering methods, and such other provisions that are appropriate.

Pollutant – anything which causes or contributes to pollution. This may include but is not limited to: paints, chemicals, soap, wash water, oil, automotive fluids, non-hazardous liquid and solid wastes, yard wastes, garbage, pesticides, herbicides, fertilizers, hazardous substances and wastes, animal wastes, dissolved and particulate metals, leaves and yard clippings, and particulates such as soil, sand and salt.

Potable Water- water that is deemed safe to drink or to use for food preparation, without risk of health problems.

Spill Prevention Control and Countermeasure (SPCC) Plan - a federally required and defined plan for facilities storing over 1,320 gallons of oil (fuel) cumulatively at a site including tanks, generators, and drums of oil (fuel).


Standard Operating Procedure (SOP) – SOPs are those policies/procedures related only to the internal operations of an agency/department, division or other sub-unit thereof. SOPs are not communicated or meant to provide direction to any external agency/department. Other names for SOPs include, but are not limited to: general orders, desk manuals, procedures, field guides, process flowcharts, and checklists, etc.

Storm Drainage System- facilities by which stormwater is collected and/or conveyed including but not limited to any roads with drainage systems, streets, gutters, curbs, inlets, piped storm drains, pumping facilities, retention and detentions basins, natural and human made or altered drainage channels, reservoirs, and other drainage structures.

Storm Water – precipitation that is discharged across the land surface of through conveyances to one or more waterways and that may include stormwater runoff, snow melt runoff, and surface runoff and drainage.

Policy – Policies are directives for the conduct of County business affairs and are often in support of higher level of authority dictates such as County Code or Ordinance; Board of County Supervisor Resolutions, County Executive Order, the County’s Strategic Plan, compliance with federal laws and standards, the Code of Virginia or other regulatory agency as defined by law or contract.

Procedure – Procedures are the steps required to ensure policies are followed. Procedures are more detailed in nature and communicate operational requirements to internal and external staff for a specific transaction or a business cycle.

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100.8 KEY RISK FACTORS

1. Policies, procedures and internal SOPs are inconsistent or not properly documented, approved and disseminated.
2. Policies, procedures and internal SOPs are not reviewed and updated on a systematic basis.
3. Departments and agencies may overlook responsibilities and fail to report permit violations or annual reporting requirements.

200 ILLICID DISCHARGE ELIMINATION AND MS4 PERMIT COMPLIANCE POLICY

200.1 ILLICIT DISCHARGES

No County employee, visitor, contractor, department, or agency shall cause or allow discharges into the PWC storm drainage system which are not composed entirely of stormwater, except for the allowed discharges listed below in Section 200.2. Prohibited discharges include, but are not limited to: paints, chemicals, soap, wash water, oil, automotive fluids, non-hazardous liquid and solid wastes, yard wastes, garbage, pesticides, herbicides, fertilizers, hazardous substances and wastes, animal wastes, dissolved and particulate metals, leaves and yard clippings, and particulates such as soil, sand and salt.


200.2 ALLOWABLE DISCHARGES

Allowable discharges are identified in the MS4 permit and include, but are not limited to the following:

- Landscape irrigation (sprinklers) and other potable water discharges
- Air conditioning condensation
- Fire-fighting emergency activities
- Other unforeseen activities that Environmental Services deems as allowable under the permit

200.3 ILLICIT CONNECTIONS

The construction, use, maintenance, or continued existence of illicit connections to the storm drain system is prohibited. This expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

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200.4 GOOD HOUSEKEEPING REQUIREMENTS

200.4.1 VEHICLE AND EQUIPMENT WASHING AND MAINTAINANCE

County vehicles shall be washed at a commercial car wash facility whenever possible. For oversize or specialty equipment and vehicles that require specialty cleaning, washing must be done in a way that prevents runoff water from entering storm drains. This includes:

- Using waterless washing products or a phosphate-free, pH neutral soap, and
- Washing on a grassy area or gravel, where all runoff water infiltrates the ground, or
- Capturing all runoff so no discharge occurs

Should site-specific issues prevent all of the above conditions from being met, a SOP approved by Public Works Environmental Services is required to be adopted and posted at the site.

200.4.2 VEHICLE AND EQUIPMENT FUELING

All fuel tanks, generators, and fueling stations at Prince William County facilities must have a spill response kit that is labeled, visible to users, and stocked at all times.

County personnel must remain at the pump during vehicle and equipment fueling. Should a spill occur or be discovered, personnel must respond by:

- utilizing a clean-up kit,
- notifying the County's fuel vendor via self-dial phones posted at Garfield and Western District fueling stations, and/or
- dialing 911 for significant or hazardous spills


For spills of all sizes, a [spill report](#) form must be completed following protocol found in section 200.6.

All spent cleanup supplies must be properly disposed. Risk Management can assist departments in making arrangements.

200.4.3 OUTDOOR STORAGE OF EQUIPMENT AND MATERIALS

Outdoor storage of equipment and materials not in regular use should be temporary and kept to a minimum. When storing equipment and materials outdoors, the following conditions must be met:

- Store materials and equipment as far away from storm drains and water bodies as feasible
- Cover and protect materials stored outside from rainfall and wind dispersal
- Keep outdoor storage containers in good condition
- Conduct regular inspections of storage areas

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Should site-specific issues prevent all of the above conditions from being met, a SOP approved by Public Works Environmental Services is required to be adopted and posted at the site.

200.4.4 OUTDOOR STORAGE OF CHEMICALS

Outdoor storage of chemicals should be temporary and kept to a minimum. When storing chemicals outside, the following conditions must be met:


- Store chemicals as far away from storm drains and water bodies as feasible
- Seal storage containers and ensure they are impervious to rainfall
- Keep outdoor storage containers properly labeled and in good condition
- Store containers so they are not in direct contact with the ground
- Store containers in a way that prevents damage from vehicle and equipment impacts, wind damage, or any other external force
- Conduct regular inspections of storage areas

Should site-specific issues prevent all of the above conditions from being met, a SOP approved by Public Works Environmental Services is required to be adopted and posted at the site.

200.4.5 ROAD, STREET, AND PARKING LOT DEICING/MAINTENANCE

Deicing and other maintenance activities performed in roads, streets, and parking lots must be done in a way to minimize discharge. When performing these activities, the following conditions must be met:

- Deicing
 - Store and transfer de/anti-icing materials on an impervious containment pad or an equivalent containment area and/or under cover
 - Do not use deicing agents containing urea, or other forms of nitrogen or phosphorus
 - Avoid applying chemical deicing agents when the temperature is less than 15°F
 - Use the lowest application rate of deicing chemicals possible to loosen snow and ice for further removal by shovel or plow
- Maintenance
 - Use an approved vendor for parking lot sweeping services and, per the contract requirements, confirm the collected debris is:
 - removed from the property within 4 hours of collection (no stockpiling),
 - kept out of storm drains, and

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- properly disposed of at an approved site

Should site-specific issues prevent all of the above conditions from being met, a SOP approved by Public Works Environmental Services is required to be adopted and posted at the site.

200.4.6 PESTICIDE, HERBICIDE, FERTILIZER APPLICATION, STORAGE, TRANSPORT AND DISPOSAL

Application, storage, transport, and disposal of any pesticide, herbicide, and fertilizer products must be done in a manner that minimizes the impact to the environment to the greatest extent practicable. When performing these activities, the following conditions must be met:

Application

- Apply materials on an as needed basis only
- Do not exceed application rates defined on packaging
- Utilize only properly trained or certified personnel to perform applications of these chemicals

Storage

- Store all pesticide, herbicides and fertilizer indoors or under covered areas, with proper labeling on both the containers and the storage structure
- Conduct regular inspections of storage areas

Transport

- Secure materials during transport to prevent spills and/or utilize secondary containment
- Equip vehicles that transport liquid products with a spill kit


Disposal

- Dispose of expired and unwanted materials through a qualified, contracted County vendor
- Maintain records of material disposal indefinitely

Should site-specific issues prevent all of the above conditions from being met, a SOP approved by Public Works Environmental Services is required to be adopted and posted at the site.

200.4.7 FIRE-FIGHTING TRAINING

Fire-fighting training activities must be performed in a manner that minimizes the impact to the environment to the greatest extent practicable. When performing these activities, the following conditions must be met:

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- Direct water flows to grass or gravel areas or contain the water onsite and allow it to evaporate and infiltrate
- Block off all potentially affected storm drain inlets and direct or pump water to sanitary sewer or grass or gravel infiltration area

Should site-specific issues prevent all of the above conditions from being met, a SOP approved by Public Works Environmental Services is required to be adopted and posted at the site.

200.4.8 FUEL TANKS, GENERATORS AND OTHER OIL/FUEL STORAGE


All oil (including cooking oil) and fuel containers must be maintained and utilized in a manner that prevents leaks, spills and discharges. All drums, tanks, generators or other outdoor oil/fuel storage containers must comply with the following:

- With the exception of cooking oil storage, ensure secondary containment is utilized, either through container design or added structure
- Properly label equipment and containers and ensure they are free of drips, leaks, and film, and that the ground/pavement around it is, too
- Ensure filling and dispensing by vendors is done in accordance with County policy and that any spill is reported in accordance with 200.6 of this policy
- Inspect equipment and containers regularly and ensure any needed repairs are made in a timely manner
- Place a spill response kit near the equipment or container and ensure it is labeled, stocked, and visible to others at all times

200.4.9 SWIMMING POOL DE-CHLORINATION

During daily back-washing operations and annual flushing, steps must be taken to minimize the level of chlorine in discharge water to the greatest extent practicable. This can be achieved by:

- Direct water flows to grass or gravel areas or contain the water onsite and allow it to evaporate and infiltrate
- For annual flushing, de-chlorinate the water either chemically with appropriate products, or naturally through a 10-day retention period with no chlorine addition prior to release
- Verify chlorine and pH levels prior to release during annual flushing, with pH levels falling between 6.0 and 8.0 and free chlorine levels of 0.01 mg/l or less
- Release discharge from annual flushing at a controlled rate, as slowly as reasonably feasible

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Should site-specific issues prevent all of the above conditions from being met, a SOP approved by Public Works Environmental Services is required to be adopted and posted at the site.

200.5 TRAINING

200.5.1 GENERAL TRAINING

The following personnel must receive stormwater training biennially (every two years):

- Field personnel
- Personnel responsible for road, street, and parking lot maintenance
- Personnel working in and around recreation, public works, and maintenance facilities
- County plan reviewers, inspectors, emergency response employees, and construction site operators
- Any additional personnel deemed necessary by the permit

Training must include, at a minimum: MS4 requirements, recognition and reporting of illicit discharges, and good housekeeping and pollution prevention practices.

200.5.2 PESTICIDE AND HERBICIDE APPLICATION TRAINING

Employees and contractors who apply pesticides and herbicides must be properly trained or certified per the Virginia Pesticide Control Act (§3.2-3900 et seq. of the Code of Virginia).

200.5.3 EROSION AND SEDIMENT CONTROL TRAINING


County plan reviewers, inspectors, program administrators, and construction site operators must be trained and obtain appropriate certifications as required under Virginia Erosion and Sediment Control Law and attendant regulations.

200.5.4 SPILL RESPONSE TRAINING

All County personnel with responsibilities for complying with a facility's Spill Prevention Control and Countermeasure Plan (SPCC) must receive annual spill response training.

All Department of Fire & Rescue uniformed personnel must be trained to the level of Hazardous Materials First Responder Operations as required by OSHA standards (29 CFR 1910.120(q)(6)(ii). Annual refresher training is required and must, at a minimum, meet requirements of OSHA Standards (29 CFR 1910.120(q)(8)(ii).

The Department of Fire and Rescue's Hazardous Materials Response Team must consist of at least 10% of the Uniform personnel that are trained to the Hazardous Materials Technician

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Level (29 CFR 1910.120(q)(6)(iii)). Annual refresher training is required and must meet the requirements of OSHA Standards (29 CFR 1910.120(q)(8)(ii)).

200.6 NOTIFICATION OF SPILLS AND/OR ILLICIT DISCHARGES

If an illicit discharge is observed or created, departments are responsible for immediately reporting the incident to PWC Hazardous Material Personnel by calling 911 or non-emergency number at (703) 792-6700. Details such as location of the incident and description of the discharge should be conveyed. Secondary notification should be made to Environmental Services and Risk Management via the [Spill Report Form](#) located on the Risk Management intranet home page.

200.7 RECORD KEEPING/ ANNUAL REPORTING

Public Works Environmental Services will notify all impacted departments of annual reporting requirements in the first quarter of each fiscal year. Within the first 30 days following the close of that fiscal year, Departments will provide Environmental Services all required data, reports, and other deliverables assigned to them at the start of the year. Should a new or revised requirement be imposed, Environmental Services will notify impacted departments within 30 days.

200.8 SWPPP

Facilities that have been identified as high priority through the MS4 permitting process will be notified by Environmental Services and required to develop and implement a Storm Water Pollution Prevention Plan (SWPPP). Departments are responsible for complying with all SWPPP requirements including good housekeeping, record keeping, training, and inspections.

200.9 OVERSIGHT

Risk Management and Environmental Services will audit records and inspect facilities for compliance with the MS4 permit on an annual basis. Results of audits and inspections will be reported to department management and executive management.

Appendix J – Public Education/Participation

More Best Management Practices . . .

• Pet Care

Pet waste washes from yards and paved areas. It is a major source of bacteria and excessive nutrients in local waters. Pet wastes can contribute up to 50% of the total bacteria in a stream. **Please pick up and flush pet wastes down the toilet or place pet wastes in the trash**

• Car maintenance

Ensure your car is not leaking oil or fluids

Visit repair shops that properly dispose of oils and wastes

Properly dispose of used oil and batteries, learn more at: www.pwccgov.org/trashandrecycling

• Septic system maintenance

A leaking septic system can release nutrients and pathogens into near by waters. Inspect and pump your septic system every five years

• Household hazardous waste disposal

Properly dispose of items in designated locations, and never flush HHW down the drain or toilet. For more information visit: www.pwccgov.org/trashandrecycling

• Manage your lawn and landscape

Use fertilizers and pesticides sparingly and not within 15 to 20 feet of a stream). For more information on management plans: <http://www.ext.vt.edu/>

Don't allow grass clippings and leaves to enter the storm drain since this can add nutrients and organic matter to streams

Sweep excess fertilizer and pesticides off of impervious surfaces and onto lawn

Landscape with low maintenance and native plants — and grow less turf

Leave grass height between 3" and no higher than 12"

Install practices such as rain barrels, permeable pavement, rain gardens and vegetated filter strips that have less impact



Resources and who to call

Solid Waste Division at 703-792-4670

- Recycle motor oil, anti-freeze and car batteries
- Household Hazardous Wastes
- Electronics Recycling
- Yard Waste Composting



Virginia Cooperative Extension at 703-792-6285

- Nutrient Management Planning

Environmental Health Department at 703-792-6310

- Well and Septic Maintenance

Fire & Rescue at 703-792-6360 or after hours public safety communications at 703-792-6500

- Hazardous Waste Spills

- Emergency situations — call 9-1-1

Keep Prince William Beautiful at 571-285-3772

- Litter Control, Prevention and Clean Ups
- Heavily littered areas in a specific spot

Prince William County

Department of Public Works

Watershed Management

5 County Complex Court, Suite 170

Prince William, VA 22192

703-792-7070

illicitdischarge@pwccgov.org

www.pwccgov.org/publicworks



Prince William County

Help Stop Pollutants from Entering Our Streams



Illicit Discharge

Detection and

Elimination Program

Protecting the health, safety and welfare of the public, environment, and infrastructure by controlling pollution entering our local waterways and the Chesapeake Bay.

About Storm Water Runoff

Storm water runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent storm water runoff from naturally soaking into the ground. Storm water can pick up debris, chemicals, dirt, and other pollutants then flow **untreated** directly into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. These liquids and contaminants can impact the water quality of local streams, creeks, rivers, the Chesapeake Bay and beyond!

Storm water pollution and runoff can:

- Destroy wildlife and kill fish and shellfish
- Cause human illness
- Limit recreational activities, swimming conditions, and even close beaches
- Erode and destroy stream channels



What is Illicit Discharge

Any fluid or material substance that is disposed, emptied or dumped into the storm water system that is not rain water. Prince William County

holds a permit to help monitor and control any **non-storm water** from entering the local municipal separate storm sewer system. This permit helps preserve local water quality.



What is not an Illicit Discharge

- Discharges from drinking water sources, springs, and groundwater
- Air conditioning condensation and foundation drains
- Watering lawns and landscaping
- Individual car washing at a residence
- Discharges from firefighting activities
- Swimming pool water that has had chlorine and other chemicals removed

Local efforts to control Illicit Discharge

Through a permit from the Virginia Department of Environmental Quality and the Environmental Protection Agency, the County has the legal responsibility to control discharges and impose fines on anyone who knowingly allows or causes pollutants to enter the storm sewer system. The program requires us to:

- Inventory and monitor storm water outfalls
- Eliminate illicit discharges and improper disposal
- Educate the public and raise awareness
- Inspect industrial and commercial storm water permits to ensure compliance



For your safety!

Please stay clear of any suspected illicit discharge or polluted flow of material. Do not come in contact with it or try to clean it up. Please call 703-792-7070 to report the problem. Trained personnel will respond, inspect, identify and then take steps to clean it up.

If you feel the situation is critical or poses a threat to the safety of people in the area, please call **9-1-1**.

What can you do to help?

Report Illicit Discharges

Report any suspicious dumping directly into storm drain inlets.

Signs of dumping are most readily observed during dry weather situations (more than 48 hours since a rain event):

- Oil sheen/grease entering or exiting storm drains
- Detergents (odd colors)
- Sediment (red/orange), cloudiness
- Chemicals and paint



What to report:

- Time and date, name, and phone number
- Description of spill (color, odor, amount, etc.), location, does it discharge into waterway
- Any information describing the source of the spill

How to report

- Call 703-792-7070
- Send an email: illicitdischarge@pwcgov.org

Use Best Management Practices

- Car washes

Wash your car at a commercial car wash since they must treat the wastewater

OR

Use phosphate free soaps/detergents and wash on a grassy area so that wash water is filtered through the soil

ARTICLE II. STORMWATER POLLUTION

ARTICLE II. STORMWATER POLLUTION

Sec. 23.2-4.1. Unlawful discharge to the stormwater system and waters of the county

- (a) It shall be a violation of this article for any person to discharge:
- (1) Any wastes, trash, garbage, or any matter causing or aiding pollution on any property in the County in any manner so as to allow such to be washed into any stormwater system by storm or floodwater.
 - (2) Any grass clippings, mulch, or yard waste, animal carcasses and other wastes into the stormwater system, or do any injury to the stormwater system or in any manner pollute the stormwater system.
 - (3) Any discharge of gasoline, oil waste, antifreeze, or other automotive, motor or equipment fluids into the stormwater system.
 - (4) Any commercial, industrial, or manufacturing entity to discharge process water, wash water, or unpermitted discharge into any stormwater system.
 - (5) Any person to throw, place, or deposit, or cause to be thrown, placed or deposited, in any gutter, ditch, storm drain or other drainage area in the county, anything that impedes or interferes with the free flow of stormwater therein.
 - (6) Chlorinated swimming pool water without dissipating chlorine.
- (b) Subject to the provisions of subsection (c) below, the following activities shall not be unlawful discharges:
- (1) Discharges pursuant to a VPDES or NPDES permit;
 - (2) Discharges resulting from fire fighting activities;
 - (3) Water line flushing;
 - (4) Landscape irrigation;
 - (5) Diverted stream flows or rising groundwater;
 - (6) Infiltration of uncontaminated groundwater;
 - (7) Pumping of uncontaminated groundwater;
 - (8) Discharges from potable water sources, foundation drains, irrigation water, springs, water from crawl spaces or footing drains;
 - (9) Air conditioning condensation;
 - (10) Lawn watering;
 - (11) Residential car washing;
 - (12) Dechlorinated swimming pool discharges; and
 - (13) Public street washing.
- (Ord. 03-87, 9-16-03)

Chapter 23.2 - STORMWATER MANAGEMENT

ARTICLE II. STORMWATER POLLUTION

Sec. 23.2-4.2. Inspecting and monitoring stormwater discharge.

The director shall have the authority to inspect and monitor discharges and sources of potential discharge to the storm sewer system to ensure compliance with this article, including the authority to enter upon private property to inspect or monitor such discharges or sources of potential discharge. The director shall also have the authority to initiate enforcement actions in accordance with section 23.2-4.3.

(Ord. 03-87, 9-16-03)

Sec. 23.2-4.3. Notice to correct violations.

If any activity listed in subsection 23.2-4.1(b) of this chapter is found by the director to be a source of pollutants to waters of the United States, the director shall serve a written notice on the party responsible for the activity which orders that the activity be ceased or conducted in a manner that will avoid the discharge of pollutants to the stormwater system. The notice shall state the date by which the activity shall cease or be conducted without pollution. Failure to comply with any such order within the time stated in the notice shall constitute a violation.

For any violations of this chapter, the owner must comply with the director's orders within the time specified in the notice. Failure to comply with such order shall constitute a violation of this chapter. In addition to any penalty imposed for each violation, a judge hearing the case may direct the person responsible to remediate or correct, and each day's default in such remediation or correction shall constitute a violation of and a separate offense under this section.

(Ord. 03-87, 9-16-03)

Sec. 23.2-4.4. Penalties for violations of article.

- (a) Any person who knowingly violates any provision of this article shall be guilty of a Class 1 misdemeanor. Each day that such violation is committed, and each day that such violation is permitted to remain uncorrected shall constitute a separate offense.
- (b) Any person who otherwise violates any provision of this article shall be subject to civil penalty between \$250.00 and \$1,000.00 for each day that the violation continues. The court assessing such civil penalty may order the penalty to be paid into the treasury of the county and designated for the purpose of minimizing, preventing, managing or mitigating pollution of the waters of the county.
- (c) Any person who violates any provision of this article shall be responsible for testing, containing, cleaning up, abating, removing and disposing of any substance unlawfully discharged into the storm sewer system or into waters of the county, or, if the director determines that correction of the violation can best be accomplished by the county, shall be liable to the county for all costs of testing, containment, cleanup, abatement, removal and disposal of any substance unlawfully discharged into the storm sewer system or into waters of the county.

(Ord. 03-87, 9-16-03)

Additional outreach events undertaken or maintained in FY18

Prince William County Public Works and our partners maintain and continuously improve sustainability practices and conservation programs to protect and restore our community.

Sustainability Practices

Environmental Management System within Prince William County

- Manage and monitor actions to reduce government agencies impact on environment
- Focus on global issues (tanks, chemicals and storm water management) at County level
- Ensure County staff understand GHS and have access to online SDS for employee safety
- Implement improved practices, training and reviews at department and division level based on their unique setting or operations
- Enhance awareness of all employees so they can recommend improvements and enhancements to their operations
- Form an Environmental Management System Council to support the government efforts and provide leadership

Smarter Chemical Council within Prince William County

- Seek and review chemicals that are safer for staff and secondarily safer for the environment
- Review practices to also look for safer solutions for staff
- Create a list of preferred chemicals (reduce the number and variety of chemicals used in-house)
 - Provide proper handling and disposal
 - Simplify management and emergency response
 - Realize savings by buying in bulk from same vendor
- Ensure safe handling of harsher chemicals that must be used

Sustainability Partners within Prince William County

- Volunteer program for government agencies to take steps to reduce their waste, increase recycling and conserve energy
- Focus on providing training for County employees on Environmental Topics including illicit discharge, spill prevention and watersheds

Environmental Reviews and Awareness Training for Prince William County Staff

- Offer short video presentations on spill prevention, illicit discharge and watersheds for all County staff to watch on Intranet
- Conduct drills on spill response and inspections to look for spills and leaks
- Provide ongoing training and refreshers for Public Works staff
- Review chemicals and how to handle and dispose

Action Steps taken by Prince William County Government and Service Authority

- Follow County's Comprehensive Plan to reflect a sustainable approach to future development and zoning
- Adopt an Environmental Policy Statement
- Adopt an Illicit Discharge Detection and Elimination Policy
- Establish an aggressive citation and prosecution program to handle illicit discharge violations with enforcement by the fire marshal's office.
- Place and monitor spill kits at County facilities at high risk areas where spills could enter waterways, plus remind staff to report spills and leaks
- Create protocol for staff and volunteers for found tanks, suspicious bottles/jars and oil/fluid spills during inspections and cleanups
- Follow protocol for properly washing and fueling County vehicles and equipment
- Enforce protocol for outdoor storage of equipment, materials, and chemicals
- Enforce protocol for deicing operations at County facilities
- Offer tax credit for open space on agricultural and forested reserve lands
- Support water monitoring programs conducted by Occoquan Laboratories and studies on Bacteria Source Tracking tests through Virginia Tech
- Establish a protocol for monitoring, inspecting and replacing Above Ground Storage Tanks as needed to reduce spills and runoff
- Establish proper collection and disposal of batteries, universal waste, printer cartridges and other electronic accessories, chemicals and hazardous wastes in County government and Service Authority (water and sewer)
- Collect hazardous waste from operations, store in drums and dispose of waste through contractor to ensure waste does not compromise environment (Service Authority)
- Provide regular training on spill prevention and response, universal waste management, RCRA, Environmental Management Systems, illicit discharge prevention, hazardous communications, and outdoor hazards
- Conduct regular inspections of refuse hauling equipment to reduce incidents of spills and leaks from trucks, as well as trash blowing from trucks to prevent liquids and debris from entering local waterways

Conservation Programs and Projects

Water Quality Monitoring sponsored by Prince William Soil & Water Conservation District

- Conduct water quality testing with volunteers under the supervision of trained leaders
- Monitor for floatables in the streams
- Clean trash from the streams (cleaned 29,217 pounds in 2017)
- Share test results and observations with County personnel for follow up action or orchestrated clean-ups

Agricultural Best Management Practices guided by Prince William Soil & Water Conservation District

- Achieve Nutrient Reduction from BMPs and Planning at Agricultural Operations

- Implement Soil and Water Conservation Plans and Technical Assistance at Agricultural Operations
- Provide Technical Assistance to Landowners
- Completed a series of workshops and field studies on best management practices for horse owners

Residential Best Management Practices

- Provide Watershed Education to adults (Soil & Water Conservation District)
- Offer Virginia Conservation Assistance Program to local residents to address urban erosion issues (Soil & Water Conservation District)
- Conduct training on Best Lawn Programs to demonstrate responsible use of fertilizers and herbicides (Virginia Cooperative Extension)
- Provide guidance on alternative lawns rather than just turf (Virginia Cooperative Extension)
- Continue with a robust Master Gardner training and community engagement effort to help instill sound and wise landscaping practices (Virginia Cooperative Extension)
- Offer a wide range of community education topics on landscaping, gardening and best practices to help residents reduce their chemical use (Virginia Cooperative Extension)

Stream Restoration, Stabilization and Improvements

- Install infrastructure / sanitary sewer protection
- Improve and re-establish aquatic habitat and riparian areas
- Promote and offer information on FEMA floodplain protection and enhancement
- Meet TMDL goals
- Reconnect the stream to its floodplain
- Replant riparian corridor
- Help educate and prevent loss of private property
- Raise awareness about the benefits of clean water quality

Pollution Prevention

- Create a nutrient management plan for their treatment plant sites that prescribes the amount of fertilizer to use at sites to reduce the amount of nitrogen and phosphorous that could run into creeks (Service Authority)
- Require treatment of wastewater generated by commercial and industrial facilities to remove harmful pollutants before discharge into a sewer system (Service Authority)
- Implement an education program about Fats, Oil and Grease (FOG) to reduce the amount of fats, oils and grease that enters sewer from commercial food service establishments – the fats, oils and grease cling to sewer pipes that can cause backups and overflows (Service Authority)
- Maintain and enhance a Stormwater Pollution Prevention Plan (SWPPP) at the County Landfill to control potential runoff and pollutants at this high risk facility
- Establish a SWPPP at additional sites that may have a high risk of discharging pollutants, including three Parks and Recreation facilities and the Fleet Management Shop

Habitat Projects

- Serve as caregiver for the Julie J. Metz Neabsco Creek Wetlands Preserve (Public Works)
- Tend a number of school gardens and wildlife habitats around community (Virginia Cooperative Extension)
- Establish meadows and natural habitats (Public Works, Historic Preservation)
- Create space for bee hives (Public Works, Historic Preservation)
- Relocate bees to healthier environments so they can thrive (Public Works, Historic Preservation and local beekeepers)
- Plant and establish a pollinator garden, bee hive setting and bee hotel setting at the County Landfill (Public Works, KPWB, Bees and Schools, Conservation Alliance, GMU)
- Create hay operation at Bristoe Station Battlefield to produce crop food for livestock and reduce mowing costs (Public Works, Historic Preservation)
- Seek opportunities to reduce the need to mow, water and fertilize as feasible on County properties (all)

Native Plants

- Maintain a webpage on the value of native plants with links to local resources and experts (Public Works)
- Host garden tours and special lectures (Prince William Wildflower Society)
- Install native plants as part of pollinator garden at County Landfill

Reforestation Projects

- Commit to a practice to preserve natural tree stands, retain top soil and reforest or create meadows at new County projects rather than creating turf/lawn – this saves costs in mowing, fertilizing/pest control and maintenance, plus restores the natural appearance and function of the area (Public Works)
- In the past 10 years, the County has undertaken 15 reforestation projects and planted 48 acres with 24,000 trees (Public Works)
- Reduces the need to mow, which saves the County money and reduces use of gas-powered equipment
- Reduces the need to water and fertilize
- Serves as excellent erosion control and buffer
- Recreate areas to how the originally stood, which helps with community identity and historic interpretation (Public Works, Historic Preservation)

Volunteer Projects

- Since 2010, families with students that participated in the Youth Ambassadors' Conference on the Environment have assisted with a wide array of conservation projects (Public Works) including:
 - Trail improvements
 - Stream improvements
 - Litter pick up
 - Tree planting

- Meadow and garden planting
- Recycling improvements (including a paper collection box at the Animal Shelter)
- Bird box installation
- Habitat creation
- Slope stabilization
- Organize Litter Clean Ups throughout the community (Keep Prince William Beautiful)
- Place labels on storm drains advising citizens that the drain leads to local waterways and the bay (Keep Prince William Beautiful)

Community Enrichment

Education

- Maintain a special page on eliminating illicit discharge with detailed pages specifically for targeted industries including Carpet Cleaning Companies and Lawn and Landscape Services (Public Works)
- Post monthly messages about pollution prevention and illicit discharge concerns on the Prince William County Government Facebook and Twitter sites (Public Works and Communications Office)
- Maintain a detailed website for residents on actions and practices to help protect local water quality, pollution prevention and illicit discharge at www.pwcgov.org/cleanwaters (Public Works)
- Place season specific messages in quarterly newsletter send to HOAs and interested residents with topics including native plants, smart fall practices for lawn care and cleaning up after pets (Public Works)
- Distribute posters and brochures about cleaning up after pets to Vets, Kennels and Dog Care Professionals (Public Works)
- Create and distribute children's activity book that follows a turtle as she learns about storm drains and how they work including fun games, activities and illustrations (Public Works)
- Begin specific awareness campaigns for the community including plastic pollution prevention and native plants (Public Works)
- Since 2001, hosted an annual Youth Ambassadors' Conference on the Environment to share local environment topics with 4th to 8th grade students (Public Works)
- Since 2002, offered high schools students to take the lead and guide younger students on a variety of topics and activities as part of the Youth Ambassadors' Conference on the Environment (Public Works)
- Since 2010, offer a special symposium for parents during the Youth Ambassadors' Conference on the Environment to share information on the same topic as covered for the students (Public Works)
- Provide a preschool with an environmental focus and curriculum – make it even better by repurposing an old library to house the preschool (Prince William Department of Parks and Recreation)
- Offer summer camps with an environmental focus and curriculum (Prince William Department of Parks and Recreation)

- Since 1991, provide an opportunity for 4th graders to learn about the crops, trees, soil, agricultural practices, bees, erosion, regions of Virginia and farm animals (Prince William Soil & Water Conservation District with support from Public Works)
- Since 1995, the County has celebrated its recycling success with the popular Prince William Recycles Day Event at the County Landfill with landfill tours, entertainment and lots of information (Public Works)
- Since 2013, the County has participated in Compost Awareness Day with displays, guest speakers and activities at the County's compost facility (Public Works)
- Coordinate networking and knowledge sharing by local government, state government and non-profit organizations involved with environmental volunteer, education and services (Public Works)
- Provide outdoor lab studies for sixth grade students to learn about animals, habitats and ecosystems (Prince William County Schools)
- Provide outdoor and indoor lab studies for fourth grade students to learn about watersheds (Prince William County Schools)
- Provide a meaningful field experience for third grade students to learn about watersheds, soils and ecosystems at a local working farm (Prince William Soil & Water Conservation District)
- Offer environmental and cultural resource programs at the Julie J. Metz Neabsco Creek Wetlands Preserve (Public Works)
- Host an Earth Day Festival for County Employees with information on recycling, water quality, pollution prevention, pest management, gardening and an assortment of other topics (Public Works)
- Provide education on water quality topics to students (Prince William County Service Authority)
- Host a five session Water Academy for citizens to raise awareness on efforts to provide clean drinking water (Prince William County Service Authority)

Enhanced services to citizens from Public Works

- Collect household hazardous waste and electronics twice a week to provide residents with a viable disposal option and reduce occurrence of materials disposed down storm drains
- Implementing an improved system using new aerating bunkers and an anaerobic digest at the County's compost facility so that we can handle up to 40,000 tons of organic waste each year
- Provide opportunities for citizens to drop off paper for shredding in a secured manner twice a year since 2011
- Monitor and manage mosquitoes to eliminate health concerns and nuisance
- Monitor and manage forest pests such as gypsy moth, emerald ash borers and thousand cankerworms to reduce impact on local trees
- Capture Landfill gas to generate enough energy to power 5,000 homes in the community and to reduce potential pollution from the gas

- Pick up litter daily along highly traveled and visible roads, as well as clean dump sites throughout the community
- Enforce property code requirements to eliminate dump heaps, overgrown grass and unkempt structures on residential and commercial properties

Appendix K - Training



Prince William County Government
Board of County Supervisors



Illicit Discharge Detection

*David Ungar – Environmental Engineer,
Watershed Management*

Definitions



- **Municipal Separate Storm Sewer System (MS4):**
Conveyance or system of conveyances that discharge into local water bodies.
 - ◆ These discharges are NOT treated!

- **Illicit Discharge:** Any discharge to the MS4 that is not composed entirely of storm water.
 - ◆ There are exceptions to this.



The difference between spills and illicit discharges



- Spills are typically accidental discharges, whereas illicit discharges are done on purpose or through negligence.
- Spill examples:
 - ◆ Hydraulic hose burst
 - ◆ Automotive fluids from car crash
- Report spills:
 - ◆ Fire Marshal's Office at 703-792-6360
 - ◆ Risk Management at 703-792-6741



Examples of Discharges



■ Allowed

- ◆ Residential car washing
- ◆ Lawn watering
- ◆ Air conditioning condensation
- ◆ Fire fighting activities
- ◆ Water line flushing
- ◆ Uncontaminated ground water

■ Prohibited

- ◆ Commercial car washing
- ◆ Chlorinated swimming pool water
- ◆ Motor vehicle fluids
- ◆ Cooking oil
- ◆ Paint
- ◆ Litter
- ◆ Salt stockpiles
- ◆ Yard waste
- ◆ Wash water



Negative impacts



- Can produce health risks to people coming into contact with the water and shutdown public recreational facilities.
- Increase cost to treat water before being used for drinking and irrigation.
- Organic matter provides nutrients that cause algal blooms. Algal blooms deplete oxygen and can kill aquatic organisms.
- Can contaminate fish, crabs, clams, and other potential food sources.



Enforcement: County Ordinance



ARTICLE II. STORMWATER POLLUTION

Sec. 23.2-4.1. Unlawful discharge to the stormwater system and waters of the county

- (a) It shall be a violation of this article for any person to discharge:
- (1) Any wastes, trash, garbage, or any matter causing or aiding pollution on any property in the County in any manner so as to allow such to be washed into any stormwater system by storm or floodwater.
 - (2) Any grass clippings, mulch, or yard waste, animal carcasses and other wastes into the stormwater system, or do any injury to the stormwater system or in any manner pollute the stormwater system.
 - (3) Any discharge of gasoline, oil waste, antifreeze, or other automotive, motor or equipment fluids into the stormwater system.
 - (4) Any commercial, industrial, or manufacturing entity to discharge process water, wash water, or unpermitted discharge into any stormwater system.
 - (5) Any person to throw, place, or deposit, or cause to be thrown, placed or deposited, in any gutter, ditch, storm drain or other drainage area in the county, anything that impedes or interferes with the free flow of stormwater therein.
 - (6) Chlorinated swimming pool water without dissipating chlorine.
- (b) Subject to the provisions of subsection (c) below, the following activities shall not be unlawful discharges:
- (1) Discharges pursuant to a VPDES or NPDES permit;
 - (2) Discharges resulting from fire fighting activities;
 - (3) Water line flushing;
 - (4) Landscape irrigation;
 - (5) Diverted stream flows or rising groundwater;
 - (6) Infiltration of uncontaminated groundwater;
 - (7) Pumping of uncontaminated groundwater;
 - (8) Discharges from potable water sources, foundation drains, irrigation water, springs, water from crawl spaces or footing drains;
 - (9) Air conditioning condensation;
 - (10) Lawn watering;
 - (11) Residential car washing;
 - (12) Dechlorinated swimming pool discharges; and
 - (13) Public street washing.
- (Ord. 03-87, 9-16-03)



Enforcement: County Ordinance



Sec. 23.2-4.4. Penalties for violations of article.

- (a) Any person who knowingly violates any provision of this article shall be guilty of a Class 1 misdemeanor. Each day that such violation is committed, and each day that such violation is permitted to remain uncorrected shall constitute a separate offense.
- (b) Any person who otherwise violates any provision of this article shall be subject to civil penalty between \$250.00 and \$1,000.00 for each day that the violation continues. The court assessing such civil penalty may order the penalty to be paid into the treasury of the county and designated for the purpose of minimizing, preventing, managing or mitigating pollution of the waters of the county.
- (c) Any person who violates any provision of this article shall be responsible for testing, containing cleaning up, abating, removing and disposing of any substance unlawfully discharged into the storm sewer system or into waters of the county, or, if the director determines that correction of the violation can best be accomplished by the county, shall be liable to the county for all costs of testing, containment, cleanup, abatement, removal and disposal of any substance unlawfully discharged into the storm sewer system or into waters of the county.

(Ord. 03-87, 9-16-03)









RA
EASE

airlease.com

WM
410 796 7010

8101

WM
410 796 7010

NO PARKING
OR STORING OF
TRUCKS OR EQUIPMENT
IN THIS AREA







HEARS CO CREEK

SWMP: 5509

Outfall: 35409

Outfall: 24409

C

D

B

A

MENDOZA LN

STOCKHOLM WAY

ROTTERDAM LOOP

LANDITES POINT LOOP

TASSIA LN

Cooking oil dumping inlet

Reporting



- If the discharge poses a direct threat to public health, call 911.
- Phone: 703-792-7104
- Email: illicitdischarge@pwcgov.org
- Learn more at www.pwcgov.org/cleanwaters



Appendix L – Water Quality Programs

#684: Bull Run, Lowes Parking Lot



- 84" x 54" box culvert
- Contribution from upstream BMP
- ~1" flow during storm (7/18)
- Low visibility, steep slopes







Access: Difficult



#941: Bull Run, Prince Wm. Parkway



- **54" concrete pipe**
- **Signs of recent repair**
- **1/4" water, level with spillway**
- **Debris in spillway**

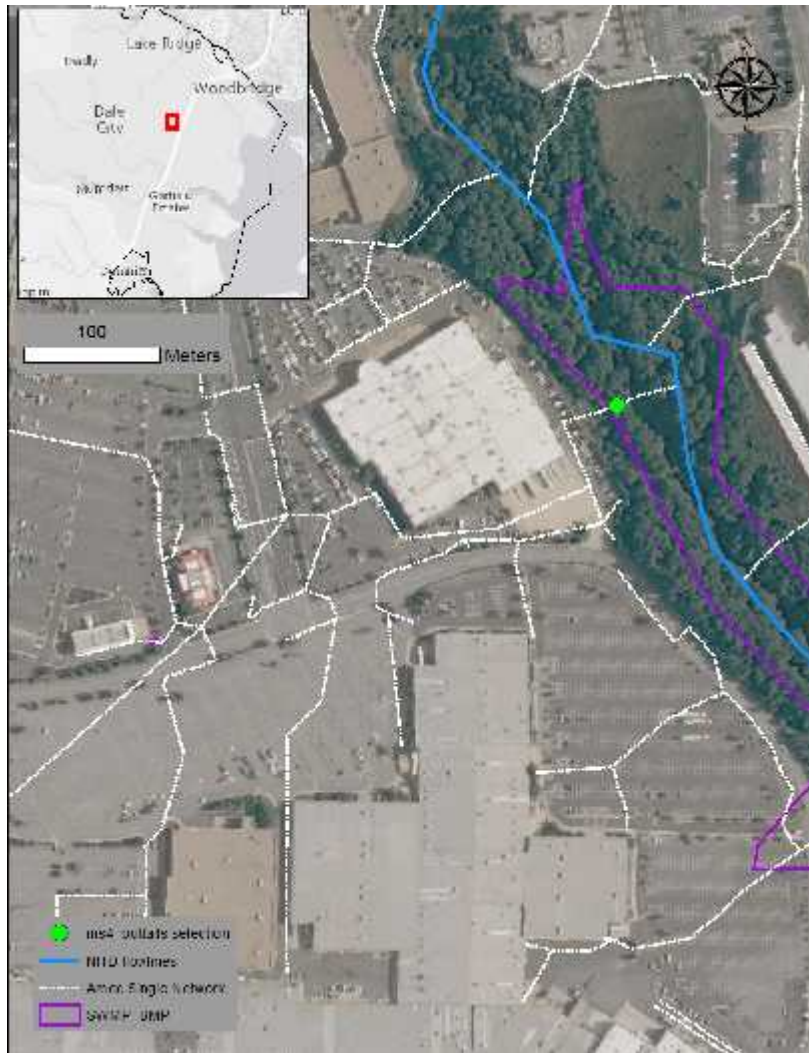




Access: Easy

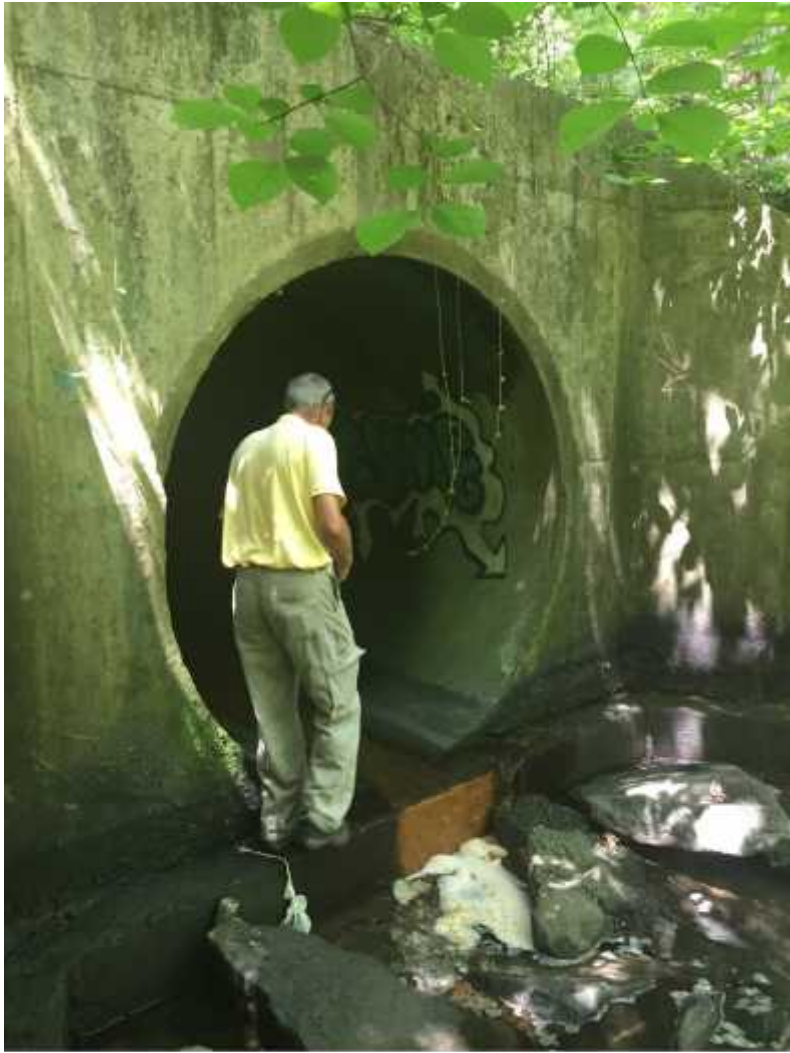


#3471: Woodbridge, Potomac Mills



- 84" concrete pipe
- < 1/4" flow
- Signs of human presence, uncertain frequency

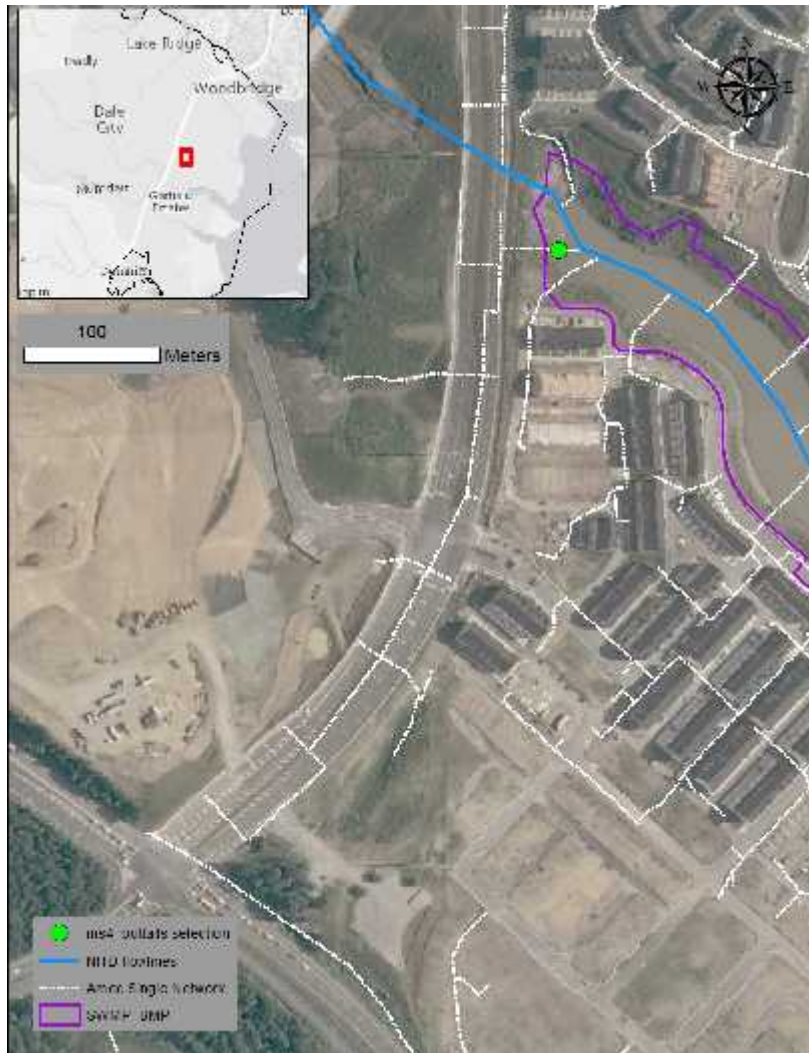




Access: Easy



#4684: Dale City



- **54" concrete pipe**
- **Low flow draining to scour pool**
- **Steep banks surrounding outfall**





Access: Moderate



Additional Slides: Bull Run



Additional Slides: Bull Run



Additional Slides: Pr. Wm. Pkwy



Additional Slides: Pr. Wm. Pkwy



Additional Slides: Pr. Wm. Pkwy



Additional Slides: Potomac Mills



Additional Slides: Potomac Mills



Additional Slides: Potomac Mills



Additional Slides: Dale City



Additional Slides: Dale City



Additional Slides: Dale City



Additional Slides: Dale City





Prince William County

Wet Weather Screening Program

Permit No.
VA0088595

Prince William County Department of Public Works
Watershed Management Branch
5 County Complex Court, Suite 170
Prince William, Virginia 22192

12/1/2015

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I. Introduction

Prince William County is dedicated to providing its citizens with the healthiest environment possible. It is with this goal the County establishes programs aimed at reducing pollutant impacts from heavily urbanized and industrialized areas. Non-point source pollution from urban and industrial areas within the County is a great concern due to its potential to impact water quality. Pollutants are transported from these areas during rain events and often deposited untreated into nearby streams and rivers. To mitigate this issue, the Environmental Protection Agency (EPA) and Virginia Department of Environmental Quality (VA-DEQ) have instituted programs aimed at reducing the potential impact of pollutants from urban areas.

Under the Virginia Pollutant Discharge Elimination System Permit Program (VPDS) and Virginia Stormwater Management Program (VSMP) permits are issued aimed at reducing pollution runoff from industrial and urban areas containing Municipal Separate Storm Sewers Systems or MS-4s. These systems transport water from urbanized areas to streams and rivers and are a major concern of point and non-point source pollution. Discharges from MS4s are regulated under the Virginia Stormwater Management Act and Clean Water Act (CWA) through permits issued by DEQ and the EPA. Through this program, Prince William County maintains a Phase 1 VSMP MS-4 permit (Permit No. VA0088595).

Through its VSMP permit, the County is required to monitor pollutants from areas suspected to be contributing excess levels of pollutants to its MS-4 by implementing a Wet Weather Screening Program. Unlike the Dry Weather Monitoring Program, the Wet Weather Screening Program is aimed at assessing pollutant load and composition during rain events. Using information obtained through this program, the County is to then develop strategies to reduce this pollutant load from these areas. The County's MS-4 permit, issued on December 17th, 2014, outlines requirements for the Wet Weather Screening Program as follows:

I.B.1).2) Wet Weather Screening Program: In addition to the monitoring required in Part I.C., the permittee shall continue to investigate, and address areas within their jurisdiction that are suspected to be contributing excessive levels of pollutants to the MS4. No later than 12 months after the effective date of this permit, the permittee shall develop written procedures for a wet weather screening program which shall include standard operating procedures to be used for initial screening and follow-up purposes. The written procedures shall be incorporated as part of the MS4 Program Plan.

The County has identified potential high risk discharge sites through its hotspot analysis GIS model. This model will be used to guide site location through the identification of areas designated for further research during the field screening stage of the program. A qualified laboratory or contractor will be chosen to perform field sampling, and to present results to the County

This program manual describes the methods and procedures for Prince William County's Wet Weather Screening Program. All procedures are subject to modification as program feasibility and applicability are assessed during program implementation. All program modifications will be noted as part of the County's Program Plan.

II. Wet Weather Monitoring Site Selection

Using the IDDE hotspot Identification and Analysis Model as a basis, locations for Wet Weather monitoring are to be assessed and selected by County personnel. Initial screening locations will be selected using the Hotspot Identification tool and additional GIS desktop analysis. Sites selected in initial screening will be investigated further through field screening activities. Final sites for Wet Weather Screening will be identified using results from the field screening process.

i. Initial Site Screening

The IDDE Hotspot Identification and Analysis model is a tool used by the County to determine where to focus Dry Weather Monitoring Activities. The tool uses several metrics to determine where the highest probability of illicit discharges and discharge of pollutants are to occur. The tool breaks down the County into ADC zones and prioritizes those ADC zones with the highest probability for pollutant discharge to occur. These zones are then used to schedule which outfalls to screen during Dry Weather Monitoring activities. The Hotspot Identification and Analysis Modeling process can be viewed in the document located in [Appendix A](#), but is explained in lesser detail in the following section.

a) Hotspot ADC Zone selection

The Hotspot ID model uses various GIS data layers to determine pollutant discharge potential. Layers depicting Land Use, Residential development, VPDES permitted facilities, High Risk Land Use, Sanitary Sewer Cross Points, Impervious Area, Outfall Locations, Waterways, and 303(d) listed Impaired waterways are incorporated in the analysis. Each feature within a layer is assigned a probability of discharge, pollutant discharge, or component score according to a perceived ability to pollute (potential of discharge to occur, and potential for that discharge to cause harm to the environment, or in the case of an outfall, the number of potential pollution discharge locations). These probabilities of discharge are then summed within a defined area, in this case ADC zones, in order to determine where in the County illicit or other pollutant discharges are likely to occur.

Land uses are analyzed according to use code. High risk use codes were determined from parcels throughout Prince William County and assigned a relative probability of discharge from 1-5 according to their perceived discharge potential (1 being low, 5 being high).

Table 1 - Probability of Discharge According to Use Code

Use code	Use description	Use Probability
191	Technology Services	1
229	Other Utilities	1
349	Food Stores	1
140	Research and Testing	2
156	Wholesale Warehousing (Condo)	2
224	Sewage	2

343	Convenience Store	2
831	Golf Course	2
832	Golf Course	2
112	Industrial Conglomeration	3
151	Mini Warehousing	3
216	Auto Parking	3
311	Small Shopping Center	3
312	Shopping Center	3
313	Shopping Center	3
314	Large Mall	3
315	Large Mall	3
317	Shopping Center	3
318	Shopping Center	3
320	Building Materials	3
351	Restaurant	3
352	Restaurant	3
353	Restaurant	3
354	Restaurant	3
361	Motor Vehicle Sales	3
520	Barber/laundry/cleaners/etc	3
590	Barber/laundry/cleaners/etc	3
841	Swimming Pool	3
851	Marina	3
910	Agricultural Resources	3
911	Agricultural Resources	3
930	Agricultural Resources	3
121	Durable Manufacturing	4
126	Durable Manufacturing (Condo)	4
131	NonDurable Manufacturing	4
150	Wholesale Warehousing	4
160	Industrial Service Garage	4
190	Other Industrial	4
211	Railroad	4
212	Rail Rapid Transit	4
213	Bus	4
214	Motor Freight Transportation	4
219	Other Transportation	4
225	Solid Waste Disposal	4
344	Convenience Store with Gas	4
362	Gas and Service Station	4
363	Gas Station	4
369	Other Automotive	4
540	Other Repair	4

973	Storage Yard	4
366	Service Station	5
530	Motor Vehicle Repair	5

Also included in the analysis are parcels for which VPDES permits are associated. Permitted sites were screened for those which discharge into Prince William County's MS-4 and assigned a probability of discharge in the same manner as high risk parcels above. The results of this analysis are displayed below.

Table 2 - Probability of Discharge Scores for VPDES Permitted facilities

NAME	Permit No.	Score
PWCBOCS	VAR051078	0
CHASE DAVID D	VAG830458	1
GENERAL DYNAMICS LAND SYSTEMS INC	VAR051293	1
OVERNITE TRANSPORTATION CO	VAR051030	1
US FOODSERVICE INC	VAR051117	1
OLD DOMINION FREIGHT LINE INC	VAR051476	1
REMODELERS CREDIT CORP	VAR051996	2
PWC	VAR051477	2
FURR FLOYD H AND BARBARA J	VAG750237	2
SUPPORT TERMINALS OPERATING PTNSHP	VAR051039	2
7905 LC	VAR052008	2
W M TINDER INC	VAR052074	2
EVERED INC	VAR052190	3
POTOMAC & RAPPAHANNOCK TRANSPORTATION E	VAR051886	3
LAND VENTURE ONE L C	VAR051295	3
DALRYMPLE REALTY CORPORATION	VAG110100	3
THIRD GENERATION L P	VAR051085	3
KRAUSS RICHARD L TR	VAR050983	3
NEWBILL HOLDINGS LLC	VAR051639	3
ARCHIE HENRY E SR & ANNIE WILLIAMS	VAR052115	3
BURBAGE J E JR E M BURBAGE	VAR051939	3
VENABLE JEAN S	VAR052243	3
HOFFMASTERS MARINA INC	VAR051183	3
SLURRY PAVERS INC	VAR051911	3
DAVIS TEDDY R JR HELEN M ETAL	VAR052014	3
ENNSTONE INC	VAG110111	4
COSNER MEDFORD R	VAR051009	4
VIRGINIA CONCRETE CO INC	VAG110083	4
DALRYMPLE REALTY CORP	VAR051949	4
JULIUS BRANSCOME INC	VAR050908	4
JONES SAMUEL M ESTATE	VAR051298	4
CONCRETE PIPE AND PRODUCTS CO INC OF	VAG110313	4

ARBAN CAROSI INC	VAG110068	4
HARD ROCK CONCRETE LLC	VAG110067	4
SUPERIOR PROPERTIES INC	VAR051992	4
SUPERIOR PAVING CORP	VAR050901	4
POTOMAC LANDFILL INC	VAR051073	5

Additional values scored in the analysis include outfalls, cross connection points, residential development, impervious area, streams, and impaired waterways. These features are scored as described in the table below.

Table 3 - Discharge Probability Scores for other Features

NAME	Score
Outfalls - Standard	10
- VPDES Outfalls	30
- High Risk Outfalls	30
Cross Connection Points	20
Residential Areas	1
Impervious Area	1
Streams and Waterways	1
Impaired Streams and waterways	2

As stated above, scores were then summed within an ADC index area. The ADC index is a mapping tool used by the County for navigation. The ADC index's break the County into equal area blocks which are assigned alpha-numeric values that help identify their location within the County for mapping. These equal area blocks are ideal for use in segmenting the County for stormwater analysis and Dry Weather Monitoring activities. The top 20 ADC indexes are to be selected for further analysis as described below.

b) Field Screening Site Selection

Once the initial 20 ADC zones are selected for potential field screening they will be narrowed down to a final 5 for field screening. The 20 ADC zones selected in the first screening are sufficient for Dry Weather Monitoring activities, but need to be further analyzed for use in the Wet Weather Monitoring program due to different constraints on the program. ADC zones will be scored according to the worksheet in [Appendix B](#). The Desktop analysis worksheet analyzes the following aspects of each ADC zone:

- **Ms-4 service area** – The focus of the Wet Weather Monitoring Program is to assess pollutant discharges within areas covered under its VSMP MS-4 Permit. For this reason ADC zones with drainage areas discharging to the County's MS-4 will be required.
- **Size of drainage system** – Drainage systems in Prince William County can span many acres. It is important to select candidate sites with drainage systems that allow the County to focus on a particular type of land use category. Monitoring larger drainage systems is also complicated due

to the increased probability of MS-4 interconnectivity. Monitoring drainage catchments that include VDOT or other MS-4s can reduce the value of results by convoluting the identification of pollutant sources. Although such data may be valuable in some circumstances, it is not the County's goal for this program.

- **Location of drainage system** – Identifying which land uses drain into candidate sites allows for a better characterization of the pollutant-land use relationship. Selecting candidate sites that involve succinct, identifiable drainage locations is a priority.
- **Land use, VPDES permits** – Areas with a high density of high risk land use and/or VPDES permits will be preferred. These areas have a higher probability of pollutant discharge, and therefore are of particular interest to the County. A more homogeneous mixture of land use is preferred. This gives the County a better understanding of the types of pollutants discharged from a particular land use, and helps develop better strategies for reducing pollutant loadings. For example, a site which drains mostly from commercial land uses will give the County a better understanding of the discharges coming from these areas, as opposed to a mixture of many different land uses (Commercial/industrial/residential), where the pollutants identified during monitoring cannot be as easily attributed to their sources.
- **County Easements** – In order to be able to run the monitoring station, the County must have legal authority to place it within the stormsewer system. Candidate sites must have access through County maintenance and repair easements. Proper permissions must be given by any stakeholders that may be attached to the site. Sites are preferred to be easily and safely accessible to staff and lab officials collecting samples.
- **Potential Monitoring sites** – Due to time constraints to County staff, sites which have more potential monitoring sites will be preferred. A site which contains more potential monitoring sites reduces the amount of travel and assessment time as opposed to visiting ADC zones with only one potential monitoring site. This also gives the County more choices to find an acceptable Wet Weather Monitoring location.

ii. Final Site Selection

The final sites selected will be evaluated further through a field assessment. Potential sites will be evaluated using the scoring matrix provided in [Appendix C](#). This form incorporates all aspects of final site selection protocol in order to quantifiably compare potential monitoring locations. Factors that influence final site selection are as follows:

Evaluate environmental impact of site – Identify and locate areas where aggregate materials are stored, vehicles are permanently parked, the location of dumpsters and grease traps, locations where spills may occur. Identify potential pollutants that could enter the environment for the sampling site.

Evaluate outfall locations for potential sampling – Locate outfalls and further evaluate ability to facilitate sampling equipment. It is difficult for a desktop analysis to fully convey outfall conditions including ease of access and its ability to house sampling equipment. Assess whether the outfall is in good condition, headwalls are intact, and if the outfall is submerged or blocked by sediment. Assess potential security issues for sampling equipment. Identify all potential monitoring sites.

Evaluate Drainage Systems for overall sampling impact – more specifically identify areas from which the monitoring site drains. Confirm land use for businesses/industry contributing to runoff.

The top two scoring sites will be selected for Wet Weather Monitoring. Sites selected will be gauged to determine flow rates, and measured for the retrofit of sampling equipment.

III. Wet Weather Monitoring Field Procedures

i. Sampling Methods

Sampling will be accomplished using an automated sampler. The sampler is an electronic sampling device which collects discrete samples of stormwater runoff at intervals throughout a storm event. Flow rates will be recorded in order to compute flow weighted composite samples. This should provide the County with an idea of how pollutant concentrations change during the length of a storm event.

Samplers will be attached to outfalls of sampling sites as selected in the above protocol. When applicable, grab samples may be utilized in order to gather analyte data such as TPH. The specific model of sampler will be determined by the contractor or contracted laboratory when selected to perform modeling activities.

ii. Analytes

The Wet Weather Monitoring Program will test for a host of analytes commonly found in stormwater runoff. These include various nutrients, metals, hydrocarbons, and sediments. Many of these analytes are also measured as part of the County’s Dry Weather and In-Stream Monitoring programs. A list of these analytes can be seen below.

Table 4 - Wet Weather Program Monitoring Analytes

Analyte
pH
COD
Zinc
Copper
Led
Nickel
Total Phosphorous
Total Kjeldahl Nitrogen
Nitrate and Nitrite
TSS
Ammonia as Nitrogen

This list will be modified during the life of the program. Analytes may be added/removed according to results obtained during monitoring according to the effectiveness of monitoring efforts. Analytes will also be added or removed as recommended by assigned contractor or laboratory responsible for monitoring efforts.

iii. Sampling Schedule

There is no specific sampling schedule or threshold presented in the County's MS-4 Permit. The County would like to assess two Wet Weather Monitoring sites on a biennial basis. This allows the County to assess the concentration of pollutants during the first yearly cycle, install appropriate BMP's designed to reduce pollutants, and finally use the second yearly monitoring cycle to assess the installed BMPs effectiveness. Samples will be taken at the two sites on a quarterly basis. Once the two year monitoring cycle is complete, two additional sites will be selected for Wet Weather Monitoring activities using the protocols described in the preceding sections. During this time, program procedures will be re-evaluated and updated as needed.

IV. Documentation and Reporting

This section will describe the documentation and reporting processes for the County's Wet Weather Monitoring Program.

i. Site Selection

Results of site selection will be presented in the County's Annual Report once complete. This includes procedures for the desktop and field analysis protocols presented in this document. All applicable forms, site plans, photos, diagrams, and calculations will be included in this analysis. All procedures dealing with site selection should be completed by the County's next annual reporting period (June 30TH, 2016). Information detailing the sites location (latitude and longitude), internal ID number,

ii. Monitoring Station Construction

Processes detailing monitoring site installation and construction will be included in the County's Annual Report when completed. Details on the type of automatic sampling hardware, including in depth procedures dealing with the sampling and transportation of samples, as well as analyte processing procedures will be included in the updated manual once determined by contractor or certified laboratory. All maintenance activities on monitoring hardware will be reported as completed.

iii. Annual Reporting

As required by the County's MS-4 permit, each annual report will include a list of locations Wet Weather Screening has occurred and the results of monitoring samples. In addition, the County will include as part of each annual report the weather conditions, date and time, and time of most recent storm event for each discrete sample taken. Meteorological data associated with the most recent storm event to the time of sample taken will be gathered from weatherunderground.com.

iv. Trends and Long Term Analysis and Program Follow-up

As the County is proposing to monitor sites on a biennial basis, each annual report will present monitoring trends. This will include a trends analysis as samples are processed quarterly for the year, as well as an assessment of effectiveness of BMP's installed as part of the biennial monitoring process. Results from year 1 of monitoring efforts will be used to implement BMP's in the monitoring site drainage area aimed at reducing critical pollutants. The effectiveness of those BMP's will be evaluated in year 2 of the Wet Weather Monitoring Program. All results of this analysis will be presented in the County's Annual Report.

Appendix A – Hotspot Identification and Analysis Model



Prince William County

Wet Weather Screening Program

Introduction

As a requirement for meeting guidelines mandated by the USEPA (Part 1.B.2.l)1) of Permit No VA0088595), Prince William County must identify and inventory “areas of concern” or areas predisposed to illicit discharges within its Municipal Separate Storm Sewer system (MS4). These “areas of concern” include: areas such as car washes, car dealerships, pet kennels, and restaurants; sites with previously occurring illicit discharges; areas of older development; areas representing the general land use of the county; sites with a history of citizen complaint; and areas located near environmentally sensitive features. Previously the County identified areas for dry weather monitoring by using a schedule of grids and a subjective assessment of areas of interest. In an attempt to generate a more quantitative assessment of illicit discharge “hot spots” around the County, a GIS based risk assessment was developed.

Variables

GIS layers

- County Municipal boundaries and ADC Index
- Land Use
- Residential Development
- VPDES Permitted Facilities
- High Risk Land Use Facilities
- Sanitary Sewer Cross Points
- Impervious Area
- County Outfall locations (outfalls >15in)
- County Streams
- 303(d) listed Impaired Virginia Waterways
- Raster based County imagery

Data

- Previous discharges according to land use
- History of citizen complaint according to land use

Procedures

Data Collection

Data layers were collected from the County GIS system via database linkage within version 10.3 of ArcGIS, with the exception of the 303(d) listed impaired streams data, which was acquired through the DEQ website.

Initial Layer Synthesis and Input

In order to complete the hotspot analysis, data layers must be modified to yield the information needed. First, use codes were assessed for various land uses of interest and used to select a subset of parcels which could be determined as “high risk” land uses. A “use probability” was applied to each land use, which characterizes a land use’s probability for a discharge to occur, and potential severity of that discharge should it occur. This “use probability” is initially applied subjectively, but will be further defined as more data from the IDDE program is gathered and can be re-input into the model. Figure 1 displays the location of various land uses of interest of Prince William County.

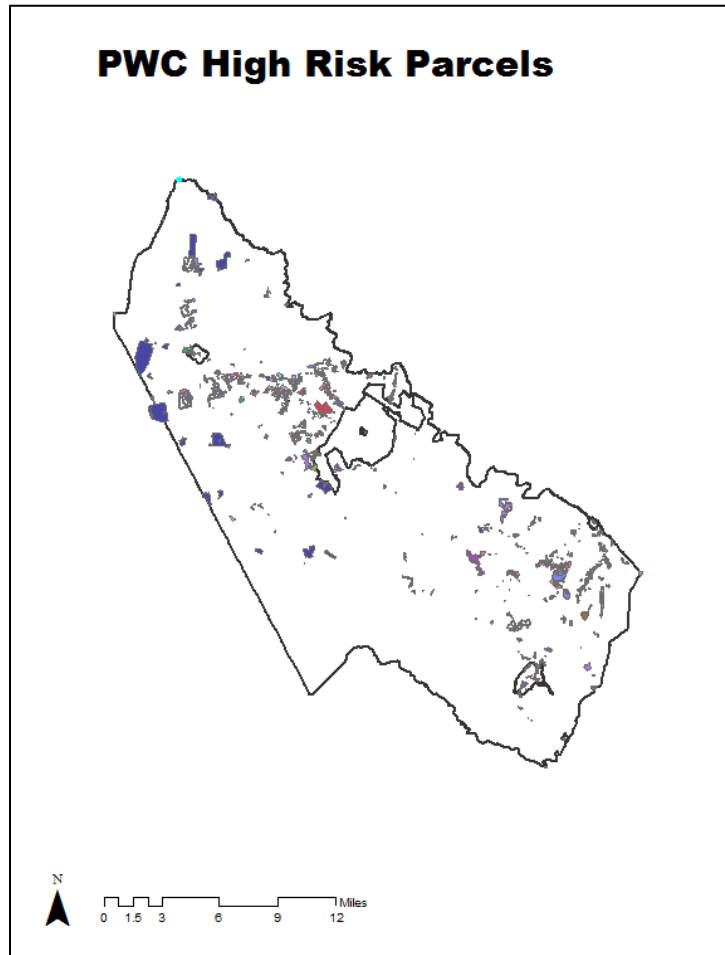


Figure 1: High Risk Parcels hotspot identification map

The impact value is a number from 1 to 5 characterizing each land use according to the potential of illicit discharge occurrence (determined from historical discharge data, low probability denotes low risk) and potential discharge severity (an assumption of the possible damage that may occur from a discharge). A list of land uses, use codes, and the initial scores given to the land uses can be seen below in Table 1.

Table 5: Impact values for Land Use hotspot identification

Use code	Use description	Use Probability
191	Technology Services	1
229	Other Utilities	1
349	Food Stores	1
140	Research and Testing	2
156	Wholesale Warehousing (Condo)	2
224	Sewage	2
343	Convienience Store	2
831	Golf Course	2
832	Golf Course	2
112	Industrial Conglomeration	3
151	Mini Warehousing	3
216	Auto Parking	3
311	Small Shopping Center	3
312	Shopping Center	3
313	Shopping Center	3
314	Large Mall	3
315	Large Mall	3
317	Shopping Center	3
318	Shopping Center	3
320	Building Materials	3
351	Restaurant	3
352	Restaurant	3
353	Restaurant	3
354	Restaurant	3
361	Motor Vehicle Sales	3
520	Barber/laundry/cleaners/etc	3
590	Barber/laundry/cleaners/etc	3
841	Swimming Pool	3
851	Marina	3
910	Agricultural Resources	3
911	Agricultural Resources	3
930	Agricultural Resources	3
121	Durable Manufacturing	4
126	Durable Manufacturing (Condo)	4
131	NonDurable Manufacturing	4
150	Wholesale Warehousing	4
160	Industrial Service Garage	4
190	Other Industrial	4
211	Railroad	4
212	Rail Rapid Transit	4

213	Bus	4
214	Motor Freight Transportation	4
219	Other Transportation	4
225	Solid Waste Disposal	4
344	Convenience Store with Gas	4
362	Gas and Service Station	4
363	Gas Station	4
369	Other Automotive	4
540	Other Repair	4
973	Storage Yard	4
366	Service Station	5
530	Motor Vehicle Repair	5

The same process was used for VPDES general stormwater discharge permit holders within the County. VPDES permitted facilities were identified using data obtained from DEQ. A determination on which VPDES permittees discharged into the County’s MS-4 system was made, and a score (discharge probability) was assigned to each facility according to its assumed probability to discharge pollutants.

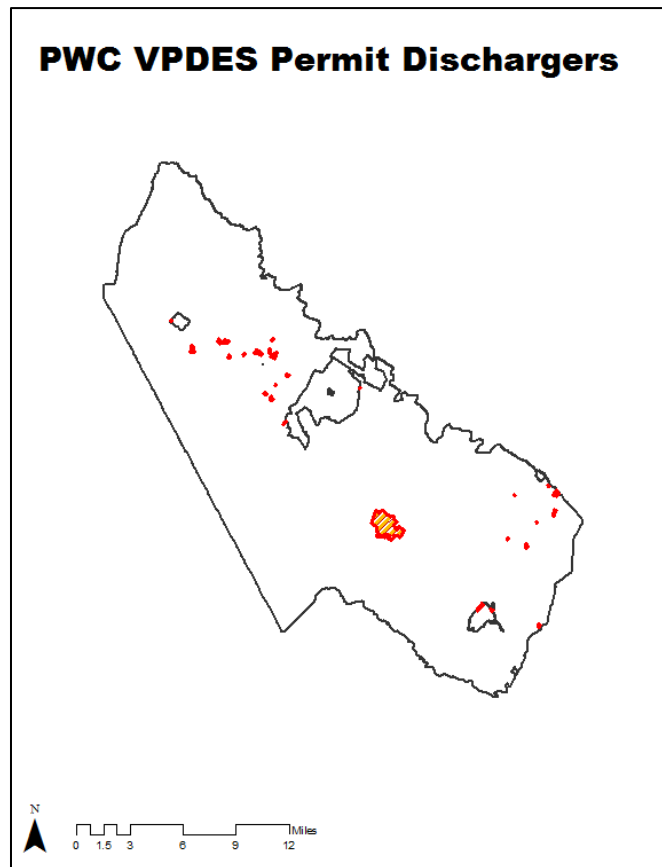


Figure 22: VPDES permitted facilities hotspot identification map

Table 2: Impact values for VPDES hotspot identification

NAME	Permit_No	Score
PWCBOCS	VAR051078	0
CHASE DAVID D	VAG830458	1
GENERAL DYNAMICS LAND SYSTEMS INC	VAR051293	1
OVERNITE TRANSPORTATION CO	VAR051030	1
US FOODSERVICE INC	VAR051117	1
OLD DOMINION FREIGHT LINE INC	VAR051476	1
REMODELERS CREDIT CORP	VAR051996	2
PWC	VAR051477	2
FURR FLOYD H AND BARBARA J	VAG750237	2
SUPPORT TERMINALS OPERATING PTNSHP	VAR051039	2
7905 LC	VAR052008	2
W M TINDER INC	VAR052074	2
EVERED INC	VAR052190	3
POTOMAC & RAPPAHANNOCK TRANSPORTATION E	VAR051886	3
LAND VENTURE ONE L C	VAR051295	3
DALRYMPLE REALTY CORPORATION	VAG110100	3
THIRD GENERATION L P	VAR051085	3
KRAUSS RICHARD L TR	VAR050983	3
NEWBILL HOLDINGS LLC	VAR051639	3
ARCHIE HENRY E SR & ANNIE WILLIAMS	VAR052115	3
BURBAGE J E JR E M BURBAGE	VAR051939	3
VENABLE JEAN S	VAR052243	3
HOFFMASTERS MARINA INC	VAR051183	3
SLURRY PAVERS INC	VAR051911	3
DAVIS TEDDY R JR HELEN M ETAL	VAR052014	3
ENNSTONE INC	VAG110111	4
COSNER MEDFORD R	VAR051009	4
VIRGINIA CONCRETE CO INC	VAG110083	4
DALRYMPLE REALTY CORP	VAR051949	4
JULIUS BRANSCOME INC	VAR050908	4
JONES SAMUEL M ESTATE	VAR051298	4
CONCRETE PIPE AND PRODUCTS CO INC OF	VAG110313	4
ARBAN CAROSI INC	VAG110068	4
HARD ROCK CONCRETE LLC	VAG110067	4
SUPERIOR PROPERTIES INC	VAR051992	4
SUPERIOR PAVING CORP	VAR050901	4
POTOMAC LANDFILL INC	VAR051073	5

Since the point of discharge is the ultimate target of the analysis, outfalls greater than 15 inches were identified through Prince William County. Applicable outfalls were identified and isolated using the feature selection tool and processed into an individual layer. The greater the density of outfalls within

an area the larger the chance of a discharge occurring. Outfalls associated with VPDES and High Risk facilities were also determined by creating a buffer around VPDES and High Risk parcels, and capturing all outfalls within the buffer. Outfalls were given a uniform impact value and factor in during the overall hotspot analysis (Standard outfall = 10, VPDES outfall = 30, High Risk Outfall = 30). Figure 3 displays the location of outfalls within the county.

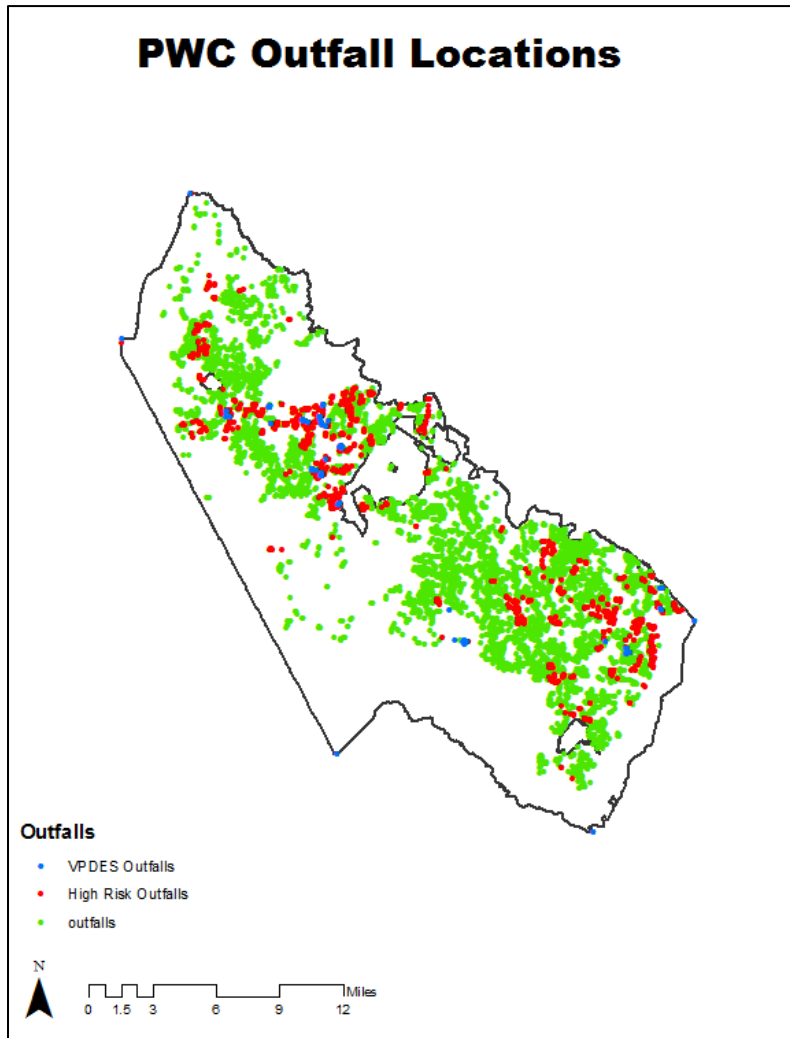


Figure 3: Location of outfalls within Prince William County

To address the potential impact of illicit discharge on environmentally sensitive areas, a streams and water body layer was included in the analysis (Figure 3). Major streams and rivers were isolated from man-made ditches and conveyances within the layer. These streams were given a uniform impact value. The area of stream within a region influences the potential discharge probability score by quantifying the amount of environmentally sensitive features in an area. Streams listed on the EPA 303(d) list of impaired water bodies have a greater potential of impact from illicit discharges and are therefore given an additional weight in model outputs.

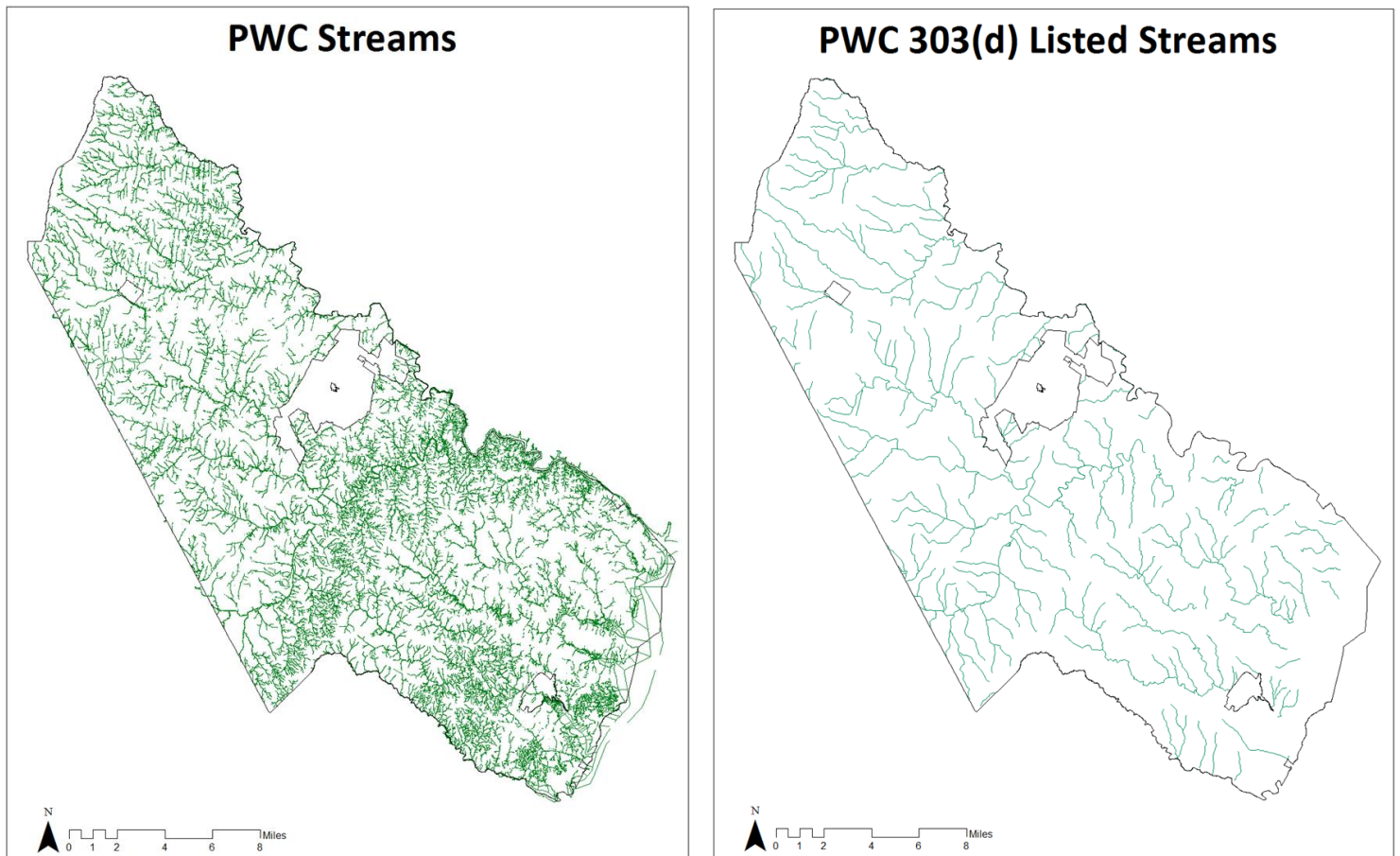


Figure 4: Streams and impaired streams within Prince William County's jurisdictional area

Next an assessment of potential areas for cross connections between the storm sewer and sanitary sewer system was performed. Areas where the storm and sanitary sewer system overlap create potential for cross contamination due to leaking sanitary sewer infrastructure. This analysis was accomplished by overlaying the storm and sanitary sewer layers using GIS, and isolating the locations where they overlap. These locations were turned into point features and assigned a uniform potential discharge probability score (20). This analysis is displayed below in Figure 5.

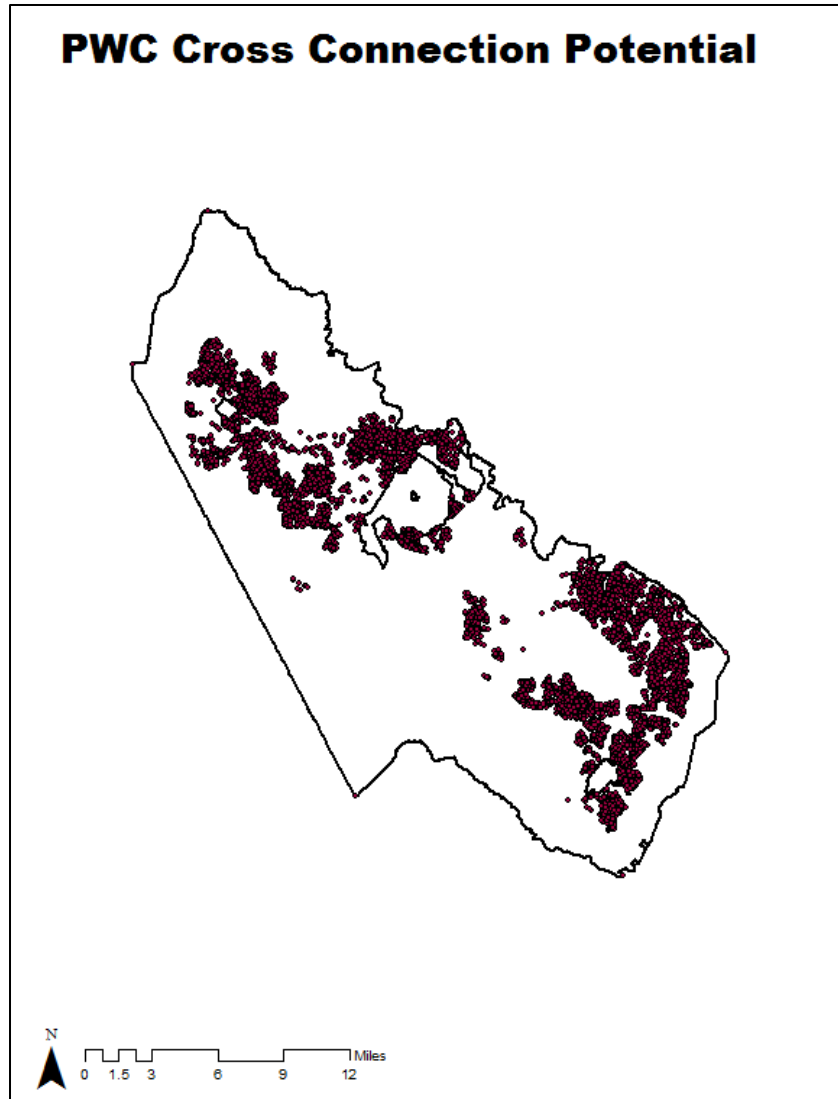


Figure 5: Location of potential cross connection sites within Prince William County

Often, areas with a higher percentage of impervious surfaces tend to contribute greater to pollutant loads. To account for this, a layer depicting impervious surface within the County was incorporated in the model. Impervious surface area is assigned a discharge score of 1. A low score was selected because the large areas covered by impervious surface can cause large impacts to model outputs. A score which balances the impact of impervious surface on pollutant output without weighing too much into model outcomes was desired. Figure 6 below shows impervious area within the County.

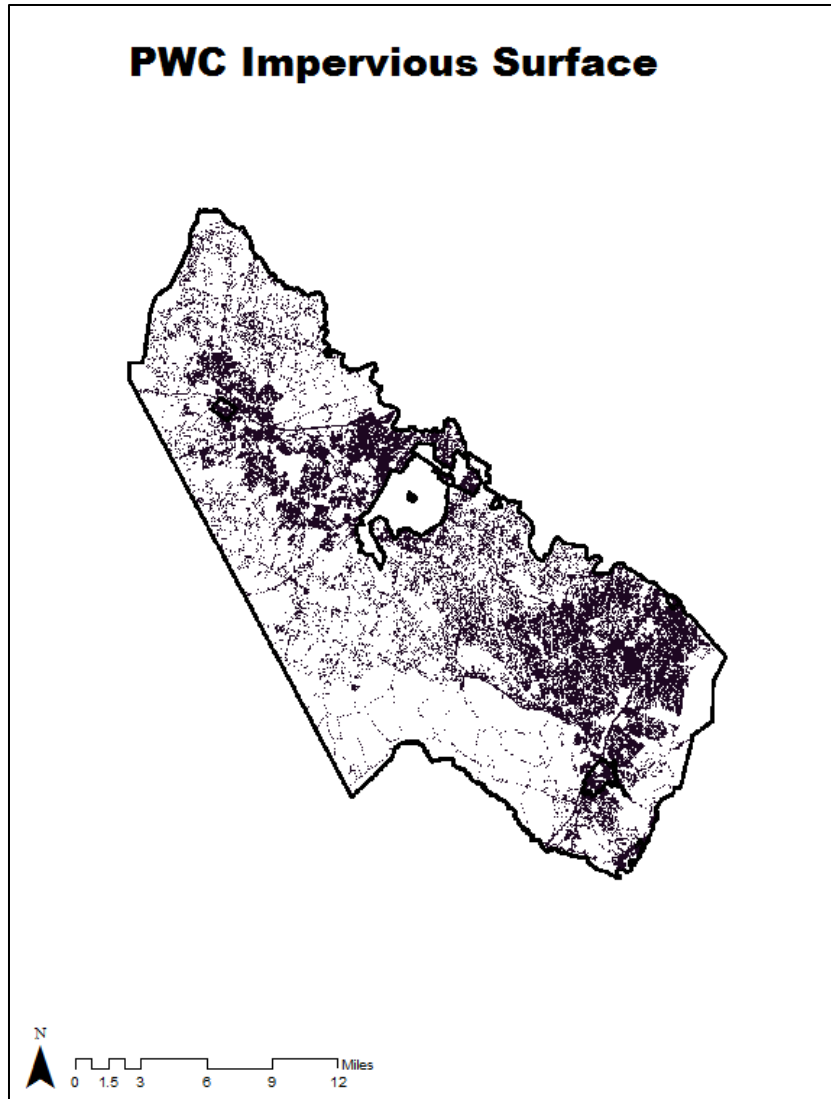


Figure 6: Impervious surface in Prince William County

Lastly, discharges from residential areas had to be accounted for. Although commercial and industrial areas were well represented in the hotspot analysis, residential areas within the County were lacking sufficient input into the model. Using a layer depicting the residential development in the County, these areas were isolated and assigned a discharge score of 1. This gives residential areas a proportioned impact on hotspot scores.

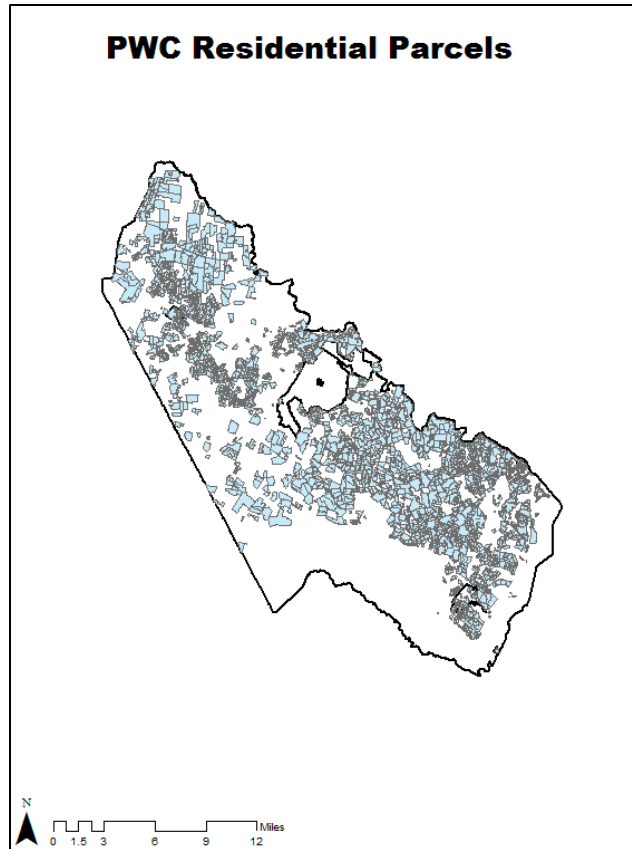


Figure 7: Impervious surface in Prince William County

Hotspot Analysis

Once the layers were manipulated to yield the desired data they had to be combined to produce the final hotspot analysis. Layers were converted from a polygon, line, or point to a raster format to allow for easier compatibility of the various data layers. The Raster format represents data in small cells, allowing for a point by point analysis of each location on the map. It facilitates the ability for data with different layer types (i.e. polygon, line, point) to be combined simply, since they are not compatible otherwise due to differences in shape, size, and location. Areas within a layer where empty space exists cause discontinuity when trying to combine them into the overall analysis. To remedy this, the Reclassify Raster tool was used. This tool removes the “Nodata” classification automatically applied to empty spots in the layer during the raster conversion, allowing a numerical value to be assigned in its place (0). Without this step, only the overlapping areas of data in each layer would be included in the analysis and an incomplete assessment of discharge probability would result.

Each layer was combined for hotspot analysis using the Raster Calculator tool. This tool performs simple mathematical operations at the cellular level, to combine the data into an overall assessment of County hotspots. The tool essentially adds together each included layer combining the discharge probability scores from each cell. Figure 8 below shows a simple representation of this process.

Data is then transposed to the ADC index and watershed maps of the County through simple Spatial Statistics tool. The Spatial Statistics tool performs a basic statistical analysis on raster cells within a specified polygon. For the purpose of this study the mean and sum of probabilities within both the

ADC index areas and sub-watersheds of the County were assessed.

Analysis using Mean vs. Area (Average) Score

There are various ways to interoperate the data output from the model. A score had to be generated for each ADC Index number and watershed in order to effectively assess and utilize model outputs; however, this presented a problem as to what mathematical method of assessment should be

used. The ArcGIS model is generated to output values for the mean, median, minimum, maximum, and sum of each individual ADC index area and watershed. As stated before, for the purpose of this analysis, only the sum and mean probability of discharge are of interest. The sum is the result of all cells within the identified area added together, while the mean is the average cell value within the area. For a watershed scale analysis, the mean probability of discharge must be used. This is because the area of each watershed differs, leaving the sum of the probabilities of each watershed highly dependent on its size. Larger watersheds will accommodate more cells leading to a larger overall probability of discharge. The ADC index, on the other hand has a uniform area removing the effect of size on the output. This allows for the sum of probabilities to be used, which gives a better overall assessment of the characteristics within that area.

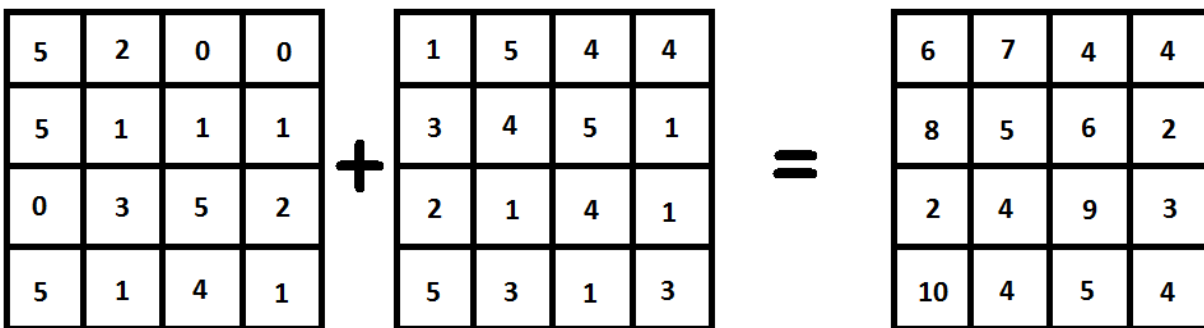


Figure 8: Raster Calculator Example

Isolation of Hotspots and Identification of Outfalls of interest

The first step in using hotspot analysis to identify outfalls for field inspection is to select the ADC index number with the highest probability of discharge is selected from the generated list. The ADC index was chosen as a basis for field analysis for a few reasons: it is easy to navigate to, being the basis for street map navigation; it encompasses a relatively small area, typically containing 8-10 outfalls per Index which is a good size for a day’s field assessment; and, it can be combined easily to into a larger area allowing for an broader perspective on illicit discharge trends. Assessing discharges on a watershed scale would incorporate too large of an area and would not be suitable for a quality comparison

between areas of the County. Once an index number is selected, then an index area map is generated showing all outfalls, storm sewer system, roads, and land uses of interest. Each map is created using ArcGIS tools to zoom to the applicable map location (ADC Index number), and to highlight all applicable features. From this map, a list of all outfalls and their size can be created. This map, with outfall information, can then be used as a field guide for the outfall monitoring.

Model Calibration

Model calibration is an important step in model development. Model outputs must be adjusted to more closely portray actual conditions. Since the raster layers used to sum severities in the model skew the data by giving more weight to larger polygons, point-sized items like outfalls must be given a larger value to compensate and allow ADC areas to more closely reflect the desired weight proportion between inputs. The value given to outfalls was adjusted so that their impact on model outputs was more representative of actual conditions.

Originally, some areas of the map contained a high probability of discharge, despite being located in more rural areas. This was found to be due to an increased proportion of streams meandering throughout the grid. In order to correct this, a balance was struck between the impact value given to streams, and their actual impact on real-world conditions. Similarly, rural areas were triggering high probabilities of discharge due to the age of parcel development despite not having substantial storm sewer systems. To remedy this, the residential and commercial layers were given a larger score to better reflect in-situ conditions.

The model will continue to be adjusted as more data becomes available pertaining to discharges within the County. Data will be used to validate and or adjust assumptions made in this version of the model.

Results and Conclusions

The results of the analysis showed areas with the greatest probability of discharge within Prince William County were consistent with previous field observations and expectations. The Route 1 corridor, Bull Run commercial area, and Potomac Mills Mall all generated high probabilities of discharge. Residential areas had a fairly constant probability of discharge. The highest probability of discharge was located around the specified land uses of interest including shopping centers and auto-related industrial areas. Rural areas with little to no storm sewer system recorded the lowest probability of discharge, as would be expected. A detailed map displaying parcel-based discharge probability was created using the methods described above (see figure 9). The land uses of interest are distinctly represented in red describing the highest discharge potential. Residential areas shown primarily in yellow present a moderate discharge potential. Rural areas are mostly indicated in blue, describing a low discharge potential which are most likely out of the scope for dry weather discharge monitoring. Outfall locations and numbers are not factored in this analysis.

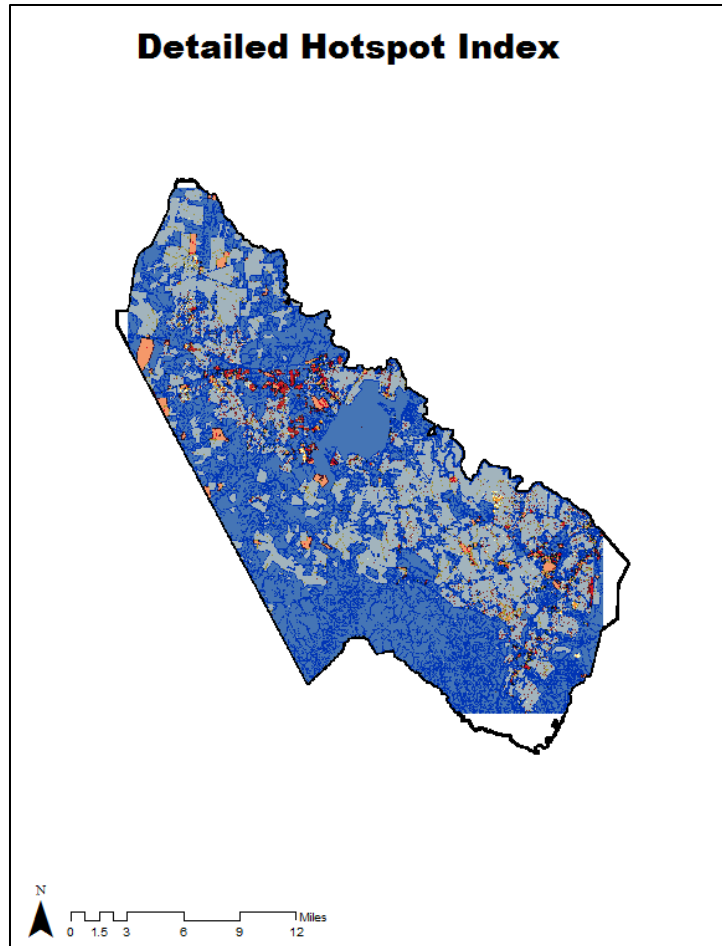


Figure 9: Detailed Discharge Probability

Previously a hotspot analysis was performed on a watershed scale. However, a watershed approach to discharge monitoring tends to skew the data, since discharge probabilities are averaged over the entire watershed making smaller pockets with high discharge; therefore, the ADC index method was determined to be the best.

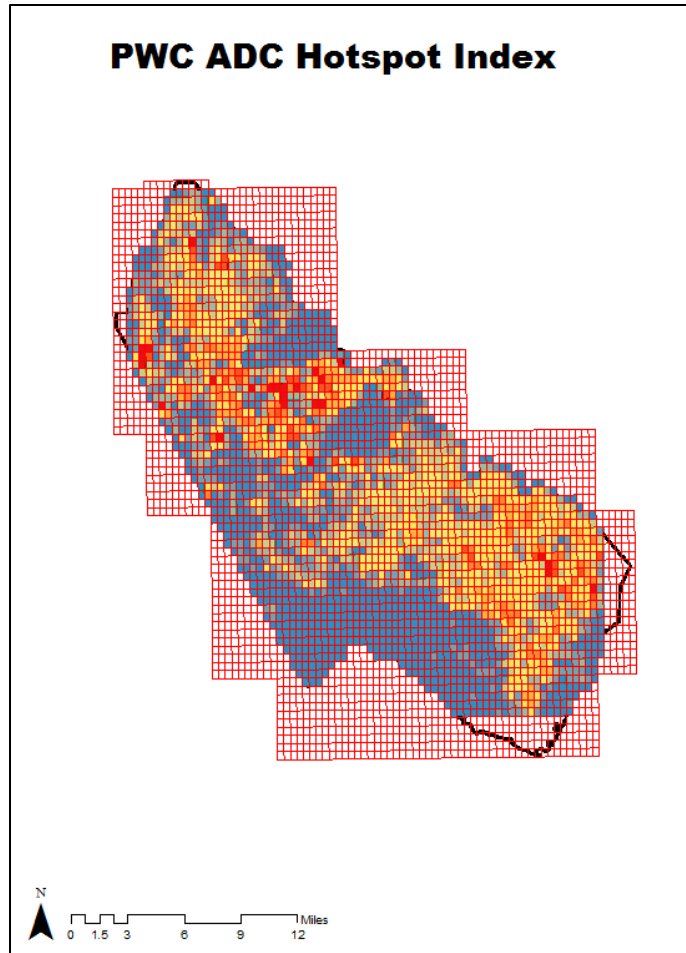


Figure 10: ADC index probability of discharge

The ADC index hotspot map, shown above (figure 10), is used for the inspection scheduling and field analysis of outfalls. As indicated in the parcel and watershed level assessments, County hotspots exist along the Route 1 corridor, Bull Run commercial area, and Town of Haymarket. Unlike the parcel and watershed level assessments, the ADC hotspot map provides a more thorough analysis of where the most probable locations for illicit discharge might actually be present. Table 3, shown below, displays the 50 ADC index areas with the highest probability of discharge. Sorted from highest to lowest, the table serves as the basis for the scheduling of dry weather outfall monitoring in the County.

Table6: Sum and mean probability of discharge scores by ADC index number

ADC_ID	MEAN	SUM
5992-C8	34916	56459172
5990-K5	34175	54919225
5756-G7	31523	51130306
5756-H7	30976	50243072
5991-A6	28771	46896730
5756-G3	27086	43879320
5992-C7	25886	42427154

5992-D7	24576	39641088
6110-G2	24456	39349704
5756-J7	24228	39322044
5757-A2	24170	39227910
5992-A6	23838	39189672
5991-A7	23096	37461712
5992-B6	22846	36782060
5991-A5	22637	36694577
5756-H4	22435	36322265
5992-G9	21579	35605350
5992-H8	21376	35270400
5756-K7	20886	33918864
5874-H7	20478	33542964
5638-G10	20215	33132385
5756-H5	20055	32609430
5756-K6	19838	32097884
5755-C4	19460	31914400
5872-C1	18951	30814326
5992-D8	18811	30624308
5874-J7	18896	30592624
5992-H7	18536	29842960
5756-H8	18295	29839145
5991-G7	18524	29675448
5756-J5	18332	29624512
5992-K10	17877	29211018
5990-C9	17834	29087254
5991-F7	17543	29033665
5992-E10	17820	28921860
5872-H10	17359	28746504
5756-G10	17724	28624260
5756-J6	17357	28222482
5991-B7	17339	28193214
5754-F5	17186	28167854
5756-C10	17250	28031250
5638-H10	17069	27839539
5756-G8	17085	27677700
5992-K6	16869	27597684
5755-E4	16728	27233184
5872-D1	16318	26777838
6110-E3	16210	26762710
5757-H6	16567	26623169
5991-K1	16215	26527740

Future Development of Model

The model will be updated as more detailed discharge information is gathered through the county monitoring program. In addition, updated data layers pertaining to the storm sewer system, outfalls, impaired stream listings, age of development, county land use, and parcel location will continually be introduced to the model. If more specific data on the age of storm sewer infrastructure becomes available, this will also be included in the model. Also, when the extent of the County's MS4 system is identified, model data will be adjusted accordingly. Finally, methods to incorporate the history of complaints and poorly maintained commercial areas will be evaluated and incorporated, if possible, into the assessment. All steps to increase the accuracy of the hotspot analysis will be evaluated for the model on an annual basis, and the model outputs will be re-assessed. An evaluation of the accuracy of the hotspot analysis, as well as verification of model outputs will be conducted on an annual basis.

Appendix B – Desktop Analysis Scoring Worksheet

Appendix C – Field Assessment Scoring Worksheet

Water Quality Monitoring Report

Third Quarter 2014 July – September

Montgomery County

Prepared for:



Prince William County Department of Public Works

County of Loudoun, Virginia

Prince William County, Virginia

Prepared by:

James C. O'Neil, Director, Environmental Infrastructure

County of Loudoun, Virginia

Montgomery County, Virginia

Montgomery County, Virginia

August 2014

Project 0000000000

1. Introduction

The County's water monitoring infrastructure consists of water quality data used to provide information about water monitoring for compliance with the Virginia Stormwater Management Program (SM) Municipal Separate Storm Sewer System (MS4) permit issued by the Virginia Department of Environmental Quality (DEQ) to Princeton County Virginia. This report discusses the results of the sampling event conducted on August 2019 and all other findings from the water quality analysis.

2. Methods

Flow rate data were collected at the outfall by an (S) automatic water coupled with an (S) flow meter (S) module installed into a Science Ring flow rate over the course of the sampling event. The flow rate was electronically calculated using (S) flowline software utilizing the Manning equation to convert flow depth and velocity to flow rate.

3. Sampling Methods

Site 1 is located near the intersection of Ring Road and it receives a total of approximately 100 acres of drainage area from a land parcel that is currently in agricultural use. County data revealed that the site is an increase in diameter with a flow of approximately 100 cfs. A runoff event on a local level occurred in the area it is at the same location of an adjacent stormwater pond.

4. Sampling Equipment

Site 1 is located near the corner of Potomac Center Blvd and Southfield Way at Brookwood. Runoff drains into a BMP for the Potomac River residential development. The drainage total of approximately 100 acres is from various parcels. The site is an increase in diameter with a flow of approximately 100 cfs.

The automatic water sampler deployed upon a qualifying storm event with precipitation forecast for the monitoring station on August 2019. The water quality data deployed the sampler at the field site and programmed the samplers' automated, discrete sampling frequency to initiate upon flow depth according to the increase or decrease at Site 1 and immediately after the program was set to collect discrete samples to be collected every 15 minutes over a 24-hour duration. Rain gauge data were collected for monitoring station in the water monitoring network. Data were easily accessed online and provided hourly precipitation total over the monitoring period. The data were prioritized based on the available data record reporting interval and proximity to monitoring location.

Following the storm event, the data were retrieved from the field and prepared for shipment to the Environmental Water Quality Laboratory in order to collect the composite discrete samples into a single flow-weighted composite discharge. The discharge was calculated from the flowline software using the Manning equation.

$$Q = VA = \left(\frac{1.49}{n}\right)AR^2\sqrt{S} \text{ [US]}$$

Q = flow rate
A = flow area
S = gravity
n = water surface slope

R = hydraulic Radius
n = Roughness coefficient
S = English unit conversion factor

Site

Summary

The range of flow rates – which correspond to the hydrograph coefficients – can be seen in Figure 1. The proportion of each of the individual flow rates is indicated by the colored bars that only partial data was collected for each and the corresponding or photo of the flow rate is provided to incorporate the data into the flow rate.

Figure 1 shows data over time for the flow rate at Site on August

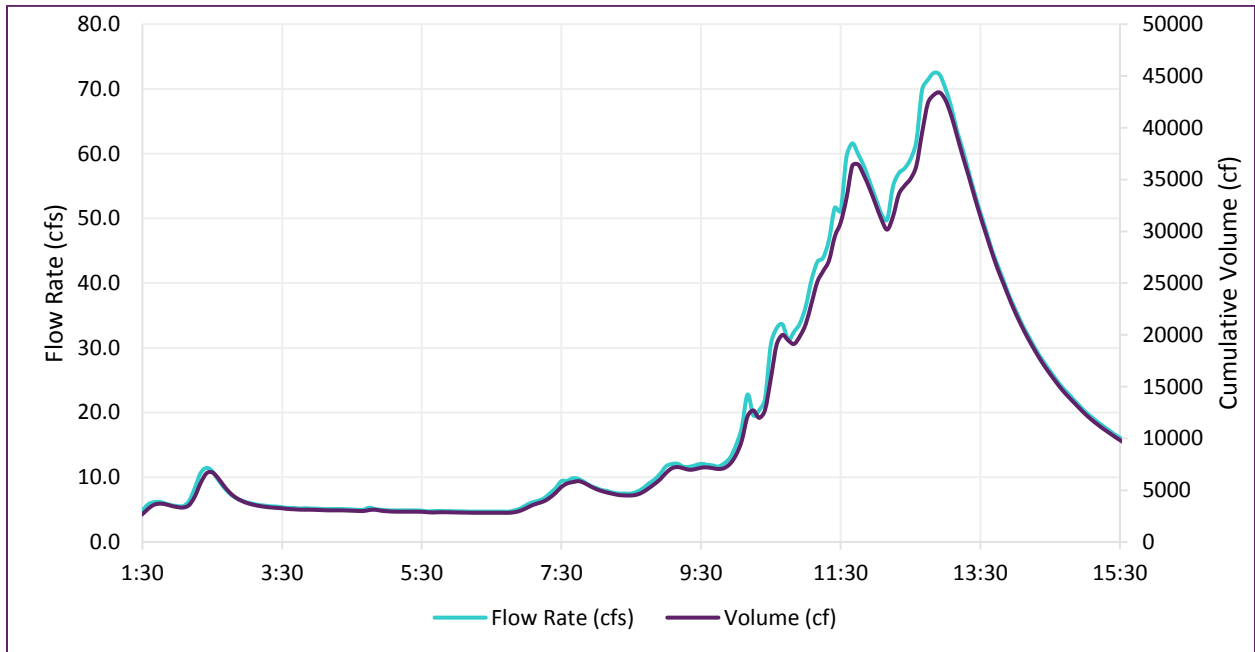


Table 3.25 Summary of Coliforms and Total Solids – Site 001

Bottle	Sample	Coliforms	Total Solids	Notes
1	1	0	0	
1	2	0	0	
1	3	0	0	
1	4	0	0	
1	5	0	0	
1	6	0	0	
1	7	0	0	
1	8	0	0	
1	9	0	0	
1	10	0	0	
1	11	0	0	
1	12	0	0	
1	13	0	0	
1	14	0	0	
1	15	0	0	
1	16	0	0	
1	17	0	0	
1	18	0	0	
1	19	0	0	
1	20	0	0	
1	21	0	0	
1	22	0	0	
1	23	0	0	
1	24	0	0	
1	25	0	0	
1	26	0	0	
1	27	0	0	
1	28	0	0	
1	29	0	0	
1	30	0	0	
1	31	0	0	
1	32	0	0	
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1	36	0	0	
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1	40	0	0	
1	41	0	0	
1	42	0	0	
1	43	0	0	
1	44	0	0	
1	45	0	0	
1	46	0	0	
1	47	0	0	
1	48	0	0	
1	49	0	0	
1	50	0	0	
1	51	0	0	
1	52	0	0	
1	53	0	0	
1	54	0	0	
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1	56	0	0	
1	57	0	0	
1	58	0	0	
1	59	0	0	
1	60	0	0	
1	61	0	0	
1	62	0	0	
1	63	0	0	
1	64	0	0	
1	65	0	0	
1	66	0	0	
1	67	0	0	
1	68	0	0	
1	69	0	0	
1	70	0	0	
1	71	0	0	
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1	76	0	0	
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1	78	0	0	
1	79	0	0	
1	80	0	0	
1	81	0	0	
1	82	0	0	
1	83	0	0	
1	84	0	0	
1	85	0	0	
1	86	0	0	
1	87	0	0	
1	88	0	0	
1	89	0	0	
1	90	0	0	
1	91	0	0	
1	92	0	0	
1	93	0	0	
1	94	0	0	
1	95	0	0	
1	96	0	0	
1	97	0	0	
1	98	0	0	
1	99	0	0	
1	100	0	0	

*3.25 L Sample

Site Description

Flow ranged from 0.0 to 5.0 cfs. The hydrograph shows a significant peak in flow rate at approximately 11:30 AM, reaching a maximum of 5.0 cfs. This peak is followed by a period of fluctuating flow rates between 0.5 and 1.5 cfs. The cumulative volume shows a corresponding increase, reaching a maximum of approximately 2500 cf at the end of the period. The data indicates that the flow rate was insufficient for sample collection between 5:30 AM and 9:30 AM.

Figure 1: Flow rate and cumulative volume data for the storm event at Site 100000 on August 2018.

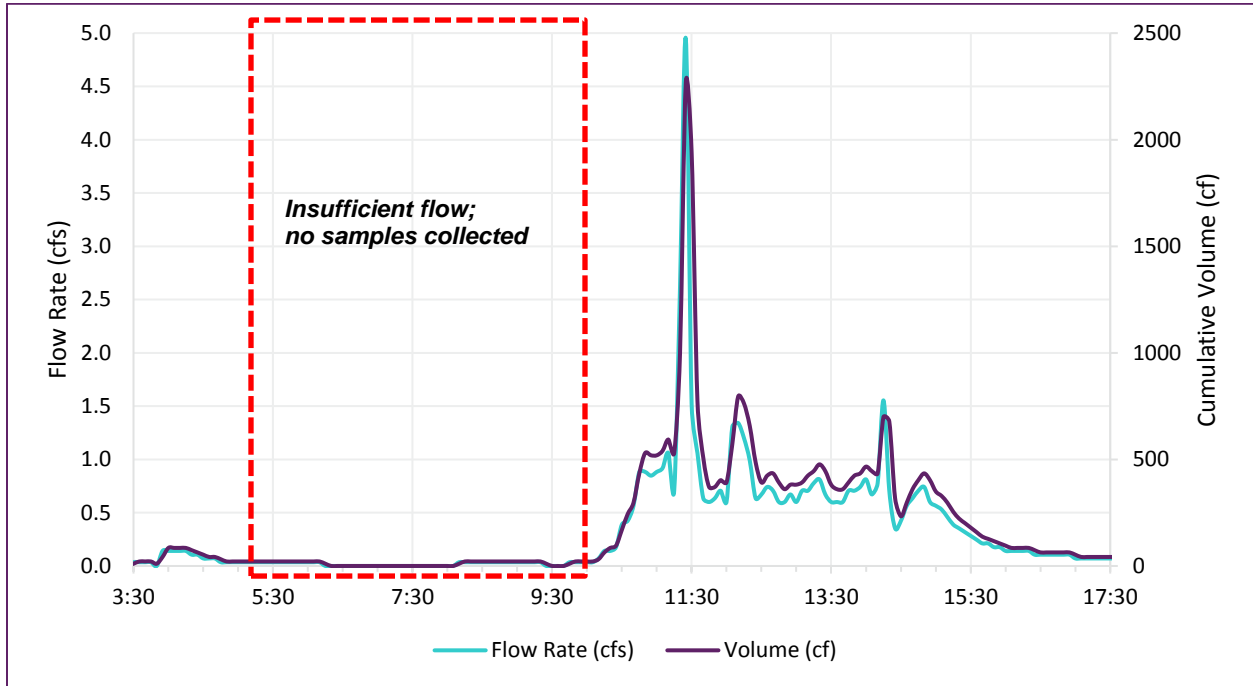


Table Summary of Coliforms and Total Solids - Site 000000

Bottle #	Initial Sample	Coliforms	Total Solids	Total Solids
1	10000	10000	10000	10000
2	10000	10000	10000	10000
3	10000	10000	10000	10000
4	10000	10000	10000	10000
5	10000	10000	10000	10000
6	10000	10000	10000	10000
7	10000	10000	10000	10000
8	10000	10000	10000	10000
9	10000	10000	10000	10000
10	10000	10000	10000	10000
11	10000	10000	10000	10000
12	10000	10000	10000	10000
13	10000	10000	10000	10000
14	10000	10000	10000	10000
15	10000	10000	10000	10000
16	10000	10000	10000	10000
17	10000	10000	10000	10000
18	10000	10000	10000	10000
19	10000	10000	10000	10000
20	10000	10000	10000	10000
21	10000	10000	10000	10000
22	10000	10000	10000	10000
23	10000	10000	10000	10000
24	10000	10000	10000	10000
25	10000	10000	10000	10000
26	10000	10000	10000	10000
27	10000	10000	10000	10000
28	10000	10000	10000	10000
29	10000	10000	10000	10000
30	10000	10000	10000	10000

*2.75 L Sample

City of Fairfax Monitoring Report
City of Fairfax
Fairfax County, Virginia

August 2020

CONFIDENTIAL

SECRET

Management

The site is located at the Bull Run water treatment facility drainage for an industrial use area and parking lot. It is a frequent truck traffic outfall. Significant signs of recent repair work are visible. The area is a dry area deployed at the site under clear conditions. The time of installation for the area is a contact of more than one inch of precipitation. The four inch of standing water in the site. The site continues to accumulate in the down stream channel. It is a noticeable increase in algae growth.



The area is slightly oily. A sample was taken in the standing water at the outfall following the storm. Not that only partial samples were collected for bottles and the results are contained in Section 4.

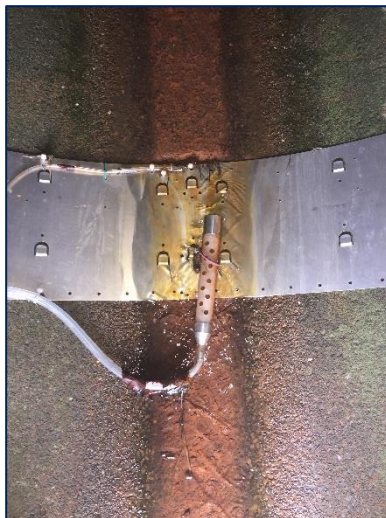


Final Report

Site is located to the west of the Mill Road and the Stoneridge at Potomac town center development. It is a 54" concrete pipe that drains to a deep scour pool before draining to a large BMP that collects drainage for the Potomac watershed. The BMP is located around the outlet area and will likely require future maintenance work as a deployed at site under clear conditions. The site is in a location that is a forecast of increased precipitation and oily runoff. A recent incident in the scour pool led to iron oxidizing bacteria present in the trickling area.



The area is located to the east of the scour pool following the storm water treatment plant. The area is a small amount of water in the scour pool and down the area. The area is not collected or bottled due to insufficient flow.



City of Fairfax Monitoring Report
June 2020
Prince William County, Virginia

August 2020

Section B

Section B

August 17, 2017

Jen Furey
Amec Foster Wheeler
14424 Albemarle Point Place
Suite 115
Chantilly, VA 20151

RE: Project: PRINCE WILLIAM CO STORMWATER
Pace Project No.: 92351237

Dear Jen Furey:

Enclosed are the analytical results for sample(s) received by the laboratory on August 11, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Kevin Godwin
kevin.godwin@pacelabs.com
1(704)875-9092
Project Manager

Enclosures

cc: Benjamin Green, Amec Foster Wheeler



REPORT OF LABORATORY ANALYSIS

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without the written consent of Pace Analytical Services, LLC.

CERTIFICATIONS

Project: PRINCE WILLIAM CO STORMWATER
Pace Project No.: 92351237

Asheville Certification IDs

2225 Riverside Drive, Asheville, NC 28804
Florida/NELAP Certification #: E87648
Massachusetts Certification #: M-NC030
North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40
South Carolina Certification #: 99030001
Virginia/VELAP Certification #: 460222

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92351237001	DAL-080717	Water	08/07/17 15:25	08/11/17 10:05
92351237002	MAN-080717	Water	08/07/17 12:40	08/11/17 10:05

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92351237001	DAL-080717	EPA 200.7	SH1	4	PASI-A
		SM 2540D	SLB	1	PASI-A
		EPA 9040	ECH	1	PASI-A
		EPA 350.1 1993 Rev 2.0	AES2	1	PASI-A
		EPA 351.2	BRJ	1	PASI-A
		EPA 353.2	CJH1	1	PASI-A
		EPA 365.1	BRJ	1	PASI-A
		SM 5220D	NAL	1	PASI-A
92351237002	MAN-080717	EPA 200.7	SH1	4	PASI-A
		SM 2540D	SLB	1	PASI-A
		EPA 9040	ECH	1	PASI-A
		EPA 350.1 1993 Rev 2.0	AES2	1	PASI-A
		EPA 351.2	BRJ	1	PASI-A
		EPA 353.2	CJH1	1	PASI-A
		EPA 365.1	CJH1	1	PASI-A
		SM 5220D	NAL	1	PASI-A

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ANALYTICAL RESULTS

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

Sample: DAL-080717		Lab ID: 92351237001		Collected: 08/07/17 15:25	Received: 08/11/17 10:05	Matrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 MET ICP		Analytical Method: EPA 200.7 Preparation Method: EPA 200.7						
Copper	9.4	ug/L	5.0	1	08/14/17 16:35	08/16/17 11:04	7440-50-8	
Lead	ND	ug/L	5.0	1	08/14/17 16:35	08/16/17 11:04	7439-92-1	
Nickel	ND	ug/L	5.0	1	08/14/17 16:35	08/16/17 11:04	7440-02-0	
Zinc	388	ug/L	10.0	1	08/14/17 16:35	08/16/17 11:04	7440-66-6	
2540D TSS, Low-Level		Analytical Method: SM 2540D						
Total Suspended Solids	29.0	mg/L	2.0	1		08/13/17 10:58		
9040 pH		Analytical Method: EPA 9040						
pH	6.7	Std. Units	0.10	1		08/14/17 14:30		H6
350.1 Ammonia		Analytical Method: EPA 350.1 1993 Rev 2.0						
Nitrogen, Ammonia	ND	mg/L	0.10	1		08/15/17 13:40	7664-41-7	
351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2						
Nitrogen, Kjeldahl, Total	0.65	mg/L	0.50	1		08/17/17 06:39	7727-37-9	
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2						
Nitrogen, NO2 plus NO3	2.5	mg/L	0.020	1		08/16/17 02:29		
365.1 Phosphorus, Total		Analytical Method: EPA 365.1						
Phosphorus	0.083	mg/L	0.050	1		08/16/17 04:34	7723-14-0	
5220D COD		Analytical Method: SM 5220D						
Chemical Oxygen Demand	42.0	mg/L	25.0	1		08/14/17 19:25		

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ANALYTICAL RESULTS

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

Sample: MAN-080717	Lab ID: 92351237002	Collected: 08/07/17 12:40	Received: 08/11/17 10:05	Matrix: Water				
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 MET ICP		Analytical Method: EPA 200.7 Preparation Method: EPA 200.7						
Copper	29.0	ug/L	5.0	1	08/14/17 16:35	08/16/17 11:08	7440-50-8	
Lead	7.3	ug/L	5.0	1	08/14/17 16:35	08/16/17 11:08	7439-92-1	
Nickel	ND	ug/L	5.0	1	08/14/17 16:35	08/16/17 11:08	7440-02-0	
Zinc	241	ug/L	10.0	1	08/14/17 16:35	08/16/17 11:08	7440-66-6	
2540D TSS, Low-Level		Analytical Method: SM 2540D						
Total Suspended Solids	81.3	mg/L	6.5	1		08/13/17 10:58		
9040 pH		Analytical Method: EPA 9040						
pH	6.8	Std. Units	0.10	1		08/14/17 14:30		H6
350.1 Ammonia		Analytical Method: EPA 350.1 1993 Rev 2.0						
Nitrogen, Ammonia	ND	mg/L	0.10	1		08/15/17 13:41	7664-41-7	
351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2						
Nitrogen, Kjeldahl, Total	0.65	mg/L	0.50	1		08/17/17 06:40	7727-37-9	
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2						
Nitrogen, NO2 plus NO3	0.50	mg/L	0.020	1		08/16/17 02:30		
365.1 Phosphorus, Total		Analytical Method: EPA 365.1						
Phosphorus	0.13	mg/L	0.050	1		08/17/17 04:04	7723-14-0	
5220D COD		Analytical Method: SM 5220D						
Chemical Oxygen Demand	70.0	mg/L	25.0	1		08/14/17 19:25		

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO STORMWATER
Pace Project No.: 92351237

QC Batch: 373250 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 MET
Associated Lab Samples: 92351237001, 92351237002

METHOD BLANK: 2068073 Matrix: Water
Associated Lab Samples: 92351237001, 92351237002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Copper	ug/L	ND	5.0	08/16/17 09:32	
Lead	ug/L	ND	5.0	08/16/17 09:32	
Nickel	ug/L	ND	5.0	08/16/17 09:32	
Zinc	ug/L	ND	10.0	08/16/17 09:32	

LABORATORY CONTROL SAMPLE: 2068074

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Copper	ug/L	1000	940	94	85-115	
Lead	ug/L	1000	936	94	85-115	
Nickel	ug/L	1000	936	94	85-115	
Zinc	ug/L	1000	992	99	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2068075 2068076

Parameter	Units	92350688003 Result	MS Spike Conc.	MSD Spike Conc.	2068075		2068076		% Rec Limits	RPD	Max RPD	Qual
					MS Result	MSD Result	MS % Rec	MSD % Rec				
Copper	ug/L	ND	1000	1000	914	912	91	91	70-130	0	20	
Lead	ug/L	ND	1000	1000	857	850	86	85	70-130	1	20	
Nickel	ug/L	0.22 mg/L	1000	1000	1080	1080	85	86	70-130	1	20	
Zinc	ug/L	0.097 mg/L	1000	1000	1040	1040	95	94	70-130	0	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2068077 2068078

Parameter	Units	92351127004 Result	MS Spike Conc.	MSD Spike Conc.	2068077		2068078		% Rec Limits	RPD	Max RPD	Qual
					MS Result	MSD Result	MS % Rec	MSD % Rec				
Copper	ug/L	1410	1000	1000	2230	2050	82	64	70-130	8	20	M6
Lead	ug/L	112	1000	1000	949	872	84	76	70-130	8	20	
Nickel	ug/L	56.0	1000	1000	899	818	84	76	70-130	9	20	
Zinc	ug/L	4960	1000	1000	5880	5520	92	56	70-130	6	20	M6

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

QC Batch: 373111

Analysis Method: SM 2540D

QC Batch Method: SM 2540D

Analysis Description: 2540D Total Suspended Solids

Associated Lab Samples: 92351237001, 92351237002

METHOD BLANK: 2067456

Matrix: Water

Associated Lab Samples: 92351237001, 92351237002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	10.0	08/13/17 10:56	

LABORATORY CONTROL SAMPLE: 2067457

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Suspended Solids	mg/L	250	252	101	90-110	

SAMPLE DUPLICATE: 2067458

Parameter	Units	92350692001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	5.2	3.2	48	5	D6

SAMPLE DUPLICATE: 2067459

Parameter	Units	92350719001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	161	160	1	5	

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

QC Batch: 373220 Analysis Method: EPA 9040

QC Batch Method: EPA 9040 Analysis Description: 9040 pH

Associated Lab Samples: 92351237001, 92351237002

SAMPLE DUPLICATE: 2067898

Parameter	Units	92351237002 Result	Dup Result	RPD	Max RPD	Qualifiers
pH	Std. Units	6.8	6.8	0	9	H6

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

QC Batch: 373374 Analysis Method: EPA 350.1 1993 Rev 2.0

QC Batch Method: EPA 350.1 1993 Rev 2.0 Analysis Description: 350.1 Ammonia

Associated Lab Samples: 92351237001, 92351237002

METHOD BLANK: 2068631 Matrix: Water

Associated Lab Samples: 92351237001, 92351237002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	08/15/17 13:12	

LABORATORY CONTROL SAMPLE: 2068632

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	5	5.0	101	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2068633 2068634

Parameter	Units	92351359001 Result	MS		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Conc.	Result	Result	% Rec	% Rec						
Nitrogen, Ammonia	mg/L	0.39	5	5	5.4	5.4	101	100	90-110	0	7			

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2068635 2068636

Parameter	Units	92351159001 Result	MS		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Conc.	Result	Result	% Rec	% Rec						
Nitrogen, Ammonia	mg/L	ND	5	5	5.1	5.1	102	102	90-110	0	7			

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO STORMWATER
Pace Project No.: 92351237

QC Batch: 373380 Analysis Method: EPA 351.2
QC Batch Method: EPA 351.2 Analysis Description: 351.2 TKN
Associated Lab Samples: 92351237001, 92351237002

METHOD BLANK: 2068671 Matrix: Water
Associated Lab Samples: 92351237001, 92351237002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	ND	0.50	08/17/17 06:57	

LABORATORY CONTROL SAMPLE: 2068672

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	10	9.4	94	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2068673 2068674

Parameter	Units	92351359001		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Conc.	Result	Result	% Rec	% Rec				
Nitrogen, Kjeldahl, Total	mg/L	5.5	10	10	10	15.2	16.5	97	109	90-110	8	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2068675 2068676

Parameter	Units	92351104003		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Conc.	Result	Result	% Rec	% Rec				
Nitrogen, Kjeldahl, Total	mg/L	301	10	10	10	305	276	37	-253	90-110	10	10	M6

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO STORMWATER
Pace Project No.: 92351237

QC Batch: 373443 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 92351237001, 92351237002

METHOD BLANK: 2069303 Matrix: Water
Associated Lab Samples: 92351237001, 92351237002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.020	08/16/17 02:17	

LABORATORY CONTROL SAMPLE: 2069304

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	2.5	2.5	101	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2069305 2069306

Parameter	Units	92351155025 Result	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	MS Result	MSD Spike Conc.	MSD Result						
Nitrogen, NO2 plus NO3	mg/L	0.34	2.5	2.9	2.5	2.9	102	101	75-125	0	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2069307 2069308

Parameter	Units	92351155026 Result	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	MS Result	MSD Spike Conc.	MSD Result						
Nitrogen, NO2 plus NO3	mg/L	1.1	2.5	2.6	2.5	2.6	59	60	75-125	1	10	M1

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO STORMWATER
Pace Project No.: 92351237

QC Batch: 373493 Analysis Method: EPA 365.1
QC Batch Method: EPA 365.1 Analysis Description: 365.1 Phosphorus, Total
Associated Lab Samples: 92351237001

METHOD BLANK: 2069676 Matrix: Water
Associated Lab Samples: 92351237001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/L	ND	0.050	08/16/17 04:13	

LABORATORY CONTROL SAMPLE: 2069677

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	2.5	2.6	103	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2069678 2069679

Parameter	Units	92351042002		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec				
Phosphorus	mg/L	0.56	2.5	2.5	3.1	3.0	101	99	90-110	1	10		

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2069680 2069681

Parameter	Units	92350744001		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec				
Phosphorus	mg/L	0.61	2.5	2.5	3.1	3.2	99	104	90-110	4	10		

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

QC Batch:	373746	Analysis Method:	EPA 365.1
QC Batch Method:	EPA 365.1	Analysis Description:	365.1 Phosphorus, Total
Associated Lab Samples:	92351237002		

METHOD BLANK: 2070921 Matrix: Water

Associated Lab Samples: 92351237002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/L	ND	0.050	08/17/17 04:03	

LABORATORY CONTROL SAMPLE: 2070922

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	2.5	2.5	99	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2070923 2070924

Parameter	Units	2070923		2070924		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result						
Phosphorus	mg/L	0.13	2.5	2.5	2.6	97	99	90-110	2	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2070925 2070926

Parameter	Units	2070925		2070926		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result						
Phosphorus	mg/L	1.4	2.5	2.5	3.5	88	94	90-110	4	10 M1	

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO STORMWATER
Pace Project No.: 92351237

QC Batch: 373262 Analysis Method: SM 5220D
QC Batch Method: SM 5220D Analysis Description: 5220D COD
Associated Lab Samples: 92351237001, 92351237002

METHOD BLANK: 2068132 Matrix: Water
Associated Lab Samples: 92351237001, 92351237002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chemical Oxygen Demand	mg/L	ND	25.0	08/14/17 19:25	

LABORATORY CONTROL SAMPLE: 2068133

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chemical Oxygen Demand	mg/L	750	727	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2068134 2068135

Parameter	Units	2068134		2068135		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		92350267001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result						
Chemical Oxygen Demand	mg/L	57.0	750	750	777	769	96	95	90-110	1	3

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2068136 2068137

Parameter	Units	2068136		2068137		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		92351237001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result						
Chemical Oxygen Demand	mg/L	42.0	750	750	787	782	99	99	90-110	1	3

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QUALIFIERS

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-A Pace Analytical Services - Asheville

ANALYTE QUALIFIERS

D6 The precision between the sample and sample duplicate exceeded laboratory control limits.

H6 Analysis initiated outside of the 15 minute EPA required holding time.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: PRINCE WILLIAM CO STORMWATER

Pace Project No.: 92351237

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92351237001	DAL-080717	EPA 200.7	373250	EPA 200.7	373517
92351237002	MAN-080717	EPA 200.7	373250	EPA 200.7	373517
92351237001	DAL-080717	SM 2540D	373111		
92351237002	MAN-080717	SM 2540D	373111		
92351237001	DAL-080717	EPA 9040	373220		
92351237002	MAN-080717	EPA 9040	373220		
92351237001	DAL-080717	EPA 350.1 1993 Rev 2.0	373374		
92351237002	MAN-080717	EPA 350.1 1993 Rev 2.0	373374		
92351237001	DAL-080717	EPA 351.2	373380		
92351237002	MAN-080717	EPA 351.2	373380		
92351237001	DAL-080717	EPA 353.2	373443		
92351237002	MAN-080717	EPA 353.2	373443		
92351237001	DAL-080717	EPA 365.1	373493		
92351237002	MAN-080717	EPA 365.1	373746		
92351237001	DAL-080717	SM 5220D	373262		
92351237002	MAN-080717	SM 5220D	373262		

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Laboratory receiving samples:

Asheville Eden Greenwood Huntersville Raleigh Mechanicsville

Sample Condition Upon Receipt

Client Name: AMEC Foster

Project #:

WO#: **92351237**



Courier: Commercial Fed Ex Pace UPS USPS Other: Client

Custody Seal Present? Yes No Seals Intact? Yes No

Date/Initials Person Examining Contents: 8-14-17 / JY

Packing Material: Bubble Wrap Bubble Bags None Other
 Thermometer: IR Gun ID: 5 Type of Ice: Wet Blue None

Biological Tissue Frozen? Yes No N/A

Correction Factor: Cooler Temp Corrected (°C): 2.9

Temp should be above freezing to 6°C
 Samples out of temp criteria. Samples on ice, cooling process has begun

USDA Regulated Soil (N/A, water sample)

Did samples originate in a quarantine zone within the United States: CA, NY, or SC (check maps)? Yes No

Did samples originate from a foreign source (Internationally, including Hawaii and Puerto Rico)? Yes No

	Comments/Discrepancy:
Chain of Custody Present? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Samples Arrived within Hold Time? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Short Hold Time Analysis (<72 hr.)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	3.
Rush Turn Around Time Requested? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	4.
Sufficient Volume? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Correct Containers Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A -Pace Containers Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	6.
Containers Intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	7.
Dissolved analysis: Samples Field Filtered? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	8.
Sample Labels Match COC? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
-Includes Date/Time/ID/Analysis Matrix: <u>WT</u>	
Headspace In VOA Vials (>5-6mm)? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	10.
Trip Blank Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.
Trip Blank Custody Seals Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

CLIENT NOTIFICATION/RESOLUTION

Field Data Required? Yes No

Person Contacted: _____ Date/Time: _____

Comments/Sample Discrepancy: _____

Project Manager SCURF Review: JY

Date: 8/14/17

Project Manager SRF Review: JY

Date: 8/14/17

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers)



Document Name:
 Sample Condition Upon Receipt(SCUR)
 Document No.:
 F-CAR-CS-033-Rev.03

Document Revised: July 25, 2017
 Page 2 of 2
 Issuing Authority:

WO# : 92351237

*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Project #

PM: KRG Due Date: 08/18/17
 CLIENT: 92-Amec VA

**Bottom half of box is to list number of bottles

Item#	BP4U-125 mL Plastic Unpreserved (N/A) (Cl-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (Cl-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP3Z-250 mL Plastic ZN Acetate & NaOH (>9)	BP3C-250 mL Plastic NaOH (pH > 12) (Cl-)	WGJU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (Cl-)	AG1H-1 liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (Cl-)	AG1S-1 liter Amber H2SO4 (pH < 2)	AG3S-250 mL Amber H2SO4 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4Cl (N/A)(Cl-)	DG9H-40 mL VOA HCl (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-503S kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SP5T-125 mL Sterile Plastic (N/A - lab)	SP2T-250 mL Sterile Plastic (N/A - lab)	BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	Cubitainer	VSGU-20 mL Scintillation vials (N/A)	GN	
1	/			/	2	/																						
2	/			/	2	/																						
3	/			/	2	/																						
4	/			/	2	/																						
5	/			/	2	/																						
6	/			/	2	/																						
7	/			/	2	/																						
8	/			/	2	/																						
9	/			/	2	/																						
10	/			/	2	/																						
11	/			/	2	/																						
12	/			/	2	/																						

Sample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #



CHAIN-OF-CUSTODY / Analytical Request Document
The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Section A Required Client Information: Company: <u>Avec Food, Inc</u> Address: <u>1414 24th Avenue, Suite 117</u> Email To: <u>Sale@AFC.com</u> Phone: _____ Requested Due Date/FAT: _____		Section B Required Project Information: Report To: <u>Green Bay</u> Copy To: _____ Purchase Order No.: _____ Project Name: <u>Private William Co Supermarket</u> Project Number: _____		Section C Invoice Information: Attention: _____ Company Name: _____ Address: _____ Reference: <u>1000 Anderson Road</u> Price Profile #: <u>153</u>		REGULATORY AGENCY <input type="checkbox"/> NPDES <input type="checkbox"/> GROUND WATER <input type="checkbox"/> DRINKING WATER <input type="checkbox"/> UST <input type="checkbox"/> RCRA <input type="checkbox"/> OTHER _____ Site Location: _____ STATE: _____	
Section D Required Client Information SAMPLE ID (A-Z, 0-9, /, -) Sample IDs MUST BE UNIQUE Matrix Codes Drinking Water DW Water WWT Waste Water WW Product P Soil/Solid SL Oil OL Wipe WIP Air AR Tissue TS Other OT		COLLECTED Composite Start _____ Composite End/Stop _____ Sample Temp at Collection _____ # of Containers _____ Preservatives <input type="checkbox"/> Unpreserved <input type="checkbox"/> H ₂ SO ₄ <input type="checkbox"/> HNO ₃ <input type="checkbox"/> HCl <input type="checkbox"/> NaOH <input type="checkbox"/> Na ₂ S ₂ O ₃ <input type="checkbox"/> Methanol <input type="checkbox"/> Other _____		Requested Analysis Filtered (Y/N) <input type="checkbox"/> PH <input type="checkbox"/> Metals <input type="checkbox"/> TSS <input type="checkbox"/> Ammonia/Phosphorus <input type="checkbox"/> TKN + Nitrite + Nitrate		Residual Chlorine (Y/N) _____ Page Project No./ Lab ID. <u>92357237</u>	

ITEM #	MATRIX CODE (see valid codes to left)	SAMPLE TYPE (G=GRAB; C=COMP)	COLLECTED		SAMPLE TEMP AT COLLECTION		# OF CONTAINERS	Preservatives	Analysis Test	Requested Analysis Filtered (Y/N)	Residual Chlorine (Y/N)	SAMPLE CONDITIONS
			DATE	TIME	DATE	TIME						
1	0A1-080712	G	08/07	15:25			5		PH			Y
2	0A2-080712	G	08/07	17:40			5		Metals			Y
3									TSS			Y
4									Ammonia/Phosphorus			Y
5									TKN + Nitrite + Nitrate			Y
6												
7												
8												
9												
10												
11												
12												

REINQUISHED BY / AFFILIATION: B. Green Avec Food DATE: 8/10 TIME: 9:45

ACCEPTED BY / AFFILIATION: ANDERSON PAS DATE: 8/17 TIME: 10:05

Temp in °C _____ Received on Ice (Y/N) _____ Custody Sealed Cooler (Y/N) _____ Samples Intact (Y/N) _____

SAMPLER NAME AND SIGNATURE: Bryan M Green DATE Signed: 08/10/17

PRINT Name of SAMPLER: _____ SIGNATURE of SAMPLER: _____

Important Note: By signing this form you are accepting Face's NET 30 day payment terms, and agreeing to the charges of 1.5% per month for any invoice not paid within 30 days.

FALL-Q-020rev.07, 15-May-2007

Cost Estimation Monitoring Report

Courtney Quarter Project Director – Construction Services
 Contract Administration Services

Prepared for:



Prince William County Department of Public Works
 County Board of Supervisors
 Prince William, Virginia

Prepared by:

Construction Services Director
 Construction Services
 Fairfax
 Virginia

January
 Project

1. Introduction

The water monitoring infrastructure is critical to providing accurate water monitoring for compliance with the Virginia Stormwater Management Program (SM) Municipal Separate Storm Sewer System (MS) permit issued by the Virginia Department of Environmental Quality (DEQ) to Prince George's County Virginia. This report discusses the results of the gauging point conducted on the sewer system as well as the findings from the water quality analysis results of the gauging point.

2. Methods

The rate data were collected at the outfall by an (S) automatic gauging device and an (S) flow meter. The velocity was measured using a current meter. The discharge was calculated electronically using (S) flow meter and current meter utilizing the Manning equation to convert flow and velocity to the rate.

3. Summary of Results

The site is located near the intersection of ... a total of ... acres of ... drainage area for a land surface that is ... county data document that the ... in diameter with a ... consistently over a long period of water in the ... at the ... of an adjacent stormwater pond.

4. Summary of Observations

The site is located near the corner of ... and ... at ... Brook ... drain into a BMD for the ... residential development ... drainage area is ... in diameter ... in diameter with a ...

The automatic gauging device was deployed on a qualifying storm event with ... precipitation. The device was installed and programmed the samplers' automated, discrete gauging frequency to initiate upon flow ... or ... at Site ... and ... respectively. The device was programmed to collect ... discrete ... to be collected every ... hour duration. Sample intervals were adjusted to account for the ... that ... Rain gauge data were collected for monitoring station in the ... and ground monitoring network data were daily accessed online and provided hourly precipitation total over the monitoring period according to priority based on the ... data recording interval and proximity to monitoring location.

Following the storm event, the data were retrieved and prepared for presentation to the environmental or water quality analyst. The collected data were discretized and input into a single digitized computer program to calculate the storm event discharge using the Manning equation.

$$Q = VA = \left(\frac{1.49}{n}\right)AR^2\sqrt{S} \text{ [US]}$$

Q = flow rate
V = flow area
A = velocity
S = water surface slope

R = hydraulic Radius
n = Roughness coefficient
K = English unit conversion factor

Annual flow data is derived using in-stream flow data reported in the flow data infrastructure geographic data provided by Prince William County during the period reported by the SCA. The flow data and hydraulic radius in the data could be used for a given time interval. A Manning's *n* value of 0.015 was used for the concrete pipe. The data collected over the duration of the storm event were then used based on their representation of flow in the cumulative flow curve for each storm event. The flow data provided to the laboratory for analytical results resulting from the analysis of the total concentration of the individual analytes.

SS

SS

Sampling occurred from 1/15/2020 – 1/16/2020. Precipitation data recorded at the International Airport totaled 0.1 inches during the 24-hour interval. Precipitation consisted of light to heavy rain. All temperatures ranged from 45°F – 55°F during the 24-hour collection period. The storm was preceded by a light rain earlier that morning but the most recent notable storm at the gage occurred on 1/15/2020 totaling 0.1 inches of accumulation. Samples were retained under refrigeration until they were collected and analyzed on 1/16/2020.

SS

Sampling occurred from 1/15/2020 – 1/16/2020. Precipitation data recorded at the Boyd Airfield totaled 0.1 inches over the 24-hour interval. Precipitation consisted of light drizzle to heavy rain. All temperatures ranged from 45°F – 55°F during the 24-hour collection period. The most recent storm at the gage consisted of scattered snow accumulating less than 0.1 inches on 1/15/2020. Samples were retained under refrigeration until they were collected and analyzed on 1/16/2020.

Site

Summary

The range of flow rates - cumulative volume for the hydrograph compared to the cumulative volume can be seen in Figure 1. The flow rate is relatively low and stable until approximately 18:00, where it increases significantly. The cumulative volume also increases sharply at this time, indicating a large volume of water was captured at the site.

Figure 1 shows data over time for flow rate and cumulative volume at Site on January 1, 2023.

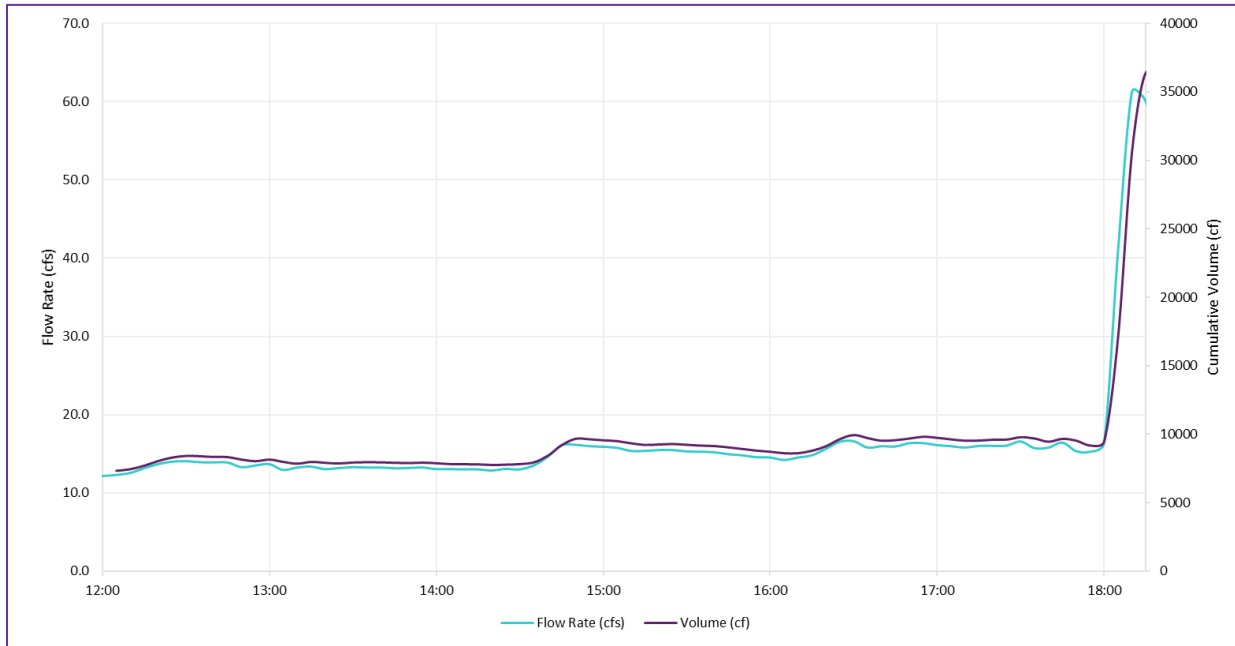


Table 1. Summary of Coliforms and Total Solids – Site 00000

Bottle #	Sample Date	Coliforms	Total Solids	Total Solids
1	1/1/20	100	100	100
2	1/1/20	100	100	100
3	1/1/20	100	100	100
4	1/1/20	100	100	100
5	1/1/20	100	100	100
6	1/1/20	100	100	100
7	1/1/20	100	100	100
8	1/1/20	100	100	100
9	1/1/20	100	100	100
10	1/1/20	100	100	100
11	1/1/20	100	100	100
12	1/1/20	100	100	100
13	1/1/20	100	100	100
14	1/1/20	100	100	100
15	1/1/20	100	100	100
16	1/1/20	100	100	100
17	1/1/20	100	100	100
18	1/1/20	100	100	100
19	1/1/20	100	100	100
20	1/1/20	100	100	100
21	1/1/20	100	100	100
22	1/1/20	100	100	100
23	1/1/20	100	100	100
24	1/1/20	100	100	100
25	1/1/20	100	100	100
26	1/1/20	100	100	100
27	1/1/20	100	100	100
28	1/1/20	100	100	100
29	1/1/20	100	100	100
30	1/1/20	100	100	100
31	1/1/20	100	100	100
32	1/1/20	100	100	100
33	1/1/20	100	100	100
34	1/1/20	100	100	100
35	1/1/20	100	100	100
36	1/1/20	100	100	100
37	1/1/20	100	100	100
38	1/1/20	100	100	100
39	1/1/20	100	100	100
40	1/1/20	100	100	100
41	1/1/20	100	100	100
42	1/1/20	100	100	100
43	1/1/20	100	100	100
44	1/1/20	100	100	100
45	1/1/20	100	100	100
46	1/1/20	100	100	100
47	1/1/20	100	100	100
48	1/1/20	100	100	100
49	1/1/20	100	100	100
50	1/1/20	100	100	100
51	1/1/20	100	100	100
52	1/1/20	100	100	100
53	1/1/20	100	100	100
54	1/1/20	100	100	100
55	1/1/20	100	100	100
56	1/1/20	100	100	100
57	1/1/20	100	100	100
58	1/1/20	100	100	100
59	1/1/20	100	100	100
60	1/1/20	100	100	100
61	1/1/20	100	100	100
62	1/1/20	100	100	100
63	1/1/20	100	100	100
64	1/1/20	100	100	100
65	1/1/20	100	100	100
66	1/1/20	100	100	100
67	1/1/20	100	100	100
68	1/1/20	100	100	100
69	1/1/20	100	100	100
70	1/1/20	100	100	100
71	1/1/20	100	100	100
72	1/1/20	100	100	100
73	1/1/20	100	100	100
74	1/1/20	100	100	100
75	1/1/20	100	100	100
76	1/1/20	100	100	100
77	1/1/20	100	100	100
78	1/1/20	100	100	100
79	1/1/20	100	100	100
80	1/1/20	100	100	100
81	1/1/20	100	100	100
82	1/1/20	100	100	100
83	1/1/20	100	100	100
84	1/1/20	100	100	100
85	1/1/20	100	100	100
86	1/1/20	100	100	100
87	1/1/20	100	100	100
88	1/1/20	100	100	100
89	1/1/20	100	100	100
90	1/1/20	100	100	100
91	1/1/20	100	100	100
92	1/1/20	100	100	100
93	1/1/20	100	100	100
94	1/1/20	100	100	100
95	1/1/20	100	100	100
96	1/1/20	100	100	100
97	1/1/20	100	100	100
98	1/1/20	100	100	100
99	1/1/20	100	100	100
100	1/1/20	100	100	100

*3.25 L Sample

Site Description

The range of flow rates – concentration for hydrograph comparison and cumulative volume can be seen in Figure 1. A slight reduction in flow rate and volume occurred at the site that was not collected for the – data – incident in the data presented. The flow rate and volume data were adjusted to incorporate the data that was not collected for the rain event.

Figure 1: Flow rate data over time for the storm event at Site on January

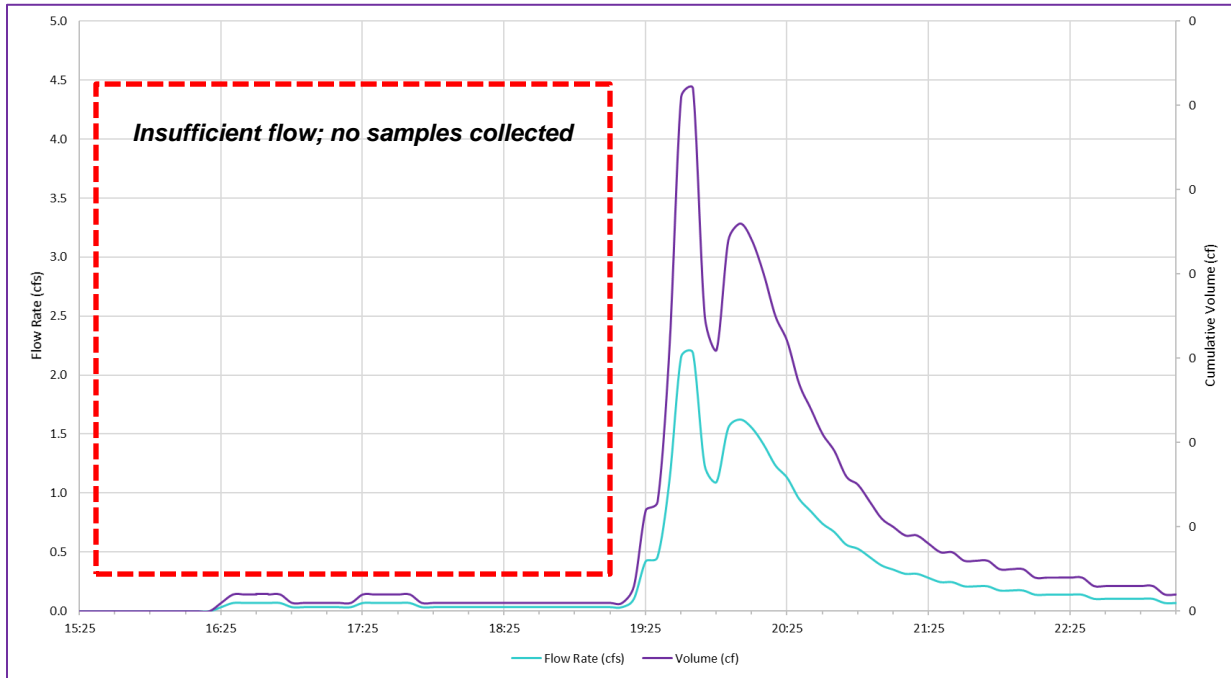


Table Summary of Coliforms and Total Solids - Site 000000

Bottle	Sample	Coliform	Total Solids	Coliform
1	1	1	1	1
1	2	1	1	1
1	3	1	1	1
1	4	1	1	1
1	5	1	1	1
1	6	1	1	1
1	7	1	1	1
1	8	1	1	1
1	9	1	1	1
1	10	1	1	1
1	11	1	1	1
1	12	1	1	1
1	13	1	1	1
1	14	1	1	1
1	15	1	1	1
1	16	1	1	1
1	17	1	1	1
1	18	1	1	1
1	19	1	1	1
1	20	1	1	1
1	21	1	1	1
1	22	1	1	1
1	23	1	1	1
1	24	1	1	1
1	25	1	1	1
1	26	1	1	1
1	27	1	1	1
1	28	1	1	1
1	29	1	1	1
1	30	1	1	1
1	31	1	1	1
1	32	1	1	1
1	33	1	1	1
1	34	1	1	1
1	35	1	1	1
1	36	1	1	1
1	37	1	1	1
1	38	1	1	1
1	39	1	1	1
1	40	1	1	1
1	41	1	1	1
1	42	1	1	1
1	43	1	1	1
1	44	1	1	1
1	45	1	1	1
1	46	1	1	1
1	47	1	1	1
1	48	1	1	1
1	49	1	1	1
1	50	1	1	1
1	51	1	1	1
1	52	1	1	1
1	53	1	1	1
1	54	1	1	1
1	55	1	1	1
1	56	1	1	1
1	57	1	1	1
1	58	1	1	1
1	59	1	1	1
1	60	1	1	1
1	61	1	1	1
1	62	1	1	1
1	63	1	1	1
1	64	1	1	1
1	65	1	1	1
1	66	1	1	1
1	67	1	1	1
1	68	1	1	1
1	69	1	1	1
1	70	1	1	1
1	71	1	1	1
1	72	1	1	1
1	73	1	1	1
1	74	1	1	1
1	75	1	1	1
1	76	1	1	1
1	77	1	1	1
1	78	1	1	1
1	79	1	1	1
1	80	1	1	1
1	81	1	1	1
1	82	1	1	1
1	83	1	1	1
1	84	1	1	1
1	85	1	1	1
1	86	1	1	1
1	87	1	1	1
1	88	1	1	1
1	89	1	1	1
1	90	1	1	1
1	91	1	1	1
1	92	1	1	1
1	93	1	1	1
1	94	1	1	1
1	95	1	1	1
1	96	1	1	1
1	97	1	1	1
1	98	1	1	1
1	99	1	1	1
1	100	1	1	1

*3.25 L Sample

Summary

Recent monitoring data indicate that the discharge from the Potomac River at the quality criteria for multiple analytes indicated in Table 1 occurred at the Potomac River at Site 1, Site 2, Site 3, Site 4, Site 5, Site 6, Site 7, Site 8, Site 9, Site 10, Site 11, Site 12, Site 13, Site 14, Site 15, Site 16, Site 17, Site 18, Site 19, Site 20, Site 21, Site 22, Site 23, Site 24, Site 25, Site 26, Site 27, Site 28, Site 29, Site 30, Site 31, Site 32, Site 33, Site 34, Site 35, Site 36, Site 37, Site 38, Site 39, Site 40, Site 41, Site 42, Site 43, Site 44, Site 45, Site 46, Site 47, Site 48, Site 49, Site 50, Site 51, Site 52, Site 53, Site 54, Site 55, Site 56, Site 57, Site 58, Site 59, Site 60, Site 61, Site 62, Site 63, Site 64, Site 65, Site 66, Site 67, Site 68, Site 69, Site 70, Site 71, Site 72, Site 73, Site 74, Site 75, Site 76, Site 77, Site 78, Site 79, Site 80, Site 81, Site 82, Site 83, Site 84, Site 85, Site 86, Site 87, Site 88, Site 89, Site 90, Site 91, Site 92, Site 93, Site 94, Site 95, Site 96, Site 97, Site 98, Site 99, Site 100.

Figure 1: Compliance tracking for the City of Fairfax Monitoring Program

	2016		2017				2018
	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Copper	x	x	x	x		x	
Lead							
Nickel							
Zinc	x		x	x	x	x	
Total Suspended Solids						x	
Total Nitrogen					x	x	
Phosphorus, Total							
Chemical Oxygen Demand		x				x	
pH						x	

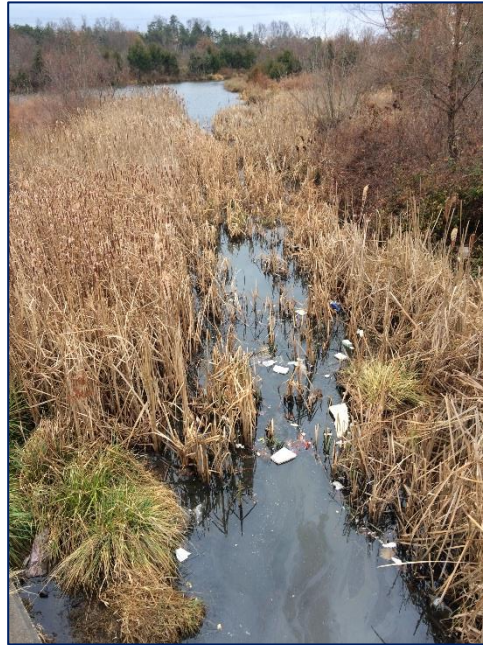
	2016		2017				2018
	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Copper	x		x	x	x	x	
Lead							
Nickel							
Zinc			x		x	x	
Total Suspended Solids						x	
Total Nitrogen	x	x	x	x		x	
Phosphorus, Total							
Chemical Oxygen Demand						x	
pH		x		x		x	

XXXXXXXXXX

XXXXXXXXXX

Management

This site is located in the Bull Run watershed drainage area, an industrial area and parking lot. It is a frequent truck traffic outfall. Significant recent repair work is required.



The area is slightly oily in appearance in the standing water. It is in the outfall following the storm.



Location

Site is located on the corner of Sacco Mill Road and Stoneridge at Potomac on the
dip side. It is a 54" concrete pipe that drains to a deep scour pool before draining to a large BMP
that collects drainage for the Potomac. It is located around the outlet area continuing
and will likely require future maintenance at the location in the retention pond downstream
from the location and after the event.



The area is located to the east of the site in the scour pool following the storm event. The
product is all around the site in the scour pool and downstream.



Section B

Section B

January 08, 2018

Jen Furey
Amec Foster Wheeler
14424 Albemarle Point Place
Suite 115
Chantilly, VA 20151

RE: Project: Prince William CO Q4 2017
Pace Project No.: 92368261

Dear Jen Furey:

Enclosed are the analytical results for sample(s) received by the laboratory on December 26, 2017. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Taylor Ezell
taylor.ezell@pacelabs.com
(704)875-9092
Project Manager

Enclosures

cc: Benjamin Green, Amec Foster Wheeler



REPORT OF LABORATORY ANALYSIS

This report shall not be reproduced, except in full,
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CERTIFICATIONS

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

Asheville Certification IDs

2225 Riverside Drive, Asheville, NC 28804

Florida/NELAP Certification #: E87648

Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40

South Carolina Certification #: 99030001

Virginia/VELAP Certification #: 460222

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92368261001	DAL-122317	Water	12/23/17 18:15	12/26/17 12:00
92368261002	MAN-122317	Water	12/23/17 22:06	12/26/17 12:00

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92368261001	DAL-122317	EPA 200.7	SER	4	PASI-A
		SM 2540D	NAL	1	PASI-A
		EPA 9040	ECH	1	PASI-A
		EPA 350.1 1993 Rev 2.0	AES2	1	PASI-A
		EPA 351.2	CJH1	1	PASI-A
		EPA 353.2	DMN	1	PASI-A
		EPA 365.1	MDW	1	PASI-A
		SM 5220D	NAL	1	PASI-A
92368261002	MAN-122317	EPA 200.7	SER	4	PASI-A
		SM 2540D	NAL	1	PASI-A
		EPA 9040	ECH	1	PASI-A
		EPA 350.1 1993 Rev 2.0	AES2	1	PASI-A
		EPA 351.2	CJH1	1	PASI-A
		EPA 353.2	DMN	1	PASI-A
		EPA 365.1	MDW	1	PASI-A
		SM 5220D	NAL	1	PASI-A

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

Sample: DAL-122317		Lab ID: 92368261001		Collected: 12/23/17 18:15	Received: 12/26/17 12:00	Matrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 MET ICP		Analytical Method: EPA 200.7 Preparation Method: EPA 200.7						
Copper	53.4	ug/L	5.0	1	01/02/18 11:30	01/03/18 21:29	7440-50-8	
Lead	6.7	ug/L	5.0	1	01/02/18 11:30	01/03/18 21:29	7439-92-1	
Nickel	7.8	ug/L	5.0	1	01/02/18 11:30	01/03/18 21:29	7440-02-0	
Zinc	396	ug/L	10.0	1	01/02/18 11:30	01/03/18 21:29	7440-66-6	
2540D TSS, Low-Level		Analytical Method: SM 2540D						
Total Suspended Solids	135	mg/L	10.0	1		12/29/17 18:15		
9040 pH		Analytical Method: EPA 9040						
pH	2.9	Std. Units	0.10	1		12/28/17 14:50		E,H6
350.1 Ammonia		Analytical Method: EPA 350.1 1993 Rev 2.0						
Nitrogen, Ammonia	0.29	mg/L	0.10	1		12/29/17 12:42	7664-41-7	
351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2						
Nitrogen, Kjeldahl, Total	2.3	mg/L	0.50	1		01/03/18 04:01	7727-37-9	
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2						
Nitrogen, NO2 plus NO3	5.2	mg/L	0.040	2		01/04/18 14:58		
365.1 Phosphorus, Total		Analytical Method: EPA 365.1						
Phosphorus	0.24	mg/L	0.050	1		12/28/17 03:04	7723-14-0	
5220D COD		Analytical Method: SM 5220D						
Chemical Oxygen Demand	159	mg/L	25.0	1		01/08/18 17:10		M1

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

Sample: MAN-122317		Lab ID: 92368261002		Collected: 12/23/17 22:06	Received: 12/26/17 12:00	Matrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 MET ICP		Analytical Method: EPA 200.7 Preparation Method: EPA 200.7						
Copper	231	ug/L	5.0	1	01/02/18 11:30	01/03/18 21:32	7440-50-8	
Lead	71.2	ug/L	5.0	1	01/02/18 11:30	01/03/18 21:32	7439-92-1	
Nickel	13.2	ug/L	5.0	1	01/02/18 11:30	01/03/18 21:32	7440-02-0	
Zinc	686	ug/L	10.0	1	01/02/18 11:30	01/03/18 21:32	7440-66-6	
2540D TSS, Low-Level		Analytical Method: SM 2540D						
Total Suspended Solids	167	mg/L	10.0	1		12/29/17 18:16		
9040 pH		Analytical Method: EPA 9040						
pH	5.9	Std. Units	0.10	1		12/28/17 14:50		H6
350.1 Ammonia		Analytical Method: EPA 350.1 1993 Rev 2.0						
Nitrogen, Ammonia	0.14	mg/L	0.10	1		12/29/17 12:43	7664-41-7	
351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2						
Nitrogen, Kjeldahl, Total	2.7	mg/L	0.50	1		01/03/18 04:02	7727-37-9	
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2						
Nitrogen, NO2 plus NO3	5.4	mg/L	0.040	2		01/04/18 14:59		
365.1 Phosphorus, Total		Analytical Method: EPA 365.1						
Phosphorus	0.36	mg/L	0.050	1		12/28/17 03:05	7723-14-0	
5220D COD		Analytical Method: SM 5220D						
Chemical Oxygen Demand	261	mg/L	25.0	1		01/08/18 17:10		

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

QC Batch: 392617 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 MET
Associated Lab Samples: 92368261001, 92368261002

METHOD BLANK: 2177650 Matrix: Water

Associated Lab Samples: 92368261001, 92368261002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Copper	ug/L	ND	5.0	01/03/18 20:36	
Lead	ug/L	ND	5.0	01/03/18 20:36	
Nickel	ug/L	ND	5.0	01/03/18 20:36	
Zinc	ug/L	ND	10.0	01/03/18 20:36	

LABORATORY CONTROL SAMPLE: 2177652

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Copper	ug/L	500	530	106	85-115	
Lead	ug/L	500	493	99	85-115	
Nickel	ug/L	500	500	100	85-115	
Zinc	ug/L	500	487	97	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2177653 2177654

Parameter	Units	92367598001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	Max		Qual
										RPD	RPD	
Copper	ug/L	0.0089 mg/L	500	500	520	515	102	101	70-130	1	20	
Lead	ug/L	0.0054 mg/L	500	500	481	470	95	93	70-130	2	20	
Nickel	ug/L	ND	500	500	487	478	97	95	70-130	2	20	
Zinc	ug/L	0.044 mg/L	500	500	523	507	96	93	70-130	3	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2177655 2177656

Parameter	Units	92367724002 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	Max		Qual
										RPD	RPD	
Copper	ug/L	ND	500	500	517	502	102	99	70-130	3	20	
Lead	ug/L	ND	500	500	478	463	95	92	70-130	3	20	
Nickel	ug/L	ND	500	500	494	478	98	95	70-130	3	20	
Zinc	ug/L	0.19 mg/L	500	500	679	642	97	90	70-130	6	20	

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QUALITY CONTROL DATA

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

QC Batch:	392837	Analysis Method:	SM 2540D
QC Batch Method:	SM 2540D	Analysis Description:	2540D Total Suspended Solids
Associated Lab Samples:	92368261001, 92368261002		

METHOD BLANK: 2178773 Matrix: Water

Associated Lab Samples: 92368261001, 92368261002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	1.0	12/29/17 18:14	

LABORATORY CONTROL SAMPLE: 2178774

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Suspended Solids	mg/L	250	228	91	90-110	

SAMPLE DUPLICATE: 2178775

Parameter	Units	92368355001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	37.8	53.2	34	5	D6

SAMPLE DUPLICATE: 2178776

Parameter	Units	92368408001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	9.2	13.2	36	5	D6

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QUALITY CONTROL DATA

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

QC Batch: 392633 Analysis Method: EPA 9040

QC Batch Method: EPA 9040 Analysis Description: 9040 pH

Associated Lab Samples: 92368261001, 92368261002

SAMPLE DUPLICATE: 2177771

Parameter	Units	92368261001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH	Std. Units	2.9	2.9	1	9	E,H6

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QUALITY CONTROL DATA

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

QC Batch: 392780 Analysis Method: EPA 350.1 1993 Rev 2.0

QC Batch Method: EPA 350.1 1993 Rev 2.0 Analysis Description: 350.1 Ammonia

Associated Lab Samples: 92368261001, 92368261002

METHOD BLANK: 2178370 Matrix: Water

Associated Lab Samples: 92368261001, 92368261002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	12/29/17 12:33	

LABORATORY CONTROL SAMPLE: 2178371

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	5	4.9	98	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2178372 2178373

Parameter	Units	92368042001 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Nitrogen, Ammonia	mg/L	2.1	5	5	7.0	7.0	99	99	90-110	0	7	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2178374 2178375

Parameter	Units	92367563001 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Nitrogen, Ammonia	mg/L	23.1	5	5	28.1	28.0	101	99	90-110	0	7	

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QUALITY CONTROL DATA

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

QC Batch: 392733 Analysis Method: EPA 351.2
QC Batch Method: EPA 351.2 Analysis Description: 351.2 TKN
Associated Lab Samples: 92368261001, 92368261002

METHOD BLANK: 2178261 Matrix: Water

Associated Lab Samples: 92368261001, 92368261002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	ND	0.50	01/03/18 03:55	

LABORATORY CONTROL SAMPLE: 2178262

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	10	9.7	97	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2178263 2178264

Parameter	Units	2178263		2178264		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		92368194001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result						
Nitrogen, Kjeldahl, Total	mg/L	1.7	10	10	12.0	12.1	103	104	90-110	1	10

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2178265 2178266

Parameter	Units	2178265		2178266		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		92367466013 Result	MS Spike Conc.	MSD Spike Conc.	MS Result						
Nitrogen, Kjeldahl, Total	mg/L	ND	10	10	11.5	10.5	112	102	90-110	9	10 M1

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QUALITY CONTROL DATA

Project: Prince William CO Q4 2017
Pace Project No.: 92368261

QC Batch: 393212 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 92368261001, 92368261002

METHOD BLANK: 2180536 Matrix: Water
Associated Lab Samples: 92368261001, 92368261002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.020	01/04/18 14:17	

LABORATORY CONTROL SAMPLE: 2180537

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	2.5	2.5	100	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2180538 2180539

Parameter	Units	92367675004 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Nitrogen, NO2 plus NO3	mg/L	0.026	2.5	2.5	2.3	2.3	92	92	75-125	0	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2180540 2180541

Parameter	Units	92367675005 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Nitrogen, NO2 plus NO3	mg/L	0.37	2.5	2.5	2.7	2.7	93	93	75-125	1	10	

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QUALITY CONTROL DATA

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

QC Batch:	392564	Analysis Method:	EPA 365.1
QC Batch Method:	EPA 365.1	Analysis Description:	365.1 Phosphorus, Total
Associated Lab Samples:	92368261001, 92368261002		

METHOD BLANK: 2177510 Matrix: Water

Associated Lab Samples: 92368261001, 92368261002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/L	ND	0.050	12/28/17 03:00	

LABORATORY CONTROL SAMPLE: 2177511

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	2.5	2.6	102	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2177512 2177513

Parameter	Units	92367924004 Result	MS	MSD	MS	MSD	MS	MSD	% Rec	Max	Qual
			Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits	RPD	
Phosphorus	mg/L	ND	2.5	2.5	2.5	2.5	99	97	90-110	2	10

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2177514 2177515

Parameter	Units	92367863001 Result	MS	MSD	MS	MSD	MS	MSD	% Rec	Max	Qual
			Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits	RPD	
Phosphorus	mg/L	1.9	2.5	2.5	4.4	4.4	97	98	90-110	1	10

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QUALITY CONTROL DATA

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

QC Batch: 393306 Analysis Method: SM 5220D
QC Batch Method: SM 5220D Analysis Description: 5220D COD
Associated Lab Samples: 92368261001, 92368261002

METHOD BLANK: 2180847 Matrix: Water

Associated Lab Samples: 92368261001, 92368261002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chemical Oxygen Demand	mg/L	ND	25.0	01/08/18 17:10	

LABORATORY CONTROL SAMPLE: 2180848

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chemical Oxygen Demand	mg/L	750	739	99	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2180849 2180850

Parameter	Units	92368261001 Result	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	MS Result	MSD Spike Conc.	MSD Result						
Chemical Oxygen Demand	mg/L	159	100	277	272	118	113	90-110	2	3	M1	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2180851 2180852

Parameter	Units	92368335001 Result	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	MS Result	MSD Spike Conc.	MSD Result						
Chemical Oxygen Demand	mg/L	126	100	214	212	88	86	90-110	1	3	M1	

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QUALIFIERS

Project: Prince William CO Q4 2017
Pace Project No.: 92368261

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.
ND - Not Detected at or above adjusted reporting limit.
TNTC - Too Numerous To Count
J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.
MDL - Adjusted Method Detection Limit.
PQL - Practical Quantitation Limit.
RL - Reporting Limit.
S - Surrogate
1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.
Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.
LCS(D) - Laboratory Control Sample (Duplicate)
MS(D) - Matrix Spike (Duplicate)
DUP - Sample Duplicate
RPD - Relative Percent Difference
NC - Not Calculable.
SG - Silica Gel - Clean-Up
U - Indicates the compound was analyzed for, but not detected.
Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.
A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.
N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.
Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.
TNI - The NELAC Institute.

LABORATORIES

PASI-A Pace Analytical Services - Asheville

ANALYTE QUALIFIERS

D6 The precision between the sample and sample duplicate exceeded laboratory control limits.
E Analyte concentration exceeded the calibration range. The reported result is estimated.
H6 Analysis initiated outside of the 15 minute EPA required holding time.
M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Prince William CO Q4 2017

Pace Project No.: 92368261

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92368261001	DAL-122317	EPA 200.7	392617	EPA 200.7	392712
92368261002	MAN-122317	EPA 200.7	392617	EPA 200.7	392712
92368261001	DAL-122317	SM 2540D	392837		
92368261002	MAN-122317	SM 2540D	392837		
92368261001	DAL-122317	EPA 9040	392633		
92368261002	MAN-122317	EPA 9040	392633		
92368261001	DAL-122317	EPA 350.1 1993 Rev 2.0	392780		
92368261002	MAN-122317	EPA 350.1 1993 Rev 2.0	392780		
92368261001	DAL-122317	EPA 351.2	392733		
92368261002	MAN-122317	EPA 351.2	392733		
92368261001	DAL-122317	EPA 353.2	393212		
92368261002	MAN-122317	EPA 353.2	393212		
92368261001	DAL-122317	EPA 365.1	392564		
92368261002	MAN-122317	EPA 365.1	392564		
92368261001	DAL-122317	SM 5220D	393306		
92368261002	MAN-122317	SM 5220D	393306		

REPORT OF LABORATORY ANALYSIS

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Laboratory receiving samples:

Asheville Eden Greenwood Huntersville Raleigh Mechanicsville

Sample Condition Upon Receipt

Client Name:

Amec Foster

Project #: **WO# : 92368261**



Courier: Fed Ex UPS USPS Client
 Commercial Pace Other: _____

Custody Seal Present? Yes No Seals Intact? Yes No

Date/Initials Person Examining Contents: PM 12/27/17

Packing Material: Bubble Wrap Bubble Bags None Other

Biological Tissue Frozen?

Thermometer: IR-Gun ID: T027 Type of Ice: Wet Blue None

Yes No N/A

Correction Factor: 0 Cooler Temp Corrected (°C): 3.1

Temp should be above freezing to 6°C
 Samples out of temp criteria. Samples on ice, cooling process has begun

USDA Regulated Soil (N/A, water sample)

Did samples originate in a quarantine zone within the United States: CA, NY, or SC (check maps)?
 Yes No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? Yes No

	Comments/Discrepancy:
Chain of Custody Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Samples Arrived within Hold Time? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Short Hold Time Analysis (<72 hr.)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	3.
Rush Turn Around Time Requested? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	4.
Sufficient Volume? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Correct Containers Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	6.
-Pace Containers Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers Intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	7.
Dissolved analysis: Samples Field Filtered? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	8.
Sample Labels Match COC? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
-Includes Date/Time/ID/Analysis Matrix: <u>uuu</u>	
Headspace in VOA Vials (>5-6mm)? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	10.
Trip Blank Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.
Trip Blank Custody Seals Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

CLIENT NOTIFICATION/RESOLUTION

Field Data Required? Yes No

Person Contacted: _____ Date/Time: _____

Comments/Sample Discrepancy: _____

Project Manager SCURF Review: (Signature)

Date: 12/29

Project Manager SRF Review: (Signature)

Date: 12/29

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers)



Document Name:
Sample Condition Upon Receipt(SCUR)
 Document No.:
F-CAR-CS-033-Rev.03

Document Revised: July 25, 2017
 Page 2 of 2
 Issuing Authority:
 Pace Quality Office

*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.
 **Bottom half of box is to list number of bottles

Project #

WO# : 92368261

PM: PTE

Due Date: 01/03/18

CLIENT: 92-Amec VA

Item#	BP4U-125 mL Plastic Unpreserved (N/A) (Cl-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (Cl-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP3Z-250 mL Plastic ZN Acetate & NaOH (>9)	BP3C-250 mL Plastic NaOH (pH > 12) (Cl-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (Cl-)	AG1H-1 liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (Cl-)	AG1S-1 liter Amber H2SO4 (pH < 2)	AG3S-250 mL Amber H2SO4 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4Cl (N/A)(Cl-)	DG9H-40 mL VOA HCl (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SP5T-125 mL Sterile Plastic (N/A - lab)	SP2T-250 mL Sterile Plastic (N/A - lab)	BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	Cubitainer	VSGU-20 mL Scintillation vials (N/A)	GN		
1	/			/	/	/	/	/		/	/	/	/	/	/									/					
2	/			/	/	/	/	/		/	/	/	/	/	/										/				
3	/			/	/	/	/	/		/	/	/	/	/	/										/				
4	/			/	/	/	/	/		/	/	/	/	/	/										/				
5	/			/	/	/	/	/		/	/	/	/	/	/										/				
6	/			/	/	/	/	/		/	/	/	/	/	/										/				
7	/			/	/	/	/	/		/	/	/	/	/	/										/				
8	/			/	/	/	/	/		/	/	/	/	/	/										/				
9	/			/	/	/	/	/		/	/	/	/	/	/										/				
10	/			/	/	/	/	/		/	/	/	/	/	/										/				
11	/			/	/	/	/	/		/	/	/	/	/	/										/				
12	/			/	/	/	/	/		/	/	/	/	/	/										/				

pH Adjustment Log for Preserved Samples

Sample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #

Water Monitoring Report

Quarterly January – March

January

Prepared for:



Prince William County Department of Public Works

County of Loudoun, Virginia

Prince William County, Virginia

Prepared by:

Contractor Environmental Infrastructure

County of Loudoun, Virginia

Contractor

Contractor

February

March

1. Introduction

The Water Monitoring Report for the month of January was prepared to provide information on the status of the water supply system in Prince William County, Virginia. The data was collected from the automatic water quality monitoring stations located at the various points of the water supply system. The data was analyzed using the Manning equation to determine the flow rate and velocity of the water in the pipes.

2. Methodology

The flow rate data was collected at the outfall by an automatic water quality monitoring station. The data was collected using a flow meter installed at the outfall. The flow rate was calculated using the Manning equation, which relates the flow rate to the pipe diameter, the roughness coefficient, and the slope of the pipe.

3. Summary of Results

The flow rate data was collected at the outfall of the water supply system. The data was analyzed using the Manning equation to determine the flow rate and velocity of the water in the pipes. The results of the analysis are summarized in the following table.

4. Discussion

The flow rate data was collected at the outfall of the water supply system. The data was analyzed using the Manning equation to determine the flow rate and velocity of the water in the pipes. The results of the analysis are summarized in the following table.

The automatic water quality monitoring stations were deployed at the various points of the water supply system. The data was collected using the automatic water quality monitoring stations. The data was analyzed using the Manning equation to determine the flow rate and velocity of the water in the pipes. The results of the analysis are summarized in the following table.

Following the completion of the data collection and analysis, the results were compared to the design criteria for the water supply system. The results of the analysis are summarized in the following table.

$$Q = VA = \left(\frac{1.49}{n}\right)AR^2\sqrt{S} \text{ [US]}$$

Q = flow rate
A = flow area
V = average velocity
S = water surface slope

R = hydraulic Radius
n = Roughness coefficient
C = English unit conversion factor

Annual flow data is being used in the City of Fairfax infrastructure geographic data provided by Prince William County. The data reported by the SCA for the area and hydraulic radius in the area could be collected for a given time interval. A Manning's n value is used for the concrete pipe. The data collected over the duration of the storm event is based on their representation of the data in the cumulative flow curve for each storm event. The data provided to the laboratory for analytical results are considered to be the concentration of the individual analyte.

SS

SS

Sampling occurred from 1/1/2018 to 1/31/2018. Precipitation data recorded at the International Airport totalled 0.00 inches during the 31 day interval. Precipitation consisted of light to heavy rain. All temperatures ranged from 32 to 63 degrees Fahrenheit during the 31 day collection period. Storms were recorded by heavy incoming rain on January 1. Samples were retained under refrigeration until they were collected and analyzed on January 1.

SS

Sampling occurred from 1/1/2018 to 1/31/2018. Precipitation data recorded at the Boyd Airfield totalled 0.00 inches over the 31 day interval. Precipitation consisted of light drizzle to light rain. All temperatures ranged from 32 to 63 degrees Fahrenheit during the 31 day collection period. The most recent event at the gauge consisted of light rain totaling 0.00 inches on January 1. Samples were retained under refrigeration until they were collected and analyzed on January 1.

Site

Site Monitoring Summary

The following table provides a summary of the monitoring data for the site. The data shows a significant increase in flow rate and volume during the period from 2:30 to 7:30, with a peak flow rate of approximately 17.5 cfs and a cumulative volume of approximately 11,000 cf.

Figure 1: Flow Rate and Cumulative Volume Data for the Site on February 1, 2024.

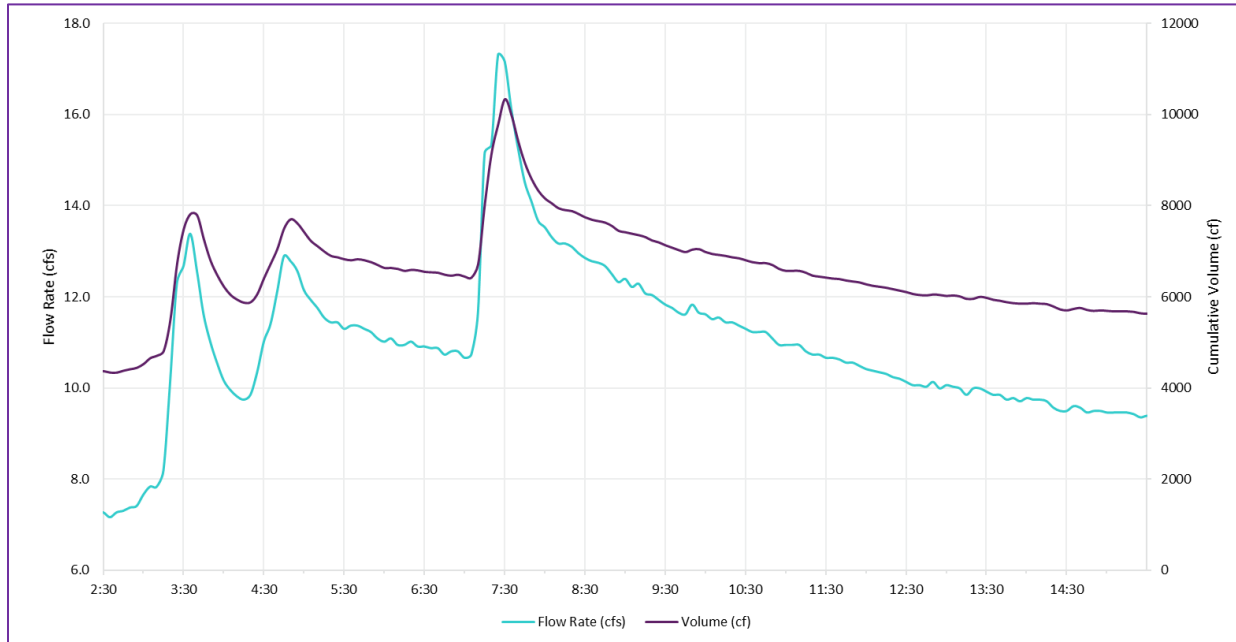


Table 1. Summary of Coliforms and Total Solids – Site 00000

Bottle #	Sample	Coliforms	Total Solids	Total Solids
1	1	100000	1000	1000
1	2	100000	1000	1000
1	3	100000	1000	1000
1	4	100000	1000	1000
1	5	100000	1000	1000
1	6	100000	1000	1000
1	7	100000	1000	1000
1	8	100000	1000	1000
1	9	100000	1000	1000
1	10	100000	1000	1000
1	11	100000	1000	1000
1	12	100000	1000	1000
1	13	100000	1000	1000
1	14	100000	1000	1000
1	15	100000	1000	1000
1	16	100000	1000	1000
1	17	100000	1000	1000
1	18	100000	1000	1000
1	19	100000	1000	1000
1	20	100000	1000	1000
1	21	100000	1000	1000
1	22	100000	1000	1000
1	23	100000	1000	1000
1	24	100000	1000	1000
1	25	100000	1000	1000
1	26	100000	1000	1000
1	27	100000	1000	1000
1	28	100000	1000	1000
1	29	100000	1000	1000
1	30	100000	1000	1000
1	31	100000	1000	1000
1	32	100000	1000	1000
1	33	100000	1000	1000
1	34	100000	1000	1000
1	35	100000	1000	1000
1	36	100000	1000	1000
1	37	100000	1000	1000
1	38	100000	1000	1000
1	39	100000	1000	1000
1	40	100000	1000	1000
1	41	100000	1000	1000
1	42	100000	1000	1000
1	43	100000	1000	1000
1	44	100000	1000	1000
1	45	100000	1000	1000
1	46	100000	1000	1000
1	47	100000	1000	1000
1	48	100000	1000	1000
1	49	100000	1000	1000
1	50	100000	1000	1000

*5.0 L Sample

Site Description

The range of flow conditions – continuous for constant hydrograph compared to cumulative volume can be seen in Figure 1. A slight reduction in flow rate is observed in the data presented below. It is noted that a flow rate was not collected for the period – a condition identified in the data presented below. The flow rate data was adjusted to incorporate the flow rate for the period that was not collected for all collected data.

Figure 1. Flow rate data over time for the storm event at Site on January

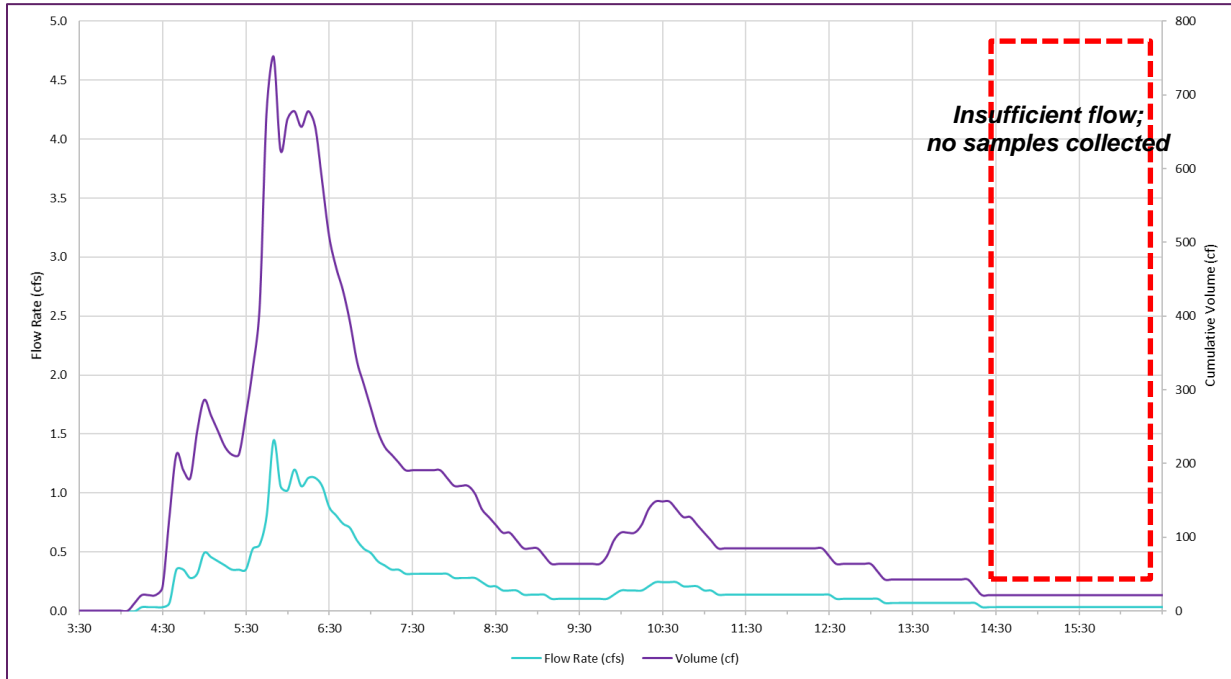


Table Summary of Coliforms and Turbidity – Site

Bottle	Site	Coliforms	Turbidity	Coliforms
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9
10	10	10	10	10
11	11	11	11	11
12	12	12	12	12
13	13	13	13	13
14	14	14	14	14
15	15	15	15	15
16	16	16	16	16
17	17	17	17	17
18	18	18	18	18
19	19	19	19	19
20	20	20	20	20
21	21	21	21	21
22	22	22	22	22
23	23	23	23	23
24	24	24	24	24
25	25	25	25	25
26	26	26	26	26
27	27	27	27	27
28	28	28	28	28
29	29	29	29	29
30	30	30	30	30
31	31	31	31	31
32	32	32	32	32
33	33	33	33	33
34	34	34	34	34
35	35	35	35	35
36	36	36	36	36
37	37	37	37	37
38	38	38	38	38
39	39	39	39	39
40	40	40	40	40
41	41	41	41	41
42	42	42	42	42
43	43	43	43	43
44	44	44	44	44
45	45	45	45	45
46	46	46	46	46
47	47	47	47	47
48	48	48	48	48
49	49	49	49	49
50	50	50	50	50
51	51	51	51	51
52	52	52	52	52
53	53	53	53	53
54	54	54	54	54
55	55	55	55	55
56	56	56	56	56
57	57	57	57	57
58	58	58	58	58
59	59	59	59	59
60	60	60	60	60
61	61	61	61	61
62	62	62	62	62
63	63	63	63	63
64	64	64	64	64
65	65	65	65	65
66	66	66	66	66
67	67	67	67	67
68	68	68	68	68
69	69	69	69	69
70	70	70	70	70
71	71	71	71	71
72	72	72	72	72
73	73	73	73	73
74	74	74	74	74
75	75	75	75	75
76	76	76	76	76
77	77	77	77	77
78	78	78	78	78
79	79	79	79	79
80	80	80	80	80
81	81	81	81	81
82	82	82	82	82
83	83	83	83	83
84	84	84	84	84
85	85	85	85	85
86	86	86	86	86
87	87	87	87	87
88	88	88	88	88
89	89	89	89	89
90	90	90	90	90
91	91	91	91	91
92	92	92	92	92
93	93	93	93	93
94	94	94	94	94
95	95	95	95	95
96	96	96	96	96
97	97	97	97	97
98	98	98	98	98
99	99	99	99	99
100	100	100	100	100

*5.0 L Sample

City of Fairfax Monitoring Report
City of Fairfax
Prince William County Virginia

February 2020

CONFIDENTIAL

SECRET

Management

The site is located at the Bull Run water treatment facility drainage area an industrial area and parking lot. It is subject to truck traffic and all identified signs of recent repair work to cracks are identified.



The area is slightly oily in appearance in the standing water at the site in the outfall following the storm.

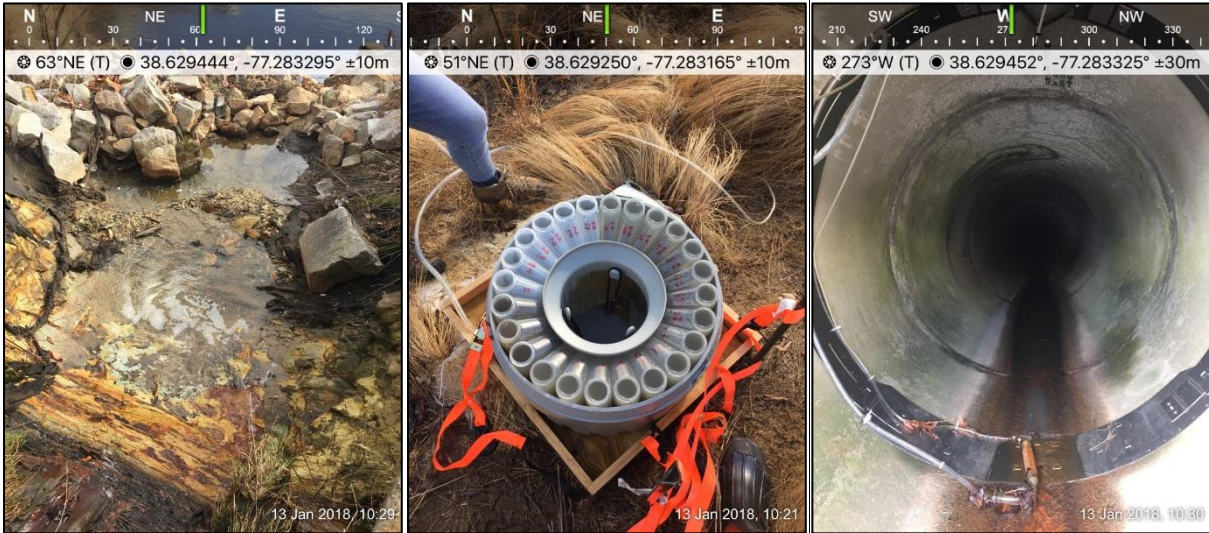


Location

Site is located along the intersection of Mill Road and Stoneridge at the intersection of the road. It is a 54" concrete pipe that drains to a deep scour pool before draining to a large BMP that collects drainage for the Stoneridge subdivision. The BMP is a large circular structure with a central well and a surrounding berm. The BMP is located on a hillside and is surrounded by trees and vegetation. The BMP is a large circular structure with a central well and a surrounding berm. The BMP is located on a hillside and is surrounded by trees and vegetation. The BMP is a large circular structure with a central well and a surrounding berm. The BMP is located on a hillside and is surrounded by trees and vegetation.



Flow was not observed on the surface of the BMP during the inspection. The BMP is a large circular structure with a central well and a surrounding berm. The BMP is located on a hillside and is surrounded by trees and vegetation. The BMP is a large circular structure with a central well and a surrounding berm. The BMP is located on a hillside and is surrounded by trees and vegetation.



City of Fairfax Monitoring Report
City of Fairfax
Prince William County Virginia

February 2020

Section B

Section B

January 25, 2018

Jen Furey
Amec Foster Wheeler
14424 Albemarle Point Place
Suite 115
Chantilly, VA 20151

RE: Project: PRINCE WILLIAM CO Q1 2018
Pace Project No.: 92370038

Dear Jen Furey:

Enclosed are the analytical results for sample(s) received by the laboratory on January 18, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Taylor Ezell
taylor.ezell@pacelabs.com
(704)875-9092
Project Manager

Enclosures

cc: Benjamin Green, Amec Foster Wheeler



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

Asheville Certification IDs

2225 Riverside Drive, Asheville, NC 28804

Florida/NELAP Certification #: E87648

Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40

South Carolina Certification #: 99030001

Virginia/VELAP Certification #: 460222

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92370038001	MAN01122018	Water	01/12/18 15:00	01/18/18 15:50
92370038002	DAL01122018	Water	01/12/18 17:00	01/18/18 15:50

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92370038001	MAN01122018	EPA 200.7	SH1	4	PASI-A
		SM 2540D	MJP	1	PASI-A
		EPA 9040	KMM	1	PASI-A
		EPA 350.1 1993 Rev 2.0	BRJ	1	PASI-A
		EPA 351.2	BRJ	1	PASI-A
		EPA 353.2	DMN	1	PASI-A
		EPA 365.1	MDW	1	PASI-A
		SM 5220D	NAL	1	PASI-A
92370038002	DAL01122018	EPA 200.7	SH1	4	PASI-A
		SM 2540D	MJP	1	PASI-A
		EPA 9040	KMM	1	PASI-A
		EPA 350.1 1993 Rev 2.0	BRJ	1	PASI-A
		EPA 351.2	BRJ	1	PASI-A
		EPA 353.2	DMN	1	PASI-A
		EPA 365.1	MDW	1	PASI-A
		SM 5220D	NAL	1	PASI-A

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: PRINCE WILLIAM CO Q1 2018
Pace Project No.: 92370038

Sample: MAN01122018		Lab ID: 92370038001		Collected: 01/12/18 15:00	Received: 01/18/18 15:50	Matrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 MET ICP		Analytical Method: EPA 200.7 Preparation Method: EPA 200.7						
Copper	133	ug/L	5.0	1	01/19/18 04:35	01/23/18 23:34	7440-50-8	
Lead	29.7	ug/L	5.0	1	01/19/18 04:35	01/23/18 23:34	7439-92-1	
Nickel	10.1	ug/L	5.0	1	01/19/18 04:35	01/23/18 23:34	7440-02-0	
Zinc	679	ug/L	10.0	1	01/19/18 04:35	01/23/18 23:34	7440-66-6	
2540D TSS, Low-Level		Analytical Method: SM 2540D						
Total Suspended Solids	101	mg/L	6.7	1		01/19/18 08:57		
9040 pH		Analytical Method: EPA 9040						
pH	7.1	Std. Units	0.10	1		01/19/18 04:48		H6
350.1 Ammonia		Analytical Method: EPA 350.1 1993 Rev 2.0						
Nitrogen, Ammonia	ND	mg/L	0.10	1		01/19/18 03:20	7664-41-7	
351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2						
Nitrogen, Kjeldahl, Total	2.3	mg/L	0.50	1		01/23/18 03:19	7727-37-9	
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2						
Nitrogen, NO2 plus NO3	0.72	mg/L	0.020	1		01/25/18 11:25		M1
365.1 Phosphorus, Total		Analytical Method: EPA 365.1						
Phosphorus	0.24	mg/L	0.050	1		01/22/18 21:10	7723-14-0	
5220D COD		Analytical Method: SM 5220D						
Chemical Oxygen Demand	171	mg/L	25.0	1		01/18/18 21:39		

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: PRINCE WILLIAM CO Q1 2018
Pace Project No.: 92370038

Sample: DAL01122018		Lab ID: 92370038002		Collected: 01/12/18 17:00	Received: 01/18/18 15:50	Matrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 MET ICP		Analytical Method: EPA 200.7 Preparation Method: EPA 200.7						
Copper	47.9	ug/L	5.0	1	01/19/18 04:35	01/23/18 23:37	7440-50-8	
Lead	ND	ug/L	5.0	1	01/19/18 04:35	01/23/18 23:37	7439-92-1	
Nickel	6.8	ug/L	5.0	1	01/19/18 04:35	01/23/18 23:37	7440-02-0	
Zinc	504	ug/L	10.0	1	01/19/18 04:35	01/23/18 23:37	7440-66-6	
2540D TSS, Low-Level		Analytical Method: SM 2540D						
Total Suspended Solids	84.7	mg/L	6.7	1		01/19/18 08:57		
9040 pH		Analytical Method: EPA 9040						
pH	6.7	Std. Units	0.10	1		01/19/18 04:48		H6
350.1 Ammonia		Analytical Method: EPA 350.1 1993 Rev 2.0						
Nitrogen, Ammonia	0.37	mg/L	0.10	1		01/19/18 03:24	7664-41-7	
351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2						
Nitrogen, Kjeldahl, Total	1.8	mg/L	0.50	1		01/23/18 03:20	7727-37-9	
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2						
Nitrogen, NO2 plus NO3	0.46	mg/L	0.020	1		01/25/18 11:28		
365.1 Phosphorus, Total		Analytical Method: EPA 365.1						
Phosphorus	0.19	mg/L	0.050	1		01/22/18 21:12	7723-14-0	
5220D COD		Analytical Method: SM 5220D						
Chemical Oxygen Demand	130	mg/L	25.0	1		01/18/18 21:39		

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q1 2018
Pace Project No.: 92370038

QC Batch: 394714 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 MET
Associated Lab Samples: 92370038001, 92370038002

METHOD BLANK: 2188039 Matrix: Water
Associated Lab Samples: 92370038001, 92370038002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Copper	ug/L	ND	5.0	01/23/18 23:06	
Lead	ug/L	ND	5.0	01/23/18 23:06	
Nickel	ug/L	ND	5.0	01/23/18 23:06	
Zinc	ug/L	ND	10.0	01/23/18 23:06	

LABORATORY CONTROL SAMPLE: 2188040

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Copper	ug/L	500	481	96	85-115	
Lead	ug/L	500	477	95	85-115	
Nickel	ug/L	500	473	95	85-115	
Zinc	ug/L	500	492	98	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2188041 2188042

Parameter	Units	92370059001		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	MS Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec					
Copper	ug/L	<2.5	500	500	478	485	95	97	70-130	2	20		
Lead	ug/L	<2.5	500	500	497	489	99	98	70-130	2	20		
Nickel	ug/L	<2.5	500	500	487	484	97	96	70-130	1	20		
Zinc	ug/L	<2.5	500	500	534	514	106	102	70-130	4	20		

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2188043 2188044

Parameter	Units	92369992001		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	MS Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec					
Copper	ug/L	5.8	500	500	502	505	99	100	70-130	1	20		
Lead	ug/L	ND	500	500	495	493	99	98	70-130	0	20		
Nickel	ug/L	ND	500	500	491	490	98	98	70-130	0	20		
Zinc	ug/L	238	500	500	765	772	105	107	70-130	1	20		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

QC Batch: 394731

Analysis Method: SM 2540D

QC Batch Method: SM 2540D

Analysis Description: 2540D Total Suspended Solids

Associated Lab Samples: 92370038001, 92370038002

METHOD BLANK: 2188081

Matrix: Water

Associated Lab Samples: 92370038001, 92370038002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	1.0	01/19/18 08:57	

LABORATORY CONTROL SAMPLE: 2188082

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Suspended Solids	mg/L	250	230	92	90-110	

SAMPLE DUPLICATE: 2188083

Parameter	Units	92370038002 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	84.7	84.7	0	5	

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REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

QC Batch: 394709 Analysis Method: EPA 350.1 1993 Rev 2.0
QC Batch Method: EPA 350.1 1993 Rev 2.0 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 92370038001, 92370038002

METHOD BLANK: 2188018 Matrix: Water

Associated Lab Samples: 92370038001, 92370038002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	01/19/18 05:22	

LABORATORY CONTROL SAMPLE: 2188019

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	5	5.0	99	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2188020 2188021

Parameter	Units	92369462001 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Nitrogen, Ammonia	mg/L	1.4	5	5	6.5	6.4	101	101	90-110	0	7	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2188022 2188023

Parameter	Units	92369700001 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Nitrogen, Ammonia	mg/L	48.8	5	5	55.3	52.7	131	79	90-110	5	7 M6	

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

QC Batch: 394839 Analysis Method: EPA 351.2
QC Batch Method: EPA 351.2 Analysis Description: 351.2 TKN
Associated Lab Samples: 92370038001, 92370038002

METHOD BLANK: 2188867 Matrix: Water

Associated Lab Samples: 92370038001, 92370038002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	ND	0.50	01/23/18 02:57	

LABORATORY CONTROL SAMPLE: 2188868

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	10	9.6	96	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2188869 2188870

Parameter	Units	92369564001		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec				
Nitrogen, Kjeldahl, Total	mg/L	22.7	10	10	10	114	124	912	1010	90-110	8	10	M6

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2188871 2188872

Parameter	Units	92369773003		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec				
Nitrogen, Kjeldahl, Total	mg/L	3.4	10	10	10	13.0	12.2	96	88	90-110	6	10	M1

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q1 2018
Pace Project No.: 92370038

QC Batch: 395406 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 92370038001, 92370038002

METHOD BLANK: 2192025 Matrix: Water
Associated Lab Samples: 92370038001, 92370038002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.020	01/25/18 11:23	

LABORATORY CONTROL SAMPLE: 2192026

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	2.5	2.6	102	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2192027 2192028

Parameter	Units	92370038001		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec				
Nitrogen, NO2 plus NO3	mg/L	0.72	2.5	2.5	1.4	1.4	25	26	75-125	1	10	M1	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2192029 2192030

Parameter	Units	92370352005		MSD		MS		MSD		% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec				
Nitrogen, NO2 plus NO3	mg/L	0.059	2.5	2.5	2.5	2.5	96	96	75-125	0	10		

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

QC Batch: 394806

Analysis Method: EPA 365.1

QC Batch Method: EPA 365.1

Analysis Description: 365.1 Phosphorus, Total

Associated Lab Samples: 92370038001, 92370038002

METHOD BLANK: 2188765

Matrix: Water

Associated Lab Samples: 92370038001, 92370038002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/L	ND	0.050	01/22/18 21:08	

LABORATORY CONTROL SAMPLE: 2188766

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	2.5	2.5	100	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2188767 2188768

Parameter	Units	92370038001 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Phosphorus	mg/L	0.24	2.5	2.5	2.9	2.8	105	103	90-110	2	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2188769 2188770

Parameter	Units	92370044001 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Phosphorus	mg/L	0.40	2.5	2.5	3.0	3.1	105	107	90-110	1	10	

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

QC Batch: 394474 Analysis Method: SM 5220D
QC Batch Method: SM 5220D Analysis Description: 5220D COD
Associated Lab Samples: 92370038001, 92370038002

METHOD BLANK: 2186965 Matrix: Water

Associated Lab Samples: 92370038001, 92370038002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chemical Oxygen Demand	mg/L	ND	25.0	01/18/18 21:39	

LABORATORY CONTROL SAMPLE: 2186966

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chemical Oxygen Demand	mg/L	750	767	102	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2186967 2186968

Parameter	Units	92369638002		MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.								
Chemical Oxygen Demand	mg/L	46.0	100	100	169	174	123	128	90-110	3	3	M1	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2187961 2187962

Parameter	Units	92369564005		MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Spike Conc.								
Chemical Oxygen Demand	mg/L	1180	100	100	1590	1260	410	80	90-110	23	3	M6, R1	

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REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-A Pace Analytical Services - Asheville

ANALYTE QUALIFIERS

H6 Analysis initiated outside of the 15 minute EPA required holding time.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.

R1 RPD value was outside control limits.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE


Project: PRINCE WILLIAM CO Q1 2018

Pace Project No.: 92370038

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92370038001	MAN01122018	EPA 200.7	394714	EPA 200.7	394821
92370038002	DAL01122018	EPA 200.7	394714	EPA 200.7	394821
92370038001	MAN01122018	SM 2540D	394731		
92370038002	DAL01122018	SM 2540D	394731		
92370038001	MAN01122018	EPA 9040	394719		
92370038002	DAL01122018	EPA 9040	394719		
92370038001	MAN01122018	EPA 350.1 1993 Rev 2.0	394709		
92370038002	DAL01122018	EPA 350.1 1993 Rev 2.0	394709		
92370038001	MAN01122018	EPA 351.2	394839		
92370038002	DAL01122018	EPA 351.2	394839		
92370038001	MAN01122018	EPA 353.2	395406		
92370038002	DAL01122018	EPA 353.2	395406		
92370038001	MAN01122018	EPA 365.1	394806		
92370038002	DAL01122018	EPA 365.1	394806		
92370038001	MAN01122018	SM 5220D	394474		
92370038002	DAL01122018	SM 5220D	394474		

REPORT OF LABORATORY ANALYSIS

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	Document Name: Sample Condition Upon Receipt(SCUR)	Document Revised: July 25, 2017 Page 1 of 2
	Document No.: F-CAR-CS-033-Rev.03	Issuing Authority: Pace Quality Office

Laboratory receiving samples:

Asheville Eden Greenwood Huntersville Raleigh Mechanicsville

Sample Condition Upon Receipt

Client Name: Amec

Project #:

WO# : 92370038



Courier: Fed Ex UPS USPS Client
 Commercial Pace Other: _____

Custody Seal Present? Yes No Seals Intact? Yes No

Date/Initials Person Examining Contents: BDT 1/18/18

Packing Material: Bubble Wrap Bubble Bags None Other

Biological Tissue Frozen?

Yes No N/A

Thermometer: IR Gun ID: 1027 Type of Ice: Wet Blue None

Correction Factor: 0 Cooler Temp Corrected (°C): 1.8

Temp should be above freezing to 6°C

Samples out of temp criteria. Samples on ice, cooling process has begun

USDA Regulated Soil (N/A, water sample)

Did samples originate in a quarantine zone within the United States: CA, NY, or SC (check maps)?

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)? Yes No

Yes No

		Comments/Discrepancy:
Chain of Custody Present?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	1.
Samples Arrived within Hold Time?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	2.
Short Hold Time Analysis (<72 hr.)?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	3.
Rush Turn Around Time Requested?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	4.
Sufficient Volume?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	5.
Correct Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	6.
-Pace Containers Used?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Containers Intact?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	7.
Dissolved analysis: Samples Field Filtered?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	8.
Sample Labels Match COC?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	9.
-Includes Date/Time/ID/Analysis Matrix: <u>UV3</u>		
Headspace in VOA Vials (>5-6mm)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	10.
Trip Blank Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	11.
Trip Blank Custody Seals Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	

Field Data Required? Yes No

CLIENT NOTIFICATION/RESOLUTION

Person Contacted: _____

Date/Time: _____

Comments/Sample Discrepancy: _____

Project Manager SCURF Review: _____

Date: 1/24

Project Manager SRF Review: _____

Date: 1/24

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers)



Document Name:
Sample Condition Upon Receipt(SCUR)
 Document No.:
F-CAR-CS-033-Rev.03

Document Revised: July 25, 2017
 Page 2 of 2
 Issuing Authority:
 Pace Quality Office

*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Project #

WO# : 92370038

PM: PTE

Due Date: 01/25/18

CLIENT: 92-Amec VA

**Bottom half of box is to list number of bottles

Item#	BP4U-125 mL Plastic Unpreserved (N/A) (Cl-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (Cl-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP3Z-250 mL Plastic ZN Acetate & NaOH (>9)	BP3C-250 mL Plastic NaOH (pH > 12) (Cl-)	WGJU-Wide-mouthed Glass Jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (Cl-)	AG1H-1 liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (Cl-)	AG1S-1 liter Amber H2SO4 (pH < 2)	AG3S-250 mL Amber H2SO4 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4Cl (N/A)(Cl-)	DG9H-40 mL VOA HCl (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SP5T-125 mL Sterile Plastic (N/A - lab)	SP2T-250 mL Sterile Plastic (N/A - lab)	BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	Cubitainer	VSGU-20 mL Scintillation vials (N/A)	GN		
1																													
2																													
3																													
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11																													
12																													

pH Adjustment Log for Preserved Samples

Sample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #

Cost Estimation Monitoring Report

Second Quarter 2020 March – June 2020

Prince William County

Prepared for:



Prince William County Department of Public Works

County of Loudoun, Virginia

Prince William County, Virginia

Prepared by:

Wood Construction Solutions Inc.

10000 Wood Lane, Suite 1000

Manassas, Virginia

703-791-1000

July 2020

Project 0000000000

Good Ironment Infrastructure Solution Inc. provided to provide the report of water monitoring for compliance with Virginia Stormwater Management Program MS Municipal Separate Storm Sewer System MS permit issued by the Virginia Department of Environmental Quality to Principia County Virginia. The report discusses the results of the field sampling conducted on April 2011 at the following locations for water quality analysis results of the field sampling.

Method

Flow rate data were collected at the outlet by an (S) automatic rain gauge and an (S) flow meter to be installed at a Science Ring flow rate over the course of the field sampling. The data were electronically calculated using (S) flowline software utilizing the Manning equation to convert flow and velocity to flow rate.

Site 1

Site 1 is located near [Redacted] Road. It receives a total of [Redacted] acres of urban area drainage area. A [Redacted] land use is in the area. The county data revealed that the [Redacted] in diameter pipe is a [Redacted] flow. The [Redacted] is a [Redacted] in diameter pipe. It is at the [Redacted] of an adjacent stormwater pond.

Site 2

Site 2 is located near the corner of [Redacted] and [Redacted] Mill. It is a north of [Redacted] drain into a [Redacted] for the [Redacted] residential development. The drainage total of [Redacted] acres. It is a [Redacted] in diameter pipe.

The automatic rain gauge was deployed with a qualifying storm event. The [Redacted] precipitation gauge was set for the monitoring site on April 2011. The [Redacted] was deployed to the [Redacted] and programmed the samplers' automated, discrete sampling sequence to initiate upon flow. The [Redacted] and [Redacted] respectively. The [Redacted] program is designed to collect [Redacted] samples to be collected every [Redacted] over a [Redacted] hour duration. Sample interval is adjusted to account for the [Redacted] that [Redacted] Rain gauge data were collected for monitoring station in the [Redacted] and ground monitoring network. Data are daily accessed online and provided hourly precipitation total over the monitoring period. The [Redacted] based on the [Redacted] data record reporting interval and proximity to monitoring location.

Following the storm event, the [Redacted] and [Redacted] for [Redacted] to [Redacted] ironment or water quality analysis. The [Redacted] of discrete samples into a single [Redacted] flowline software calculated the storm event discharge using the Manning equation.

$$Q = VA = \left(\frac{1.49}{n}\right)AR^{\frac{2}{3}}\sqrt{S} \text{ [US]}$$

- Q = flow rate
- V = flow area
- A = cross-section
- S = stormwater slope
- R = hydraulic radius
- n = roughness coefficient
- [Redacted] = English unit conversion factor

annals data were derived using in-situ data reported in the water infrastructure geographic data provided by Principia County. The data reported by the SDC area and hydraulic radius in the data could be compared for a given time interval. A Manning's n value was used for the concrete pipe. The data collected over the duration of the storm event were then used based on their representation of the cumulative flow for each storm event. The data were compared to the laboratory or analytical resulting analysis. The concentration of the individual analyte

Summary

Summary of Results

Sampling occurred from 08/01/18 – 08/01/18. Precipitation data recorded at Bull Run International Airport totaled 0.1 inches during the 24-hour interval. Precipitation consisted of light rain. All temperatures ranged from 68 degrees Fahrenheit during the collection period. Storm event was recorded by 0.1 inches of light rain on 08/01/18. Samples were retained under refrigeration until they were collected and analyzed overnight to each analytical on 08/01/18.

Summary of Observations

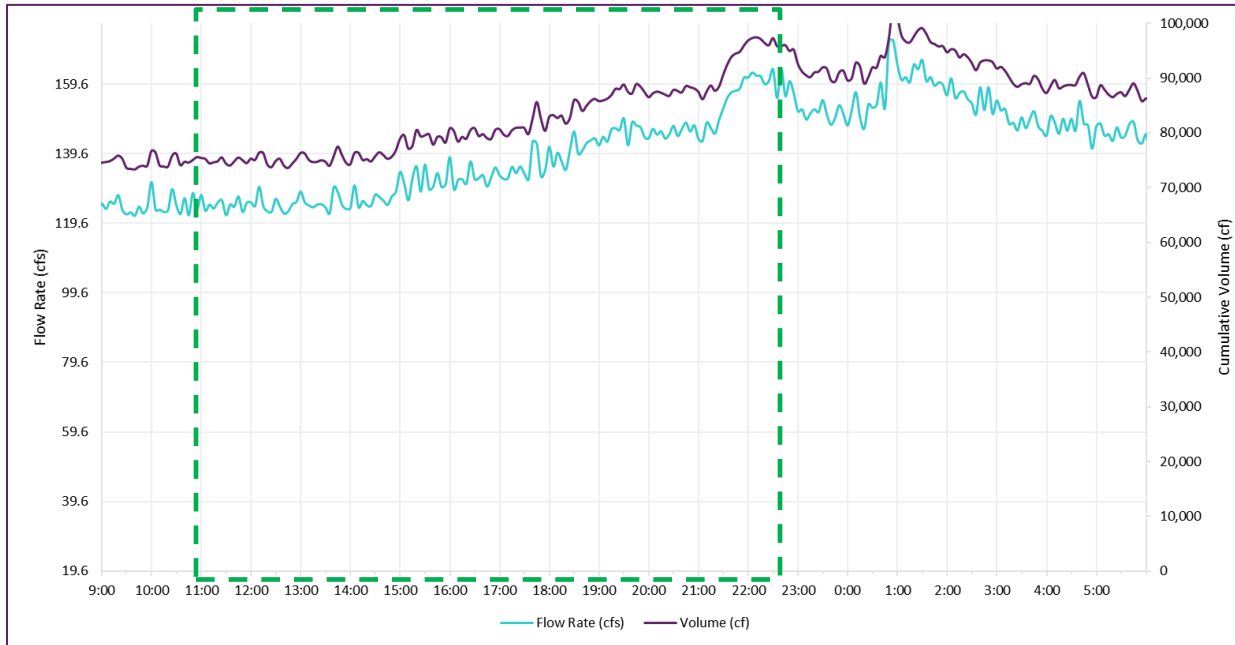
Samples were deployed on 08/01/18. Manassas City successfully captured the storm event. However, the Falls City area did not. This was insufficient flow to trigger the sampler's pre-determined flow threshold to initiate auto-start sampling at the Falls City site. This will be corrected in future sampling efforts by decreasing the overall flow threshold to trigger sampling. Manual sampling was attempted on 08/01/18 but was unsuccessful due to a lack of sufficient rainfall to trigger the sampler.

Site Name

Site Name

Flow range for - continuous for hydrograph comparison cumulative volume can be seen in figure 1. The flow rate is shown in cfs and the cumulative volume is shown in cf.

Figure 1 shows data for the event at Site on April



Ball's Run Wastewater Treatment Plant - Site 1000

Bottle #	Sample	Location	Depth	Flow
1				
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99				
100				

*5.0 L Sample

City of Fairfax Monitoring Report
June 2020
Prince William County, Virginia

July 2020

XXXXXXXXXX

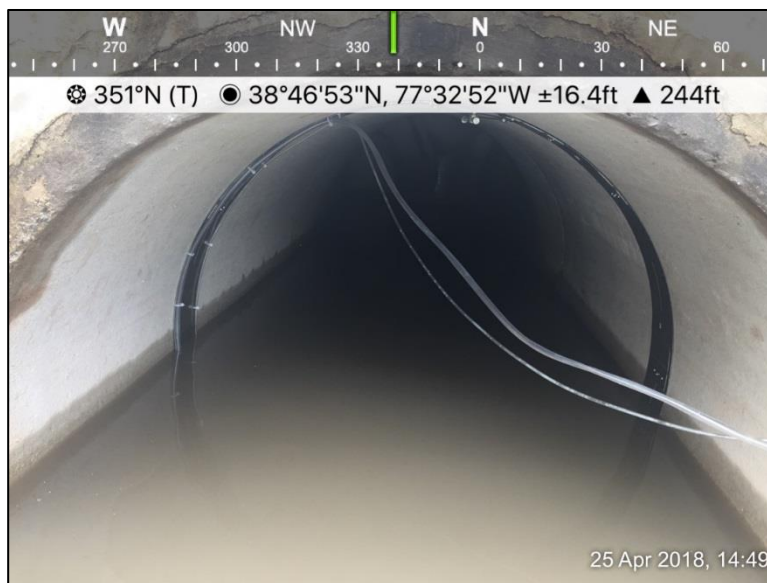
XXXXXXXXXX

Management

The site is located in the Bull Run watershed drainage for an industrial area and parking lot. It is subject to frequent truck traffic, outfall of oil and grease, and other pollutants.



The area is expected to increase in truck traffic following the construction and installation of a new parking lot due to aggregation of different down traffic, requiring the collection point for this site.



Location

Site is located on the corner of ... Mill Road and ... Stoneridge at ... ac ... It is a 54" concrete pipe that drains to a deep scour pool before draining to a large BMP that collects drainage for the ... ac ... drainage system. It is a 54" concrete pipe that drains to a deep scour pool before draining to a large BMP that collects drainage for the ... ac ... drainage system. It is a 54" concrete pipe that drains to a deep scour pool before draining to a large BMP that collects drainage for the ... ac ... drainage system.



There is a continued contribution of ground water ... at the site ... identified by the apparent iron oxidizing bacteria ... and the scour pool.



PRINCE WILLIAM COUNTY WET WEATHER MONITORING

FIELD DATA COLLECTION FORM

Date: 04/24/2018	Time: 10:30
Site ID: DALE	Weather:

INSTALLATION SUMMARY:

Analytical Equipment Used: Igo 6700	
Date/Time Installed: 10:30 4/24	Forecast Rainfall: Franklin St. Station ^{Comstock St. Station} ; 0.77 in

General Observations/Notes:
 Set to enable at 1 inch to ensure full sample collection. Small trickle at time of installation that was not registered on bubbler.
 Shown in scan post, with iron oxidizing bacteria. Groundwater flow apparent.

STORM EVENT SUMMARY:

Sampling Successful?	Yes	<input checked="" type="radio"/> No	List Details:
Rainfall Data:	Beginning:	End:	Weather Station Reference:
	Total Precipitation:		List Details:
Discharge:	Volume (cubic feet):		List Details:

General Observations/Notes:
 Sufficient flow for collection, but programming error lead to program not enabling for sampling at proper time 4:25 pm

ADDITIONAL INFORMATION

Other Observations/Comments:

PERSONNEL INFORMATION

Name: Ben Green	Name:
-----------------	-------

PRINCE WILLIAM COUNTY WET WEATHER MONITORING

FIELD DATA COLLECTION FORM

Date: 04/24/2018	Time: 08:45
Site ID: MANNY	Weather: Overcast

INSTALLATION SUMMARY:

Analytical Equipment Used: ISO 6700 Portable sampler	
Date/Time Installed: 4/24; 08:45 9:15.	Forecast Rainfall: 0.67", 40% chance at 9am
General Observations/Notes: Water in pond has risen due to spring base flow. 50% chance at 7pm Water was 1 ft 9 in (~1.8 ft), specified to trigger sampling at 1.8 ft. Oily sheen on surface of water, started measuring at noon.	

STORM EVENT SUMMARY:

Sampling Successful?	<input checked="" type="radio"/> Yes	<input type="radio"/> No	List Details:
Rainfall Data:	Beginning:	End:	Weather Station Reference:
	Total Precipitation:		List Details:
Discharge:	Volume (cubic feet):		List Details:

General Observations/Notes:
 Lots of trash and very turbid water. Bottom of outfall coated in at least an inch of new sediment.

ADDITIONAL INFORMATION

Other Observations/Comments:

PERSONNEL INFORMATION

Name: Ben Green	Name: JP Miller
-----------------	-----------------

City of Fairfax Monitoring Report
June 2020
Prince William County, Virginia

July 2020

Section B

Section B

May 04, 2018

Jen Furey
Amec Foster Wheeler
14424 Albemarle Point Place
Suite 115
Chantilly, VA 20151

RE: Project: PRINCE WILLIAM CO Q2 2018
Pace Project No.: 92382647

Dear Jen Furey:

Enclosed are the analytical results for sample(s) received by the laboratory on April 27, 2018. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Taylor Ezell
taylor.ezell@pacelabs.com
(704)875-9092
Project Manager

Enclosures

cc: Benjamin Green, Amec Foster Wheeler



REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: PRINCE WILLIAM CO Q2 2018

Pace Project No.: 92382647

Asheville Certification IDs

2225 Riverside Drive, Asheville, NC 28804

Florida/NELAP Certification #: E87648

Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40

South Carolina Certification #: 99030001

Virginia/VELAP Certification #: 460222

REPORT OF LABORATORY ANALYSIS

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SAMPLE SUMMARY

Project: PRINCE WILLIAM CO Q2 2018

Pace Project No.: 92382647

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92382647001	MAN 042518	Water	04/24/18 22:30	04/27/18 12:58

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SAMPLE ANALYTE COUNT

Project: PRINCE WILLIAM CO Q2 2018

Pace Project No.: 92382647

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92382647001	MAN 042518	EPA 200.7	SH1	4	PASI-A
		SM 2540D	NAL	1	PASI-A
		EPA 9040	RLO	1	PASI-A
		EPA 350.1 1993 Rev 2.0	DMN	1	PASI-A
		EPA 351.2	CJH1	1	PASI-A
		EPA 353.2	DMN	1	PASI-A
		EPA 365.1	AES2	1	PASI-A
		SM 5220D	DMN	1	PASI-A

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ANALYTICAL RESULTS

Project: PRINCE WILLIAM CO Q2 2018

Pace Project No.: 92382647

Sample: MAN 042518	Lab ID: 92382647001	Collected: 04/24/18 22:30	Received: 04/27/18 12:58	Matrix: Water				
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 MET ICP		Analytical Method: EPA 200.7 Preparation Method: EPA 200.7						
Copper	58.9	ug/L	5.0	1	04/27/18 22:45	05/03/18 19:47	7440-50-8	
Lead	11.8	ug/L	5.0	1	04/27/18 22:45	05/03/18 19:47	7439-92-1	
Nickel	8.0	ug/L	5.0	1	04/27/18 22:45	05/03/18 19:47	7440-02-0	
Zinc	141	ug/L	10.0	1	04/27/18 22:45	05/03/18 19:47	7440-66-6	
2540D TSS, Low-Level		Analytical Method: SM 2540D						
Total Suspended Solids	47.7	mg/L	3.3	1		05/01/18 18:10		
9040 pH		Analytical Method: EPA 9040						
pH	7.2	Std. Units	0.10	1		04/28/18 03:13		H3,H6
350.1 Ammonia		Analytical Method: EPA 350.1 1993 Rev 2.0						
Nitrogen, Ammonia	ND	mg/L	0.10	1		04/30/18 13:26	7664-41-7	
351.2 Total Kjeldahl Nitrogen		Analytical Method: EPA 351.2						
Nitrogen, Kjeldahl, Total	1.3	mg/L	0.50	1		05/02/18 04:04	7727-37-9	
353.2 Nitrogen, NO2/NO3 pres.		Analytical Method: EPA 353.2						
Nitrogen, NO2 plus NO3	0.56	mg/L	0.020	1		05/01/18 14:23		
365.1 Phosphorus, Total		Analytical Method: EPA 365.1						
Phosphorus	0.34	mg/L	0.050	1		05/02/18 13:17	7723-14-0	
5220D COD		Analytical Method: SM 5220D						
Chemical Oxygen Demand	83.0	mg/L	25.0	1		05/02/18 20:25		

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q2 2018
Pace Project No.: 92382647

QC Batch: 408340 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 MET
Associated Lab Samples: 92382647001

METHOD BLANK: 2265893 Matrix: Water
Associated Lab Samples: 92382647001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Copper	ug/L	ND	5.0	05/03/18 18:32	
Lead	ug/L	ND	5.0	05/03/18 18:32	
Nickel	ug/L	ND	5.0	05/03/18 18:32	
Zinc	ug/L	ND	10.0	05/03/18 18:32	

LABORATORY CONTROL SAMPLE: 2265894

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Copper	ug/L	500	502	100	85-115	
Lead	ug/L	500	471	94	85-115	
Nickel	ug/L	500	480	96	85-115	
Zinc	ug/L	500	464	93	85-115	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2265895 2265896

Parameter	Units	92382317001 Result	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.	Result	Result						
Copper	ug/L	ND	500	500	598	578	116	112	70-130	3	20	
Lead	ug/L	ND	500	500	517	494	103	98	70-130	5	20	
Nickel	ug/L	726	500	500	1270	1240	109	102	70-130	3	20	
Zinc	ug/L	ND	500	500	560	545	111	108	70-130	3	20	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2265897 2265898

Parameter	Units	92382514001 Result	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.	Result	Result						
Copper	ug/L	17.0	500	500	517	514	100	99	70-130	1	20	
Lead	ug/L	ND	500	500	470	470	94	94	70-130	0	20	
Nickel	ug/L	ND	500	500	481	479	96	96	70-130	1	20	
Zinc	ug/L	36.8	500	500	504	505	93	94	70-130	0	20	

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q2 2018

Pace Project No.: 92382647

QC Batch: 408797

Analysis Method: SM 2540D

QC Batch Method: SM 2540D

Analysis Description: 2540D Total Suspended Solids

Associated Lab Samples: 92382647001

METHOD BLANK: 2268081

Matrix: Water

Associated Lab Samples: 92382647001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Total Suspended Solids	mg/L	ND	1.0	05/01/18 18:07	

LABORATORY CONTROL SAMPLE: 2268082

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Total Suspended Solids	mg/L	250	242	97	90-110	

SAMPLE DUPLICATE: 2268083

Parameter	Units	92382185001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	80.0	99.4	22	5	D6

SAMPLE DUPLICATE: 2268084

Parameter	Units	92382671001 Result	Dup Result	RPD	Max RPD	Qualifiers
Total Suspended Solids	mg/L	24.4	31.6	26	5	D6

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q2 2018

Pace Project No.: 92382647

QC Batch: 408354 Analysis Method: EPA 9040

QC Batch Method: EPA 9040 Analysis Description: 9040 pH

Associated Lab Samples: 92382647001

SAMPLE DUPLICATE: 2265953

Parameter	Units	92382647001 Result	Dup Result	RPD	Max RPD	Qualifiers
pH	Std. Units	7.2	7.2	0	9	H3,H6

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q2 2018
Pace Project No.: 92382647

QC Batch: 408477 Analysis Method: EPA 350.1 1993 Rev 2.0
QC Batch Method: EPA 350.1 1993 Rev 2.0 Analysis Description: 350.1 Ammonia
Associated Lab Samples: 92382647001

METHOD BLANK: 2266350 Matrix: Water
Associated Lab Samples: 92382647001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Ammonia	mg/L	ND	0.10	04/30/18 12:46	

LABORATORY CONTROL SAMPLE: 2266351

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Ammonia	mg/L	5	5.0	101	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2266352 2266353

Parameter	Units	92382684001 Result	MS	MSD	MS	MSD	MS	MSD	% Rec	Max RPD	Qual
			Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits		
Nitrogen, Ammonia	mg/L	ND	5	5	5.1	5.1	102	102	90-110	0	7

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2266354 2266355

Parameter	Units	92382416002 Result	MS	MSD	MS	MSD	MS	MSD	% Rec	Max RPD	Qual
			Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits		
Nitrogen, Ammonia	mg/L	73.8	5	5	76.7	76.7	58	58	90-110	0	7 M6

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q2 2018

Pace Project No.: 92382647

QC Batch: 408557	Analysis Method: EPA 351.2
QC Batch Method: EPA 351.2	Analysis Description: 351.2 TKN
Associated Lab Samples: 92382647001	

METHOD BLANK: 2266927 Matrix: Water
Associated Lab Samples: 92382647001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	ND	0.50	05/02/18 03:41	

LABORATORY CONTROL SAMPLE: 2266928

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, Kjeldahl, Total	mg/L	10	9.9	99	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2266929 2266930

Parameter	Units	92382471001 Result	MS	MSD	MS	MSD	MS	MSD	% Rec	Max		Qual
			Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	
Nitrogen, Kjeldahl, Total	mg/L	2.3	10	10	12.4	12.4	102	102	90-110	0	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2266931 2266932

Parameter	Units	92382501004 Result	MS	MSD	MS	MSD	MS	MSD	% Rec	Max		Qual
			Spike Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	
Nitrogen, Kjeldahl, Total	mg/L	28.7	10	10	47.0	47.2	184	186	90-110	0	10	M6

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q2 2018
Pace Project No.: 92382647

QC Batch: 408531 Analysis Method: EPA 353.2
QC Batch Method: EPA 353.2 Analysis Description: 353.2 Nitrate + Nitrite, preserved
Associated Lab Samples: 92382647001

METHOD BLANK: 2266810 Matrix: Water
Associated Lab Samples: 92382647001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	ND	0.020	05/01/18 14:08	

LABORATORY CONTROL SAMPLE: 2266811

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Nitrogen, NO2 plus NO3	mg/L	2.5	2.5	100	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2266812 2266813

Parameter	Units	92382587004 Result	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	MS Result	MSD Spike Conc.	MSD Result						
Nitrogen, NO2 plus NO3	mg/L	0.013J	2.5	2.1	2.5	2.1	83	83	75-125	1	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2266814 2266815

Parameter	Units	30250921003 Result	MS		MSD		MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	MS Result	MSD Spike Conc.	MSD Result						
Nitrogen, NO2 plus NO3	mg/L	1.1	2.5	3.2	2.5	3.1	81	80	75-125	1	10	

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q2 2018
Pace Project No.: 92382647

QC Batch: 408786 Analysis Method: EPA 365.1
QC Batch Method: EPA 365.1 Analysis Description: 365.1 Phosphorus, Total
Associated Lab Samples: 92382647001

METHOD BLANK: 2268031 Matrix: Water
Associated Lab Samples: 92382647001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Phosphorus	mg/L	ND	0.050	05/02/18 13:01	

LABORATORY CONTROL SAMPLE: 2268032

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Phosphorus	mg/L	2.5	2.6	104	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2268033 2268034

Parameter	Units	92382091001 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Phosphorus	mg/L	0.47	2.5	2.5	3.1	3.2	107	108	90-110	1	10	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2268035 2268036

Parameter	Units	92382211002 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Phosphorus	mg/L	ND	2.5	2.5	2.6	2.6	104	102	90-110	2	10	

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QUALITY CONTROL DATA

Project: PRINCE WILLIAM CO Q2 2018
Pace Project No.: 92382647

QC Batch: 408809 Analysis Method: SM 5220D
QC Batch Method: SM 5220D Analysis Description: 5220D COD
Associated Lab Samples: 92382647001

METHOD BLANK: 2268114 Matrix: Water
Associated Lab Samples: 92382647001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chemical Oxygen Demand	mg/L	ND	25.0	05/02/18 20:25	

LABORATORY CONTROL SAMPLE: 2268115

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chemical Oxygen Demand	mg/L	750	766	102	90-110	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2268116 2268117

Parameter	Units	92382364001 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Chemical Oxygen Demand	mg/L	1700	100	100	1760	1750	64	56	90-110	0	3	M1

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2268120 2268121

Parameter	Units	92382349005 Result	MS	MSD	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
			Spike Conc.	Spike Conc.								
Chemical Oxygen Demand	mg/L	102	100	100	201	213	99	111	90-110	6	3	M1,R1

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QUALIFIERS

Project: PRINCE WILLIAM CO Q2 2018

Pace Project No.: 92382647

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

LABORATORIES

PASI-A Pace Analytical Services - Asheville

ANALYTE QUALIFIERS

D6 The precision between the sample and sample duplicate exceeded laboratory control limits.

H3 Sample was received or analysis requested beyond the recognized method holding time.

H6 Analysis initiated outside of the 15 minute EPA required holding time.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.

R1 RPD value was outside control limits.

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: PRINCE WILLIAM CO Q2 2018
Pace Project No.: 92382647

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92382647001	MAN 042518	EPA 200.7	408340	EPA 200.7	408374
92382647001	MAN 042518	SM 2540D	408797		
92382647001	MAN 042518	EPA 9040	408354		
92382647001	MAN 042518	EPA 350.1 1993 Rev 2.0	408477		
92382647001	MAN 042518	EPA 351.2	408557		
92382647001	MAN 042518	EPA 353.2	408531		
92382647001	MAN 042518	EPA 365.1	408786		
92382647001	MAN 042518	SM 5220D	408809		

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9800 Kincey Ave., Suite 100
 Huntersville, NC 28078
 (704)875-9092

SAMPLE ACKNOWLEDGMENT

Samples Submitted By: Amec Foster Wheeler, Va
Client Project ID: PRINCE WILLIAM CO Q2 2018
Client PO#:

Pace Project Manager: Taylor Ezell
 Phone (704)875-9092
 taylor.ezell@pacelabs.com

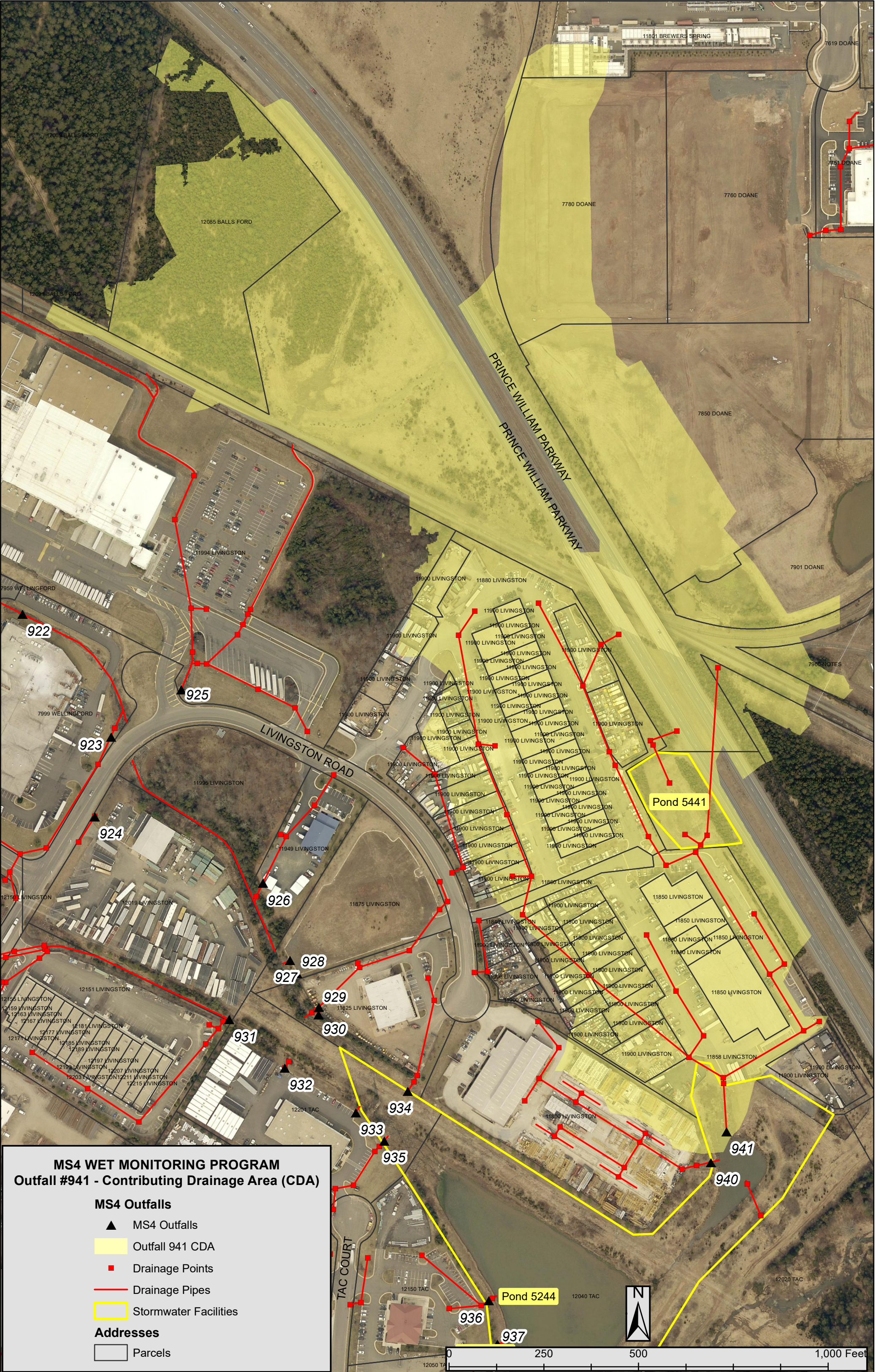
Pace Analytical Project ID: 92382647
Samples Received: April 27, 2018 12:58 PM
Estimated Completion: May 04, 2018

CC: Benjamin Green, Jen Furey

Customer Sample ID	Pace Analytical Lab ID	Matrix	Date/Time Collected	Method
MAN 042518	92382647001	Water	04/24/18 22:30	200.7 ICP Metals Copper, Lead, Nickel, Zinc 2540D Total Suspended Solids 350.1 Ammonia 351.2 Total Kjeldahl Nitrogen 353.2 Nitrogen, NO2/NO3 365.1 Phosphorus, Total 5220D COD 9040 pH

Please contact your project manager if you recognize any discrepancy in this form or have any questions about your project.

Thank you for choosing Pace Analytical Services, LLC.



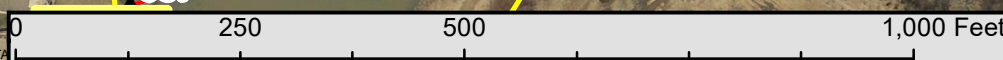
MS4 WET MONITORING PROGRAM
Outfall #941 - Contributing Drainage Area (CDA)

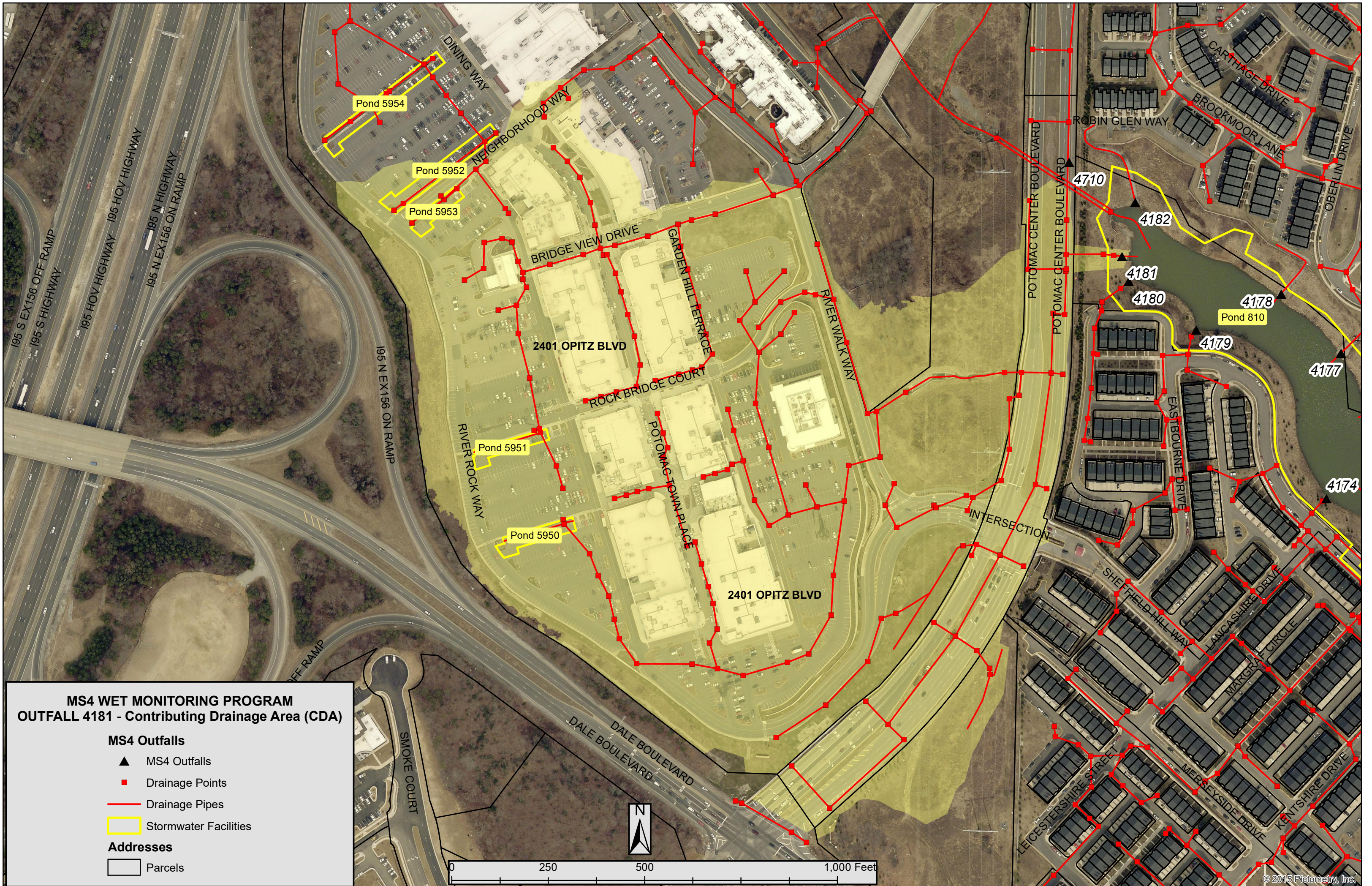
MS4 Outfalls

- ▲ MS4 Outfalls
- Outfall 941 CDA
- Drainage Points
- Drainage Pipes
- ▭ Stormwater Facilities

Addresses

- ▭ Parcels





**MS4 WET MONITORING PROGRAM
OUTFALL 4181 - Contributing Drainage Area (CDA)**

MS4 Outfalls

- ▲ MS4 Outfalls
- Drainage Points
- Drainage Pipes
- ▭ Stormwater Facilities

Addresses

- ▭ Parcels

0 250 500 1,000 Feet

Appendix M – Infrastructure Coordination

VDOT & PWC Infrastructure - Annual Coordination Meeting
July 26, 2018 - From 9:30 – 11:30AM
Room 107 A & B –Development Services Bldg-5 County Complex Court

Agenda

1. Introductions
2. Discussion on MS-4 Service Area Mapping Updates/Status
3. VDOT Program Plan Update
4. MS4 Interconnectivity
5. Illicit Discharge Detection & Elimination
6. Chesapeake Bay TMDL Action Plans
7. Other TMDL Action Plans
8. Credit for TMDL Implementation
9. VDOT web application demonstration.
10. Discuss salt/sand application for de-icing purposes.
11. Discuss possibility of installing signage in VDOT ROW.
12. Future joint meetings.

Appendix 1 – Biological Stream Monitoring

Biometric Macroinvertebrate Population and Water Quality Monitoring Report

Ball Lake and Spring Lake

Prepared for:



Prince William County Department of Public Works
County Board of Supervisors
Prince William, Virginia

Prepared by
Wood Environmental Infrastructure Solutions Inc.
10000 Madox Road, Suite 1000
Falls Church, Virginia
703.261.1000

Submitted for
Project 000000000000

Background

Background

The purpose of this report is to provide information on the abundance of benthic macroinvertebrates in the Potomac River and its tributaries. The data were collected as part of the Water Quality Monitoring Program (WQMP) in Prince William County, Virginia. The WQMP is a long-term monitoring program that provides information on the health of the Potomac River and its tributaries. The data are used to assess the quality of the water and to identify areas where there may be a need for further investigation or remediation. The data are also used to track changes in the abundance of benthic macroinvertebrates over time and to compare the results to other monitoring programs in the region. The data are presented in this report in the form of tables and graphs. The tables provide the raw data and the graphs provide a visual representation of the data. The data are presented for each of the following locations: Branch Saugling Location, Little Bull Run Saugling Location, and the Potomac River. The data are presented for both the fall and spring sampling events. The data are presented in the following order: Branch Saugling Location, Little Bull Run Saugling Location, and the Potomac River. The data are presented for each of the following parameters: Abundance, Diversity, and Richness. The data are presented in the following order: Abundance, Diversity, and Richness. The data are presented in the following order: Abundance, Diversity, and Richness.

Background

- Table 1: All field condition and parameter results
- Table 2: Spring field condition and parameter results
- Table 3: All water quality results
- Table 4: Spring water quality results
- Table 5: All Benthic Macroinvertebrate Results
- Table 6: Spring Benthic Macroinvertebrate Results
- Table 7: Attachment and Benthic Invertebrate Community Structure

Background

- Figure 1: Branch Saugling Location Map
- Figure 2: Little Bull Run Saugling Location Map
- Figure 3: Potomac River Saugling Location Map
- Figure 4: Branch Saugling Location Map

Background

- Table 8: Site Data Summary
- Table 9: Water Quality Laboratory Results
- Table 10: Benthic Macroinvertebrate Laboratory Results

S

Food

B

E. coli

g

Sc

Milligram

MS

M

RB

Sampling plan

S

SS

S

S

SM

Food Invertebrate Infrastructure Solution Inc

Biotic Index

Gravel

Water Act

Colony

Escherichia coli

Proteobacteria

Water

Milligram liter

Microbiology

Most Probable Number of Coliforms per Milliliter

Water Second

Municipal Sewerage System

Chloride

Current Mod

Standard Rapid Bioassay Protocol

Water Sampling Plan for Benthic Macroinvertebrate

Population and Water Quality Monitoring

Standard

Total Dissolved Nitrogen

Total Suspended Solids

National Sanitation Foundation

Virginia Department of Environmental Quality

Virginia Stream Condition Index

Virginia Stream Management Program

1.1 METHODS

Sampling collection occurred from October to November and from May to June in accordance with the Sampling Plan for the Benthic Macroinvertebrate and Turbidity Data Collection by Food Corridor from the location in Prince William County, Virginia: Branch 1, Branch 2, Bull Run, Branch 3, and Branch 4. Figure 1 shows the field area for the typical characterization water quality field data SPM and habitat assessment. Field data SPM or light radiant streamer data were collected in the Rapid Bioassessment Protocol (RB) Barbour et al. (1999) method. In situ water quality data were collected using a SPM water quality meter for dissolved oxygen, conductivity, and temperature. Turbidity was measured using a Mott turbidity meter in the field. Turbidity units are NTU.

Water temperature, depth, and transparency were measured at a SPM site. Water temperature was measured in the stream at a velocity area. Water temperature was measured at a Marsh, McBriney, or Mat current meter in the stream. Conductivity and depth were also taken for each site. Water samples were collected for ammonia, *Escherichia coli* (*E. coli*), nitrate, nitrite, ortho-phosphate, total ammonia nitrogen, total nitrogen, total phosphorus, and total suspended solids (TSS) analysis.

Benthic Macroinvertebrate Sampling was conducted in accordance with the Sampling Plan for the Multi-Habitat Sampling Method for each of the sites. The method consists of a total of 100 samples for each of the habitat types in the reach. Benthic Macroinvertebrate samples were placed on ice in coolers and shipped overnight to the Benthic Macroinvertebrate Laboratory in Gainesville, Florida. The laboratory sorted, counted, identified, enumerated, evaluated, and classified benthic Macroinvertebrates according to Section 1 of the RB Barbour et al. (1999) method. Metrics were calculated including the Benthic Index of Biotic Integrity (B-IBI), Percent Modified Benthic Macroinvertebrates, and Benthic Macroinvertebrate Condition Index (B-MCI). Sampling guidance for the stream and the results are provided in the Appendix.

It should be noted that B-IBI and SPM are not various ways to assess stream condition. As a result, core categories will not always agree among a given site. B-IBI at the overall tolerance of the community in a given area is affected by the relative abundance of each taxonomic group (e.g., family), and the group's predetermined tolerance level. PMA is an index of percent taxonomic similarity used to measure the affinity of various metrics to a specific taxonomic group. The taxonomic relationship to that of the selected odd community. SPM is an index designed specifically for stream and all rivers in Virginia. The index utilizes eight scoring metrics to compare monitoring sites to the metric of a designated reference condition.

1.0 SUMMARY

Sampling was conducted from October to November and from May to June in accordance with the Sampling Plan and In Situ Variability in the following section.

1.1 Field Condition and Parameter Results

Measuring physical habitat quality is an integral component of the final evaluation of the reach. The RBQ is attributed to a physical habitat quality index based on physical habitat characteristics of the waterbody and surrounding land, particularly the catchment of the site under investigation. The habitat parameters evaluated are related to overall aquatic life use and are a potential source of limitation to the aquatic biota. The scoring of each characteristic included a tag of the site data point in the index score total and the resulting condition category are defined in Table 1 for the fall and spring monitoring events. The RBQ defines the following condition categories based on the physical habitat characterization score in an effort to determine the ability of the habitat to support an optimal biological community.

Optimal	Physical habitat present to meet natural succession and is capable of supporting an optimal benthic community.
Suboptimal	Physical habitat is less than desirable but still supports succession under most circumstances to support a benthic community.
Marginal	Physical habitat is moderately degraded with a capacity at frequent intervals throughout the reach to meet the capability of supporting a benthic community.
Poor	Physical habitat is often substantially altered with degraded degradation to characteristics that could support a benthic community.

Water quality is also an integral component of the evaluation and the ability of a reach to support biological communities. Surface waters should meet Virginia's Water Quality Standard as outlined in Section 1.1.1 of the standard report. It is not to be exceeded for a general comparison of the following full suite of variability conditions for the reach.

- The range of the standard unit (Secchi optical or soft organic matter) is outside the range of the diversity in the reach because it restricts the biological cycle of soft organic matter and can reduce reproduction.
- The total water conductivity in the range of the microinvertebrate for the Secchi conductivity of the reach is generally ranging from 1 to 2 Secchi units. The conductivity of the reach is generally ranging from 1 to 2 Secchi units. The conductivity of the reach is generally ranging from 1 to 2 Secchi units.

- Water temperature affects breeding reproduction and metabolic rates of aquatic animals and for the oxygen that water may have a trace amount of oxygen for an aquatic organism that is a usual temperature of non-tidal fresh water could not be used to determine the quality of water.
- It is an important factor of water quality. A aquatic organism needs to live in the water. It is greatly affected by the characteristics of the water and the amount of initial amount of oxygen. It is generally required to maintain healthy growth and activity.
- Turbidity is a factor of water clarity and the Virginia Water Quality Standard do not include a guideline for turbidity. A general guideline for water to appear cloudy is that the turbidity is greater than 1000.

3.1.1 Fall 2017

RB's typical habitat abundance and condition ranged from good in Branch to fair in Branch. The condition indicated that our otter habitat had a sub-optimal habitat for supporting benthic community. In Branch and Branch, the habitat was marginal for supporting a benthic community.

The otter in the typical water quality characteristics of the otter habitat. The typical water quality conditions described a sub-optimal condition of turbidity at our Branch. The otter habitat is no standard for turbidity.

Table of all field condition and parameter results

Parameter	Unit	Branch	Branch	Little Bull Run	Branch	Branch
RB's habitat abundance and condition	Score					
RB's habitat condition category		Sub-optimal	Sub-optimal	Marginal	Sub-optimal	Marginal
Temperature	°C					
Conductivity	µS/cm					
Dissolved Oxygen	mg/L					
Turbidity	NTU					
Water pH						
Secchi depth						
Reaction time						
Reaction time						
Surface velocity	ft/min					

Abbreviations:

- = not applicable
- °C = degrees Celsius
- mg/L = milligrams per liter

Prepared by: BTG 08/14/18
 Checked by: JPM 08/21/18

3.1.2 Spring 2018

Biological Macroinvertebrate Abundance Monitoring Program (BAM) data for the Spring 2018 monitoring period at the Bull Run Watershed. The data indicates that the water quality is generally good, with most parameters meeting or exceeding the standards set by the Virginia Department of Environmental Quality (VDHEQ).

The water quality conditions were generally good, with most parameters meeting or exceeding the standards set by the Virginia Department of Environmental Quality (VDHEQ). The water quality was generally good, with most parameters meeting or exceeding the standards set by the Virginia Department of Environmental Quality (VDHEQ).

Water Quality Parameter Condition and Parameter Results

Parameter	Unit	Observed	Standard	Quality	Observed	Standard	Quality
BAM Abundance Score		100	100	Good	100	100	Good
BAM Condition Category		100	Marginal	Suboptimal	100	Suboptimal	Suboptimal
Physical Parameters							
Conductivity	µS/cm	100	100	Good	100	100	Good
Dissolved Oxygen	%	100	100	Good	100	100	Good
pH		100	100	Good	100	100	Good
Turbidity	NTU	100	100	Good	100	100	Good
Chemical Parameters							
Ammonia	mg/L	0	0	Good	0	0	Good
Sulfate	mg/L	0	0	Good	0	0	Good
Total Hardness	mg/L	0	0	Good	0	0	Good
Total Phosphate	mg/L	0	0	Good	0	0	Good
Total Nitrate	mg/L	0	0	Good	0	0	Good

Abbreviations:

- NA = not available, value was not recorded
- = not applicable
- °C = degrees Celsius
- mg/L = milligrams per liter

Prepared by: BTG 08/14/18

Checked by: JPM 08/21/18

Water Quality Laboratory Results

The laboratory analytical results are provided in Appendix B mentioned in the previous section. Water quality is an integral component of stream evaluation and the ability of a stream to support biological communities. Surface waters should meet Virginia's Water Quality Standard as outlined in Section 2.2.2 of the Virginia Department of Environmental Quality (VDHEQ) standard for stream water quality. It is not to be exceeded for a general comparison of the following quality parameters for stream water.

- Ammonia is toxic to fish and other types of aquatic life. Ammonia's toxicity depends on water temperature and the amount of ammonia. The general water quality standard is 0.5 mg/L.

Fall 2018 Abundance and Water Quality Results

Parameter	Unit	North Branch	South Branch	Little Bull Run	Stafford	Surry Branch
Conductivity	µg/L	<	<	<	<	<
<i>E. coli</i>	MPN/100 mL	<	<	<	<	<
Dissolved Oxygen	mg/L	<	<	<	<	<
Total Dissolved Solids	mg/L	<	<	<	<	<
Total Suspended Solids	mg/L	<	<	<	<	<

Abbreviations:

< = not detected at the associated reporting limit
 mg/L = milligrams per liter
bold indicates a result exceeding the VA water quality standards

Prepared by: BTG 08/14/18

Checked by: JPM 08/21/18

Laboratory analytical report for fall 2018 sampling is provided in Appendix B.

3.2.2 Spring 2018

Conductivity in fall 2018 water quality results for the four sites is not typical water quality conditions described above. It is noted that detection of *E. coli* at Little Bull Run indicates a result of MPN/100 mL in excess of the Virginia Water Quality Standard of MPN/100 mL. *E. coli* is typically associated with animal waste.

Fall 2019 Abundance and Water Quality Results

Parameter	Unit	North Branch	South Branch	Little Bull Run	Stafford	Surry Branch
Conductivity	µg/L	<	<	<	<	<
<i>E. coli</i>	MPN/100 mL	<	<	<	<	<
Dissolved Oxygen	mg/L	<	<	<	<	<
Total Dissolved Solids	mg/L	<	<	<	<	<
Total Suspended Solids	mg/L	<	<	<	<	<

Abbreviations:

< = not detected at the associated reporting limit
 mg/L = milligrams per liter
bold indicates a result exceeding the VA water quality standards

Prepared by: BTG 08/14/18

Checked by: JPM 08/21/18

Laboratory analytical report for fall 2019 sampling is provided in Appendix B.

Benthic Macroinvertebrate Abundance

Terms such as “tolerant” and “intolerant” taxa are used to describe benthic communities in this document without the negative or pejorative connotation of such language. Tolerant taxa are benthic organisms adapted to survive in a broad range of environmental conditions.

Intolerant taxa are adapted to a narrower limited range of environmental conditions. The term “impairment” has a negative connotation with its lay usage; in this document, the term is used to describe the natural condition of a benthic community. The scientific “impairment” condition are classified into four categories:

- Good** Similar to the reference condition of a benthic community in good quality.
- Slight** Sustaining a diverse and abundant benthic community with a few intolerant taxa and good quality.
- Moderate** Not having a highly diverse and abundant community but having taxa present in general or group generally a few intolerant taxa and on taxa being dominant community taxa in fact.
- Severe** Only a few benthic invertebrate taxa are present all tolerant taxa are diversity and often on taxa are very abundant but benthic community taxa are rarely in fact.

Good’s laboratory sorted and identified the organisms in the benthic macroinvertebrate samples and provided report dated October 2017 and August 2018 for the fall 2017 and the spring 2018 sampling respectively. Appendix B provides results of the sampling are provided in the table and photo and map are provided in this section.

3.3.1 Fall 2017

Total of 10 taxa were identified from the fall sampling along the river. The taxonomic range from 1 to 10 taxa and abundance ranged from 1 to 10. The metric indicated no impairment.

The taxa ranged from 1 to 10 along the river. The metric indicated a fair quality condition at the in Branch. The metric indicated a good or excellent condition across the river.

The percent of taxa ranged from 10 to 100. The metric indicated a fair quality condition across the river. The metric indicated a fair quality condition across the river.

The percent of iron oxide was found to be a fair condition at the in Branch. It is good and excellent. The metric indicated a fair quality condition at the river. The metric indicated a fair quality condition across the river.

The BBI ranged from 10 to 100 for the river. The metric indicated a fair quality condition for the river. The metric indicated a fair quality condition for the river.

Results for the corresponding PMA Category scores of “moderately impacted” for Little Bull Run, “slightly impacted” for Dawkins Branch, Neabsco Creek, and Purcell Branch, and “non-impacted” for Little Bull Run.

Results for the calculation of the VSCI for the individual water quality metrics ranged from excellent for Little Bull Run to fair for Purcell Branch.

Table 1. Summary of Benthic Macroinvertebrate Metrics

Metric	Little Bull Run	Dawkins Branch	Neabsco Creek	Purcell Branch	Little Bull Run
Biotic Index	4	4	4	4	4
Abundance	4	4	4	4	4
Percent Invertebrates	4	4	4	4	4
Percent Ironoregion	4	4	4	4	4
Percent Invertebrates	4	4	4	4	4
Percent Ironoregion	4	4	4	4	4
Biotic Index	4	4	4	4	4
Biotic Category	Fair	Fair	Fair	Fair	Good
VSCI	4	4	4	4	4
VSCI Category	Moderately Impacted	Slightly Impacted	Good	Slightly Impacted	Slightly Impacted
VSCI	4	4	4	4	4
VSCI Category	Strong	Strong	Good	Strong	Good

Abbreviations:

- BI = Biotic Index
- EPT = Ephemeroptera, Plecoptera, and Tricoptera
- PMA = percent model affinity
- VSCI = Virginia Stream Condition Index

Prepared by: BTG 08/15/18
 Checked by: JPM 08/21/18

3.3.2 Spring 2018

Total macroinvertebrate identified for the spring water quality monitoring ranged from excellent abundance ranged from good to excellent metric indicated no impairment for the water quality.

Macroinvertebrate ranged from good to excellent metric indicated excellent stream quality condition at Purcell Branch, fair condition at Neabsco Creek and Little Bull Run, and moderately impaired at Dawkins Branch and Little Bull Run.

Percent invertebrates to macroinvertebrate ranged from excellent to excellent percent invertebrates to excellent indicating good or excellent stream quality condition across all metrics.

Percent ironoregion macroinvertebrates showed improved stream quality condition at Little Bull Run, fair condition at Little Bull Run and Purcell Branch, but excellent condition at the remaining metrics.

Biological scores for the 100-catch macroinvertebrate method were determined according to the following criteria:

“Good” for Little Bull Run, “fair” for Little Bull Run and Wolf Branch and “fairly poor” for Wolf Branch and Wolf Branch. Moderate cores of “moderately impacted” for the 100-catch method were determined for the 100-catch method for Little Bull Run and Wolf Branch as “moderately impacted”.

Results for the calculation of the Stream Individual Assessment Index (SII) for Little Bull Run corresponds to “stress” stream quality conditions under the Stream Assessment Index (SAI) for Wolf Branch did indicate a “stress” stream quality condition.

Table 1. Spring 2018 Benthic Macroinvertebrate Results

Metric	Wolf Branch	Little Bull Run	Wolf Branch	Wolf Branch	Wolf Branch
Biotic Index	100	100	100	100	100
Abundance	100	100	100	100	100
Number of Species	1	1	1	1	1
Percent Model Affinity (PMA)	100	100	100	100	100
Percent Model Affinity (PMA)	100	100	100	100	100
BI	100	100	100	100	100
BI Category	Fair	Fairly Poor	Fair	Fairly Poor	Good
MI	100	100	100	100	100
MI Category	Moderately Impacted	Moderately Impacted	Slightly Impacted	Moderately Impacted	Moderately Impacted
SSI	100	100	100	100	100
SSI Category	Stress	Stress	Stress	Stress	Stress

Abbreviations:

- BI = Biotic Index
- EPT = Ephemeroptera, Plecoptera, and Tricoptera
- PMA = percent model affinity
- VSCI = Virginia Stream Condition Index

Prepared by: BTG 08/15/18
 Checked by: JPM 08/21/18

Comparison to Basin Results

In the 100-catch method and laboratory water quality parameters, all and spring data are generally comparable to all and spring basin data. Results for the 100-catch method, are within the normal ranges, and are below Virginia’s Water Quality Standard. The 100-catch method for *E. coli* results are within the normal ranges and are below Virginia’s Water Quality Standard. The 100-catch method for *E. coli* results are within the normal ranges and are below Virginia’s Water Quality Standard.

Water quality and benthic community results along the upper reaches of the river in the
Rapidly changing conditions indicated water at the Branch and Curcul Branch
remained relatively unchanged throughout the season in condition category scores similar to
the line site in the category scores. The water at Little Bull Run and the two other sites
showed a gradual decline throughout the season with greater seasonal variability. It appeared to
return to a line condition generally throughout the seasonal or marginal or supporting
benthic invertebrate community.

The BI category is variable among events between "Fair" and "Good" for all of the sites, with
the exception of the spring site at the Branch and spring site at the line Branch
and the two other sites, which resulted in a "Fairly Poor" category score.

Table 1: Benthic Macroinvertebrate Abundance and Water Quality Monitoring Report Summary

Parameter	Event	Flow Branch	Area in Branch	Little Bull Run	Area Code	Current Branch
RB Abundance Score	Baseline Spring	0	0	0	0	0
	Baseline Fall	0	0	0	0	0
	Spring	0	0	0	0	0
	Fall	0	0	0	0	0
	Spring	0	0	0	0	0
RB Abundance Category	Baseline Spring	Marginal	Sufficient	Sufficient	Sufficient	Sufficient
	Baseline Fall	Sufficient	Sufficient	Sufficient	Sufficient	Marginal
	Spring	Marginal	Sufficient	Marginal	Sufficient	Sufficient
	Fall	Sufficient	Sufficient	Marginal	Sufficient	Marginal
	Spring	Marginal	Sufficient	Sufficient	Sufficient	Sufficient
B Category	Baseline Spring	Fair	Fair	Good	Good	Good
	Baseline Fall	Good	Fair	Fair	Fair	Fair
	Spring	Fairly Poor	Good	Fair	Fair	Good
	Fall	Fair	Fair	Fair	Fair	Good
	Spring	Fair	Fairly Poor	Fair	Fairly Poor	Good
M Category	Baseline Spring	Severely Impacted	Moderately Impacted	Moderately Impacted	Severely Impacted	Moderately Impacted
	Baseline Fall	Slightly Impacted	Moderately Impacted	Moderately Impacted	Slightly Impacted	Slightly Impacted
	Spring	Moderately Impacted	Slightly Impacted	Moderately Impacted	Moderately Impacted	Moderately Impacted
	Fall	Moderately Impacted	Slightly Impacted	Non-Impacted	Slightly Impacted	Slightly Impacted
	Spring	Moderately Impacted	Moderately Impacted	Slightly Impacted	Moderately Impacted	Moderately Impacted
S Score	Baseline Spring	0	0	0	0	0
	Baseline Fall	0	0	0	0	0
	Spring	0	0	0	0	0
	Fall	0	0	0	0	0
	Spring	0	0	0	0	0
S Category	Baseline Spring	Severe Strain	Severe Strain	Severe Strain	Severe Strain	Strain
	Baseline Fall	Severe Strain	Strain	Strain	Severe Strain	Strain
	Spring	Severe Strain	Severe Strain	Severe Strain	Strain	Severe Strain
	Fall	Severe Strain	Strain	Good	Strain	Good
	Spring	Severe Strain	Strain	Strain	Strain	Strain

Prepared by: BTG 08/15/18

The M category was originally impacted for baseline sampling. The remaining Little and Current
 during a long event in the baseline during a cold variable out as "Moderately
 Impacted" or "Slightly Impacted". All other during at Little Bull Run during a cold out to the
 trend, as it scored as "Non-Impacted".

Stressor characteristics of Little Bull Run and Purcell Branch scoring category has remained as “Stress” or “Severe Stress”.

Summary

Following collection of a variety of fall and spring data and corresponding monitoring and comparison results, the following monitoring conducted in Prince William County also provided conclusions for the current reporting period that could not be attributed to biological changes associated with seasonality or to changes in the spring and transitional life stages of macroinvertebrates during and between monitoring that may account for benthic community dynamics.

Summary

4.1.1 Fall 2017

Measured field and laboratory water quality parameters are generally within the normal range for allolobos coolwater biota in Virginia streams and generally meet Virginia’s Water Quality Standard as outlined in Section 4.1.1.1 of the Virginia Water Quality Standard. The only exception was the detection of *E. coli* at each of the sites and our detection of a total coliform count in the Virginia Water Quality Standard which could be an indication of fecal or animal excretion in addition to the typical habitat assessment and biological evaluation indicated in paired habitat and stream benthic macroinvertebrate community.

RB biological habitat assessment indicated marginal habitat at Little Bull Run and Purcell Branch. The following detection of suboptimal habitat. The “suboptimal” category indicates that the habitat criteria are less than desirable but that the criteria are generally met under most circumstances; the “marginal” category indicates a moderate level of degradation, but generally at frequent intervals throughout the reach that do not generally indicate site’s condition did not change from baseline conditions, except for Little Bull Run which indicated marginal habitat.

Despite Purcell Branch and Little Bull Run receiving “marginal” habitat assessment ratings, evaluation of benthic community indicated no significant impairment to the benthic community at the sites, receiving a rating of “Good” or “suboptimal” the “suboptimal” habitat assessment rating indicated that the stream receiving sites could support satisfactory benthic invertebrate community under most circumstances. The following detection of marginal habitat could be attributed to the detection of fecal or animal excretion in the benthic community. Based on the biological monitoring habitat assessment and benthic community evaluation indicated in paired habitat at each of the sites, all are only in paired benthic community at the sites in Prince William County.

4.1.2 Spring 2018

Macroinvertebrate and laboratory water quality parameters are generally within normal ranges for allochthonous lotic environments in Virginia streams and generally meet Virginia's Water Quality Standards outlined in Section 4.1.1. *E. coli* levels at Little Bull Run are again above the Virginia water quality standard which could indicate organic or animal matter in addition to typical habitat parameters and biological evaluation indicated impaired habitat and stressed benthic macroinvertebrate community as long as it is

RB biological habitat parameters indicated suboptimal habitat for aquatic insects in Branch Creek at Little Bull Run and Currier Branch in the Branch indicated marginal habitat which is in line with observed conditions during spring sampling conditions.

Though the "suboptimal" habitat assessment rating indicated that our observations could support satisfactory benthic invertebrate community under most circumstances, benthic invertebrate community parameters showed that there was moderate to severe impairment to the extent that at these sites, closer in agreement with the "marginal" category. The results specified that though habitat parameters indicated the possibility of normal benthic community at our sites, the observed benthic community structure was found to be under stress or severely stressed for each of the sites. Based on the biological assessment habitat parameters and benthic community evaluation indicated impaired habitat and impaired benthic macroinvertebrate community at the sites during location in Princetonia County. Though the benthic community assessment is similar to the ongoing river data previously.

Conclusion

Macroinvertebrate and laboratory water quality parameters for the fall and spring sampling results are generally comparable to the spring sampling results which are within normal ranges, and are below Virginia's Water Quality Standards with the exception of *E. coli* results. Elevated *E. coli* results and water quality standard exceedance are consistent to the spring sampling day indicate organic or animal matter in fact to trace elevated *E. coli* results are often associated with storm events. It may explain the variability between

Based on the biological assessment habitat parameters and benthic community evaluation indicated impaired habitat and impaired benthic macroinvertebrate community at the sites during location in Princetonia County. It is generally unexplained for spring sampling over the course of sampling benthic community and habitat parameters evaluation. It indicated a more widely spread and generally higher concentration in the allochthonous or closely grouped and lower concentration in the spring. Seasonal differences in stream conditions are expected during sampling day. It is noted that data collection necessary to indicate

Changes that are occurring long term are all addressing the seasonal changes to the benthic community.

Based on the fall 2019 and spring 2020 sampling results, the conditions do not appear to show significant changes, either positive or negative, from the baseline condition. Based on Virginia's VSCI, the five study sites remain under "Stress" or "Severe Stress". Results from the following year will provide sufficient data to begin determining trends in collected data.

1. Introduction

The purpose of this report is to provide a detailed description of the Benthic Macroinvertebrate and Water Quality Monitoring Program in Prince William County, Virginia.

Barbour, M., Gerritsen, B., Snyder, and B. Striding. Rapid Bioassessment Protocols for Use in Streams and Rivers. American Water Resources Association and the National Sanitation Foundation for the Environment. 1999.

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<http://www.pw.org/portal/quality/BiologicalMonitoring/BioMonitoring>

Virginia's Legislative Information System (LIS). Critical Criteria for the 2019-2020 Session. <http://lisa.virginia.gov/advanced/titles/agency/criteria>

Benthic Macroinvertebrate Population and Water Quality Monitoring Report
Fall 2008 and Spring 2009
Prince William County, Virginia

Sheet 1 of 1

11111S

Figure 1.
Cow Branch Sampling Location
Woodbridge, VA

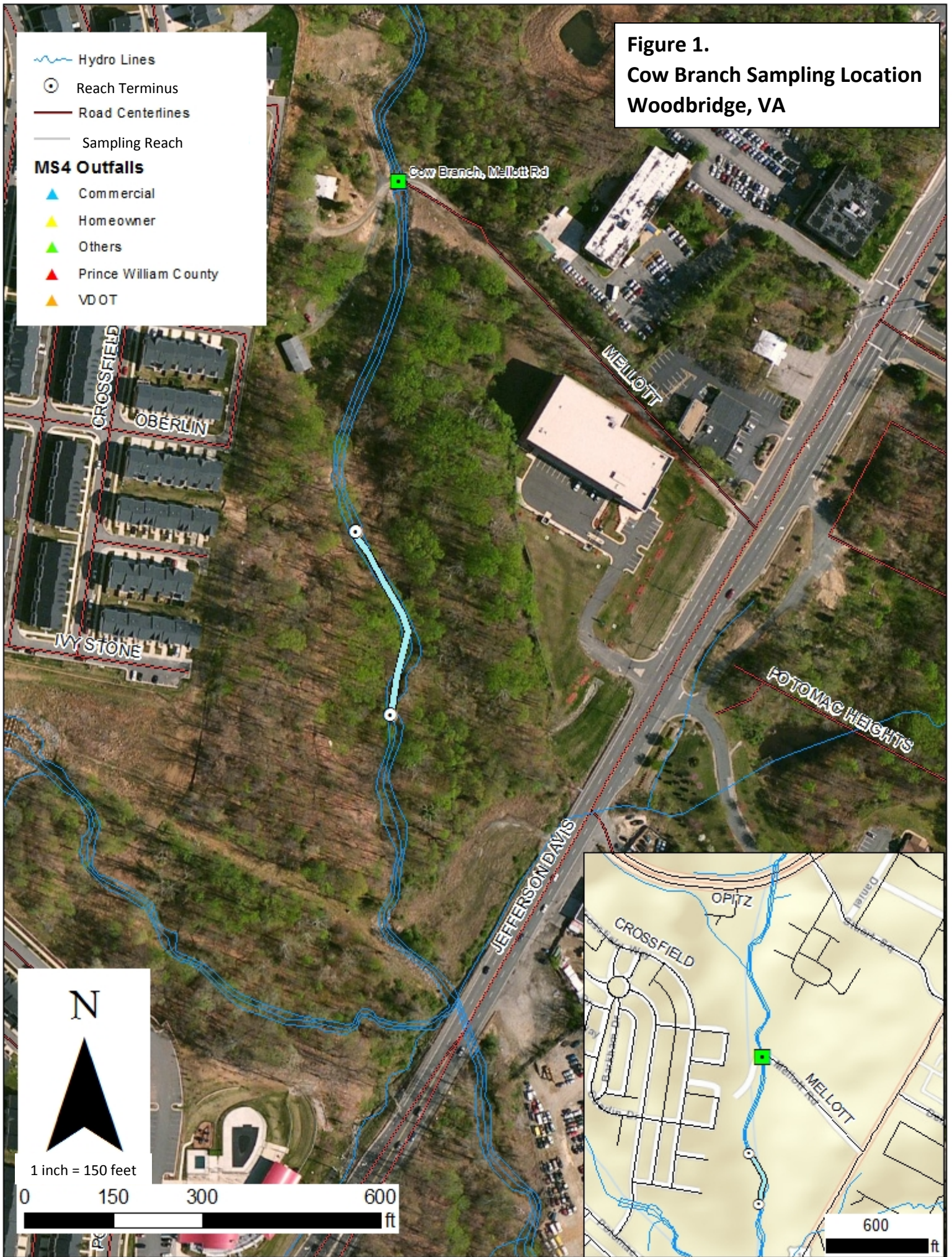


Figure 2.
Dawkins Branch Sampling Location
Manassas, VA

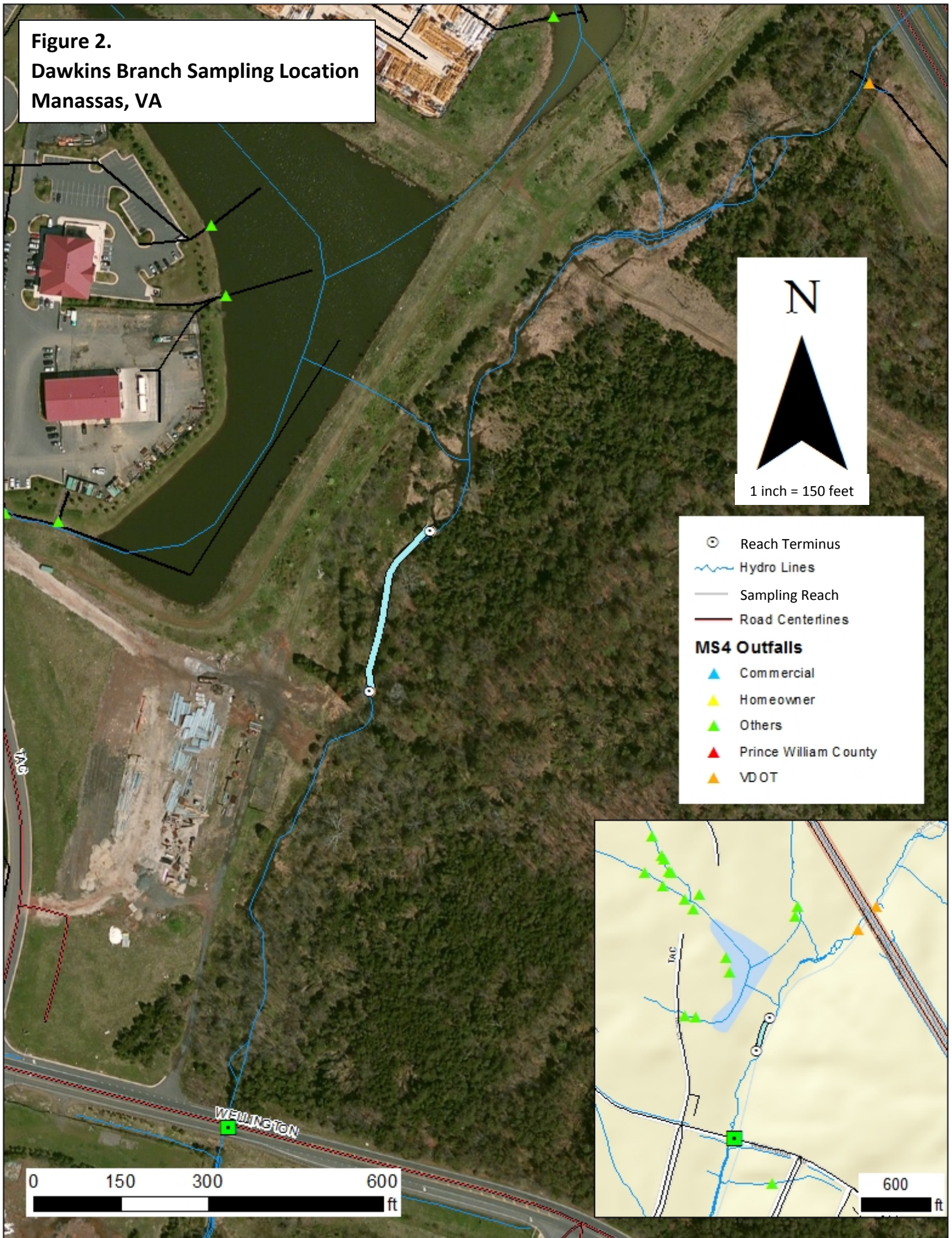


Figure 3.
Little Bull Run Sampling Location
Gainesville, VA

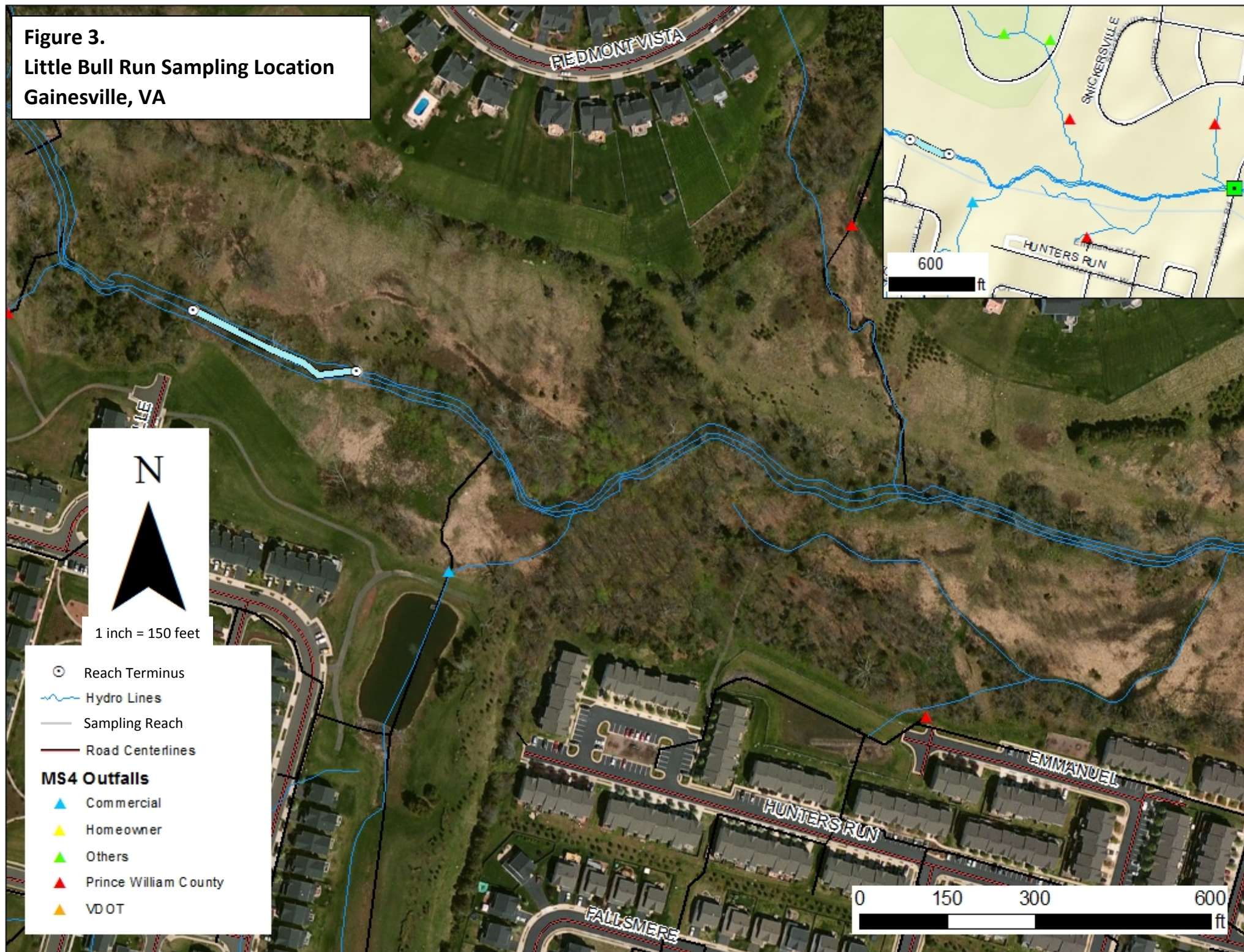


Figure 4.
Neabsco Creek Sampling Location
Dale City, VA

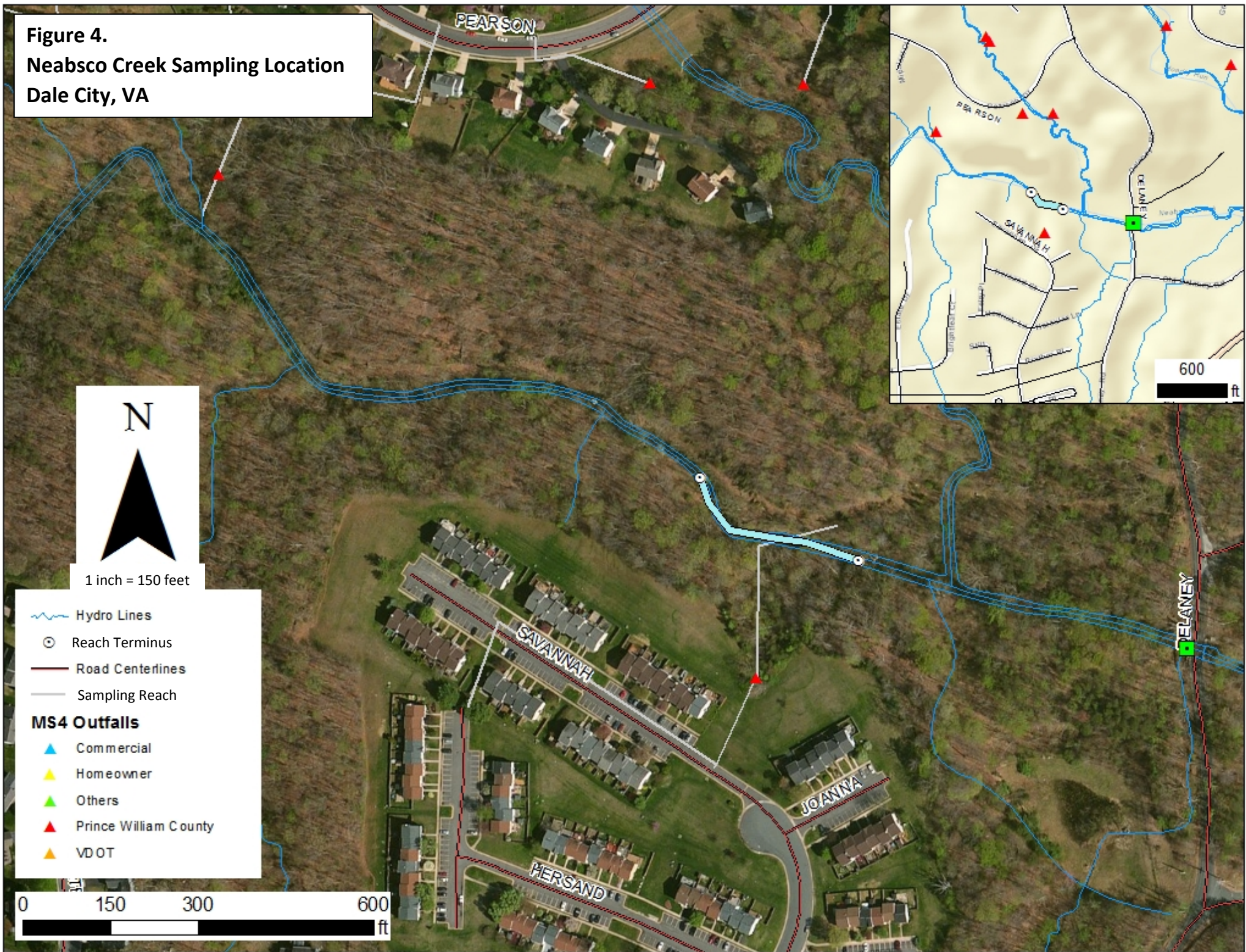
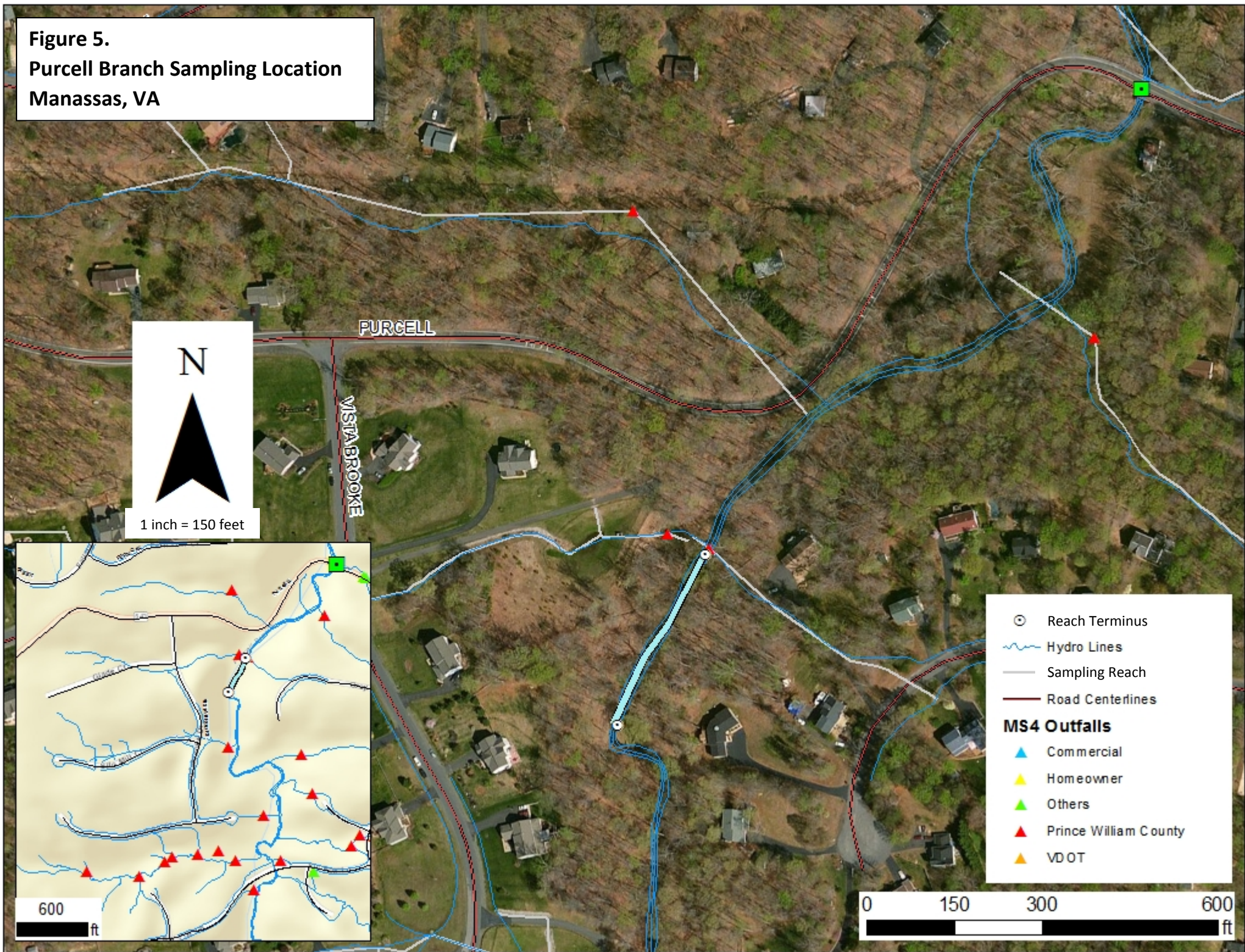


Figure 5.
Purcell Branch Sampling Location
Manassas, VA



Benthic Macroinvertebrate Population and Water Quality Monitoring Report
Fall 2000 and Spring 2001
Prince William County, Virginia

Sheet 1 of 1

XXXXXXXXXX

XXXXXXXXXX

Prince William Biological Monitoring Form



Stream Name	Cow Branch
Location	Woodbridge
River Basin	Occoquan
Investigators	Kristine Mosuela and John Miller
Date	10/10/2017
Time	09:29 AM GMT-04:00
Reason for Survey	Biomonitoring
Weather Conditions	Clear / Sunny

RIPARIAN VEGETATION
(18 meter buffer)

Dominant Type	Grasses
----------------------	---------

INSTREAM FEATURES

Est. Stream Width (m)	3.71
Est. Stream Depth (m)	0.19
Surface Velocity (m/sec at thalweg)	0.26
Canopy Cover	Partly shaded
High Water Mark (m)	1.22
Channelized	<input checked="" type="radio"/> Yes <input type="radio"/> No
Dam Present	<input type="radio"/> Yes <input checked="" type="radio"/> No

Proportion of Reach by Stream Morphology Types

Riffle (%)	60
Run (%)	25
Pool (%)	15

AQUATIC VEGETATION

Dominant Type	Attached Algae
Portion of reach with aquatic veg	15

WATER QUALITY

Temperature	21.71
Specific Conductance	0.22
Dissolved Oxygen	119% (10.46 mg/L)
pH	6.38
Turbidity	2.09
WQ Instrument Used	YSI 650
Water Odors	<input checked="" type="checkbox"/> Normal / None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Water Surface Oils

- Slick
- Sheen
- Globbs
- Flecks
- None
- Other

Inorganic Substrate Components

(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		0.0
Boulder	>256 mm (10")	10.0
Cobble	64 - 256 mm (2.5" - 10")	40.0
Gravel	2 - 64 mm (0.1" - 2.5")	30.0
Sand	0.06 - 2 mm (gritty)	15.0
Silt	0.004 - 0.06 mm	5.0
Clay	< 0.004 mm (slick)	0.0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	11
Embeddedness	6
Velocity / Depth Regime	10
Sediment Deposition	9
Channel Flow Status	11

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category
Channel Alteration	2
Frequency of Riffles (or Bends)	13
Bank Stability (LEFT BANK)	8
Bank Stability (RIGHT BANK)	8
Vegetative Protection (LEFT BANK)	3
Vegetative Protection (RIGHT BANK)	3
Riparian Vegetative Zone Width (LEFT BANK)	7
Riparian Vegetative Zone Width (RIGHT BANK)	10

Field Photography

Image 1

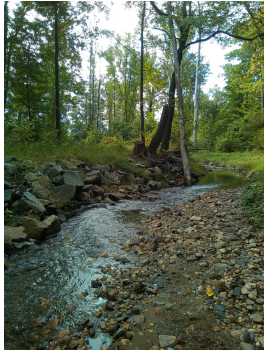
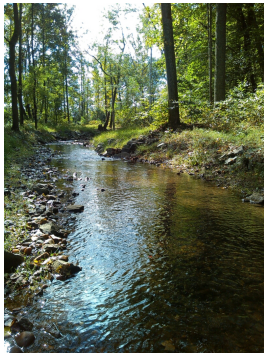


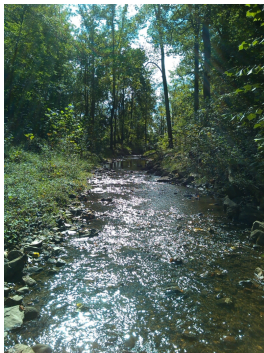
Image 2



Caption for Image 2

P

Image 3



Report completed by:

Kristine Mosuela

Signature

A handwritten signature in black ink, appearing to be 'KM', is centered within a white rectangular box. The signature is stylized and fluid.

Signature Date/Time

10/10/2017 11:32 AM GMT-04:00

Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Prince William Biological Monitoring Form



Stream Name	Dawkins Branch
Location	Manassas
River Basin	Bull Run
Investigators	Kristine Mosuela and John Miller
Date	10/06/2017
Time	11:36 AM GMT-04:00
Reason for Survey	Biomonitoring
Weather Conditions	Clear / Sunny

RIPARIAN VEGETATION
(18 meter buffer)

Dominant Type	Shrubs
----------------------	--------

INSTREAM FEATURES

Est. Stream Width (m)	4.04
Est. Stream Depth (m)	0.1
Surface Velocity (m/sec at thalweg)	0.05
Canopy Cover	
High Water Mark (m)	1.07
Channelized	<input type="radio"/> Yes <input checked="" type="radio"/> No
Dam Present	<input checked="" type="radio"/> Yes <input type="radio"/> No

Proportion of Reach by Stream Morphology Types

Riffle (%)	40
Run (%)	30
Pool (%)	30

AQUATIC VEGETATION

Dominant Type	Rooted emergent
Portion of reach with aquatic veg	40

WATER QUALITY

Temperature	20.72
Specific Conductance	0.072
Dissolved Oxygen	67% (6 mg/L)
pH	7.41
Turbidity	3.72
WQ Instrument Used	YSI 650 MDS
Water Odors	<input checked="" type="checkbox"/> Normal / None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Water Surface Oils

- Slick
- Sheen
- Globbs
- Flecks
- None
- Other

Inorganic Substrate Components
(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		0.0
Boulder	>256 mm (10")	5.0
Cobble	64 - 256 mm (2.5" - 10")	50.0
Gravel	2 - 64 mm (0.1" - 2.5")	30.0
Sand	0.06 - 2 mm (gritty)	0.0
Silt	0.004 - 0.06 mm	0.0
Clay	< 0.004 mm (slick)	15.0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	13
Embeddedness	9
Velocity / Depth Regime	9
Sediment Deposition	7
Channel Flow Status	10

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category
Channel Alteration	13
Frequency of Riffles (or Bends)	10
Bank Stability (LEFT BANK)	7
Bank Stability (RIGHT BANK)	5
Vegetative Protection (LEFT BANK)	8
Vegetative Protection (RIGHT BANK)	7
Riparian Vegetative Zone Width (LEFT BANK)	9
Riparian Vegetative Zone Width (RIGHT BANK)	9

Field Photography

Image 1



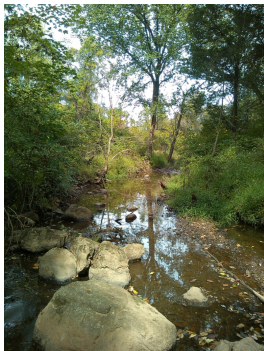
Image 2



Image 3



Image 4



Report completed by:

John Miller

Signature

A handwritten signature in black ink, appearing to read "John Miller", is centered within a white rectangular box.

Signature Date/Time

10/06/2017 04:06 PM GMT-04:00

Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Prince William Biological Monitoring Form



Stream Name	Little Bull Run
Location	Gainesville
River Basin	Bull Run
Investigators	Kristine Mosuela and John Miller
Date	10/06/2017
Time	10:11 AM GMT-04:00
Reason for Survey	Biomonitoring
Weather Conditions	Clear / Sunny

RIPARIAN VEGETATION
(18 meter buffer)

Dominant Type	Shrubs
----------------------	--------

INSTREAM FEATURES

Est. Stream Width (m)	4.9
Est. Stream Depth (m)	0.12
Surface Velocity (m/sec at thalweg)	0.12
Canopy Cover	Partly shaded
High Water Mark (m)	2.44
Channelized	<input type="radio"/> Yes <input checked="" type="radio"/> No
Dam Present	<input type="radio"/> Yes <input checked="" type="radio"/> No

Proportion of Reach by Stream Morphology Types

Riffle (%)	30
Run (%)	40
Pool (%)	30

AQUATIC VEGETATION

Dominant Type	Attached Algae
Portion of reach with aquatic veg	95

WATER QUALITY

Temperature	16.43
Specific Conductance	0.592
Dissolved Oxygen	85.2% (8.32 mg/L)
pH	7.48
Turbidity	0.8
WQ Instrument Used	YSI 650
Water Odors	<input checked="" type="checkbox"/> Normal / None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Water Surface Oils

- Slick
- Sheen
- Globbs
- Flecks
- None
- Other

Inorganic Substrate Components

(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		5.0
Boulder	>256 mm (10")	7.0
Cobble	64 - 256 mm (2.5" - 10")	30.0
Gravel	2 - 64 mm (0.1" - 2.5")	40.0
Sand	0.06 - 2 mm (gritty)	0.0
Silt	0.004 - 0.06 mm	8.0
Clay	< 0.004 mm (slick)	10.0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	11
Embeddedness	6
Velocity / Depth Regime	10
Sediment Deposition	7
Channel Flow Status	9

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category
Channel Alteration	12
Frequency of Riffles (or Bends)	8
Bank Stability (LEFT BANK)	5
Bank Stability (RIGHT BANK)	2
Vegetative Protection (LEFT BANK)	6
Vegetative Protection (RIGHT BANK)	6
Riparian Vegetative Zone Width (LEFT BANK)	7
Riparian Vegetative Zone Width (RIGHT BANK)	9

Field Photography

Image 1



Caption for Image 1

Upstream

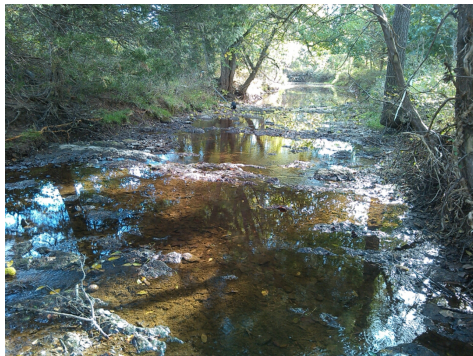
Image 2



Caption for Image 2

Downstream

Image 3



Caption for Image 3

Start of reach

Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Prince William Biological Monitoring Form



Stream Name	Neabsco Creek
Location	Dale City
River Basin	Potomac
Investigators	Kristine Mosuela and John Miller
Date	10/10/2017
Time	03:29 PM GMT-04:00
Reason for Survey	Biomonitoring
Weather Conditions	Clear / Sunny

RIPARIAN VEGETATION
(18 meter buffer)

Dominant Type	Trees
----------------------	-------

INSTREAM FEATURES

Est. Stream Width (m)	6.71
Est. Stream Depth (m)	0.23
Surface Velocity (m/sec at thalweg)	0.51
Canopy Cover	Partly shaded
High Water Mark (m)	1.44
Channelized	<input type="radio"/> Yes <input checked="" type="radio"/> No
Dam Present	<input type="radio"/> Yes <input checked="" type="radio"/> No

Proportion of Reach by Stream Morphology Types

Riffle (%)	60
Run (%)	10
Pool (%)	30

AQUATIC VEGETATION

Dominant Type	Attached Algae
Portion of reach with aquatic veg	15

WATER QUALITY

Temperature	21.53
Specific Conductance	0.129
Dissolved Oxygen	119% (10.5 mg/L)
pH	6.81
Turbidity	1.43
WQ Instrument Used	YSI 650
Water Odors	<input type="checkbox"/> Normal / None <input checked="" type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Water Surface Oils

- Slick
- Sheen
- Globbs
- Flecks
- None
- Other

Inorganic Substrate Components

(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		15.0
Boulder	>256 mm (10")	30.0
Cobble	64 - 256 mm (2.5" - 10")	25.0
Gravel	2 - 64 mm (0.1" - 2.5")	5.0
Sand	0.06 - 2 mm (gritty)	25.0
Silt	0.004 - 0.06 mm	0.0
Clay	< 0.004 mm (slick)	0.0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	13
Embeddedness	6
Velocity / Depth Regime	15
Sediment Deposition	10
Channel Flow Status	9

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category
Channel Alteration	14
Frequency of Riffles (or Bends)	13
Bank Stability (LEFT BANK)	7
Bank Stability (RIGHT BANK)	7
Vegetative Protection (LEFT BANK)	3
Vegetative Protection (RIGHT BANK)	3
Riparian Vegetative Zone Width (LEFT BANK)	6
Riparian Vegetative Zone Width (RIGHT BANK)	8

Field Photography

Image 1

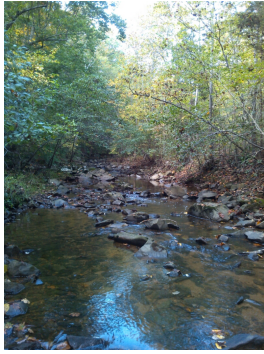


Image 2

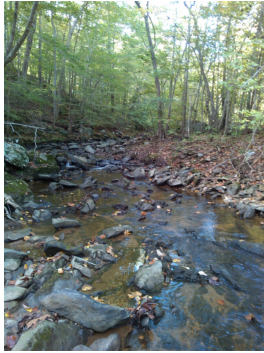
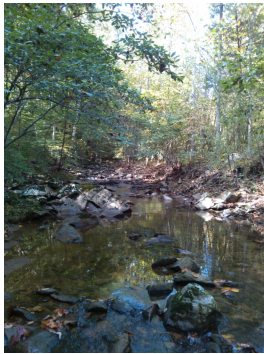


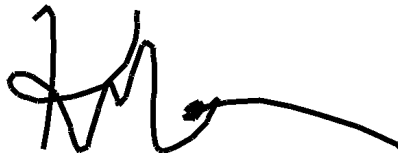
Image 3



Report completed by:

Kristine Mosuela

Signature

A handwritten signature in black ink, appearing to be 'KM', with a long horizontal stroke extending to the right.

Signature Date/Time

10/10/2017 03:31 PM GMT-04:00

Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Prince William Biological Monitoring Form



Stream Name	Purcell Branch
Location	Manassas
River Basin	
Investigators	Kristine Mosuela and John Miller
Date	10/13/2017
Time	10:38 AM GMT-04:00
Reason for Survey	Biomonitoring
Weather Conditions	100% Cloud Cover

RIPARIAN VEGETATION
(18 meter buffer)

Dominant Type	Trees
----------------------	-------

INSTREAM FEATURES

Est. Stream Width (m)	5.11
Est. Stream Depth (m)	0.16
Surface Velocity (m/sec at thalweg)	0.35
Canopy Cover	
High Water Mark (m)	1.07
Channelized	<input type="radio"/> Yes <input checked="" type="radio"/> No
Dam Present	<input type="radio"/> Yes <input checked="" type="radio"/> No

Proportion of Reach by Stream Morphology Types

Riffle (%)	35
Run (%)	60
Pool (%)	5

AQUATIC VEGETATION

Dominant Type	Attached Algae
Portion of reach with aquatic veg	35

WATER QUALITY

Temperature	16.68
Specific Conductance	0.135
Dissolved Oxygen	9.74 mg/L
pH	6.42
Turbidity	5.72
WQ Instrument Used	YSI 650
Water Odors	<input checked="" type="checkbox"/> Normal / None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Water Surface Oils

- Slick
- Sheen
- Globbs
- Flecks
- None
- Other

Inorganic Substrate Components

(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		40.0
Boulder	>256 mm (10")	10.0
Cobble	64 - 256 mm (2.5" - 10")	20.0
Gravel	2 - 64 mm (0.1" - 2.5")	5.0
Sand	0.06 - 2 mm (gritty)	20.0
Silt	0.004 - 0.06 mm	5.0
Clay	< 0.004 mm (slick)	0.0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	7
Embeddedness	6
Velocity / Depth Regime	10
Sediment Deposition	6
Channel Flow Status	8

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category
Channel Alteration	8
Frequency of Riffles (or Bends)	7
Bank Stability (LEFT BANK)	3
Bank Stability (RIGHT BANK)	4
Vegetative Protection (LEFT BANK)	6
Vegetative Protection (RIGHT BANK)	4
Riparian Vegetative Zone Width (LEFT BANK)	7
Riparian Vegetative Zone Width (RIGHT BANK)	4

Field Photography

Image 1



Image 2

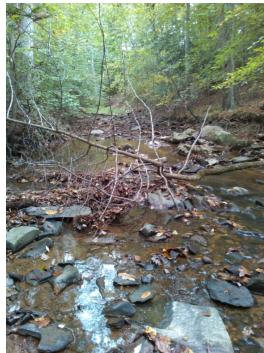
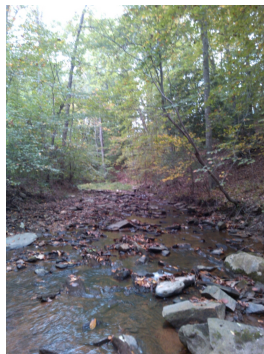


Image 3



Report completed by:

Kristine Mosuela

Signature



Signature Date/Time

10/13/2017 10:39 AM GMT-04:00

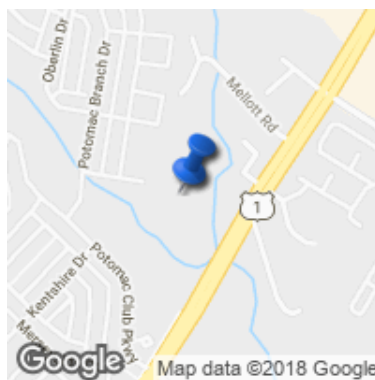
Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Prince William Biological Monitoring Form



Stream Name	Cow Branch
Location	Mellott Rd
River Basin	
Investigators	Ben Green and John Miller
Date	05/09/2018
Time	04:49 PM GMT-04:00
Reason for Survey	Biological Monitoring
Weather Conditions	Sunny

GPS location



RIPARIAN VEGETATION

(18 meter buffer)

INSTREAM FEATURES

Est. Stream Width (m)	4.26
Est. Stream Depth (m)	0.165
Surface Velocity (m/sec at thalweg)	0.22
Canopy Cover	Partly open
High Water Mark (m)	1.52
Channelized	<input checked="" type="radio"/> Yes <input type="radio"/> No
Dam Present	<input type="radio"/> Yes <input checked="" type="radio"/> No
Proportion of Reach by Stream Morphology Types	
Riffle (%)	50
Run (%)	40
Pool (%)	10

AQUATIC VEGETATION

Dominant Type	Attached Algae
Portion of reach with aquatic veg	10

WATER QUALITY

Temperature	12.61
Specific Conductance	.400
Dissolved Oxygen	11.9
pH	6.75
Turbidity	2.83 NTU
WQ Instrument Used	YSI 559
Water Odors	<input checked="" type="checkbox"/> Normal / None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Water Surface Oils

- Slick
- Sheen
- Globbs
- Flecks
- None
- Other

Inorganic Substrate Components

(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		0.0
Boulder	>256 mm (10")	10.0
Cobble	64 - 256 mm (2.5" - 10")	15.0
Gravel	2 - 64 mm (0.1" - 2.5")	35.0
Sand	0.06 - 2 mm (gritty)	20.0
Silt	0.004 - 0.06 mm	15.0
Clay	< 0.004 mm (slick)	5.0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	7
Embeddedness	8
Velocity / Depth Regime	13
Sediment Deposition	9
Channel Flow Status	10

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category
Channel Alteration	1
Frequency of Riffles (or Bends)	10
Bank Stability (LEFT BANK)	7
Bank Stability (RIGHT BANK)	6
Vegetative Protection (LEFT BANK)	4
Vegetative Protection (RIGHT BANK)	3
Riparian Vegetative Zone Width (LEFT BANK)	6
Riparian Vegetative Zone Width (RIGHT BANK)	9

Field Photography

Image 1



Caption for Image 1

Upstream from beginning of reach

Image 2



Caption for Image 2

Downstream from middle of reach

Image 3



Caption for Image 3

Upstream from middle of reach

Image 4



Caption for Image 4

Downstream from end of reach

Image 5



Caption for Image 5

Downstream from end of reach. Scour apparent from outfall confluence.

Report completed by:

BTG

Signature

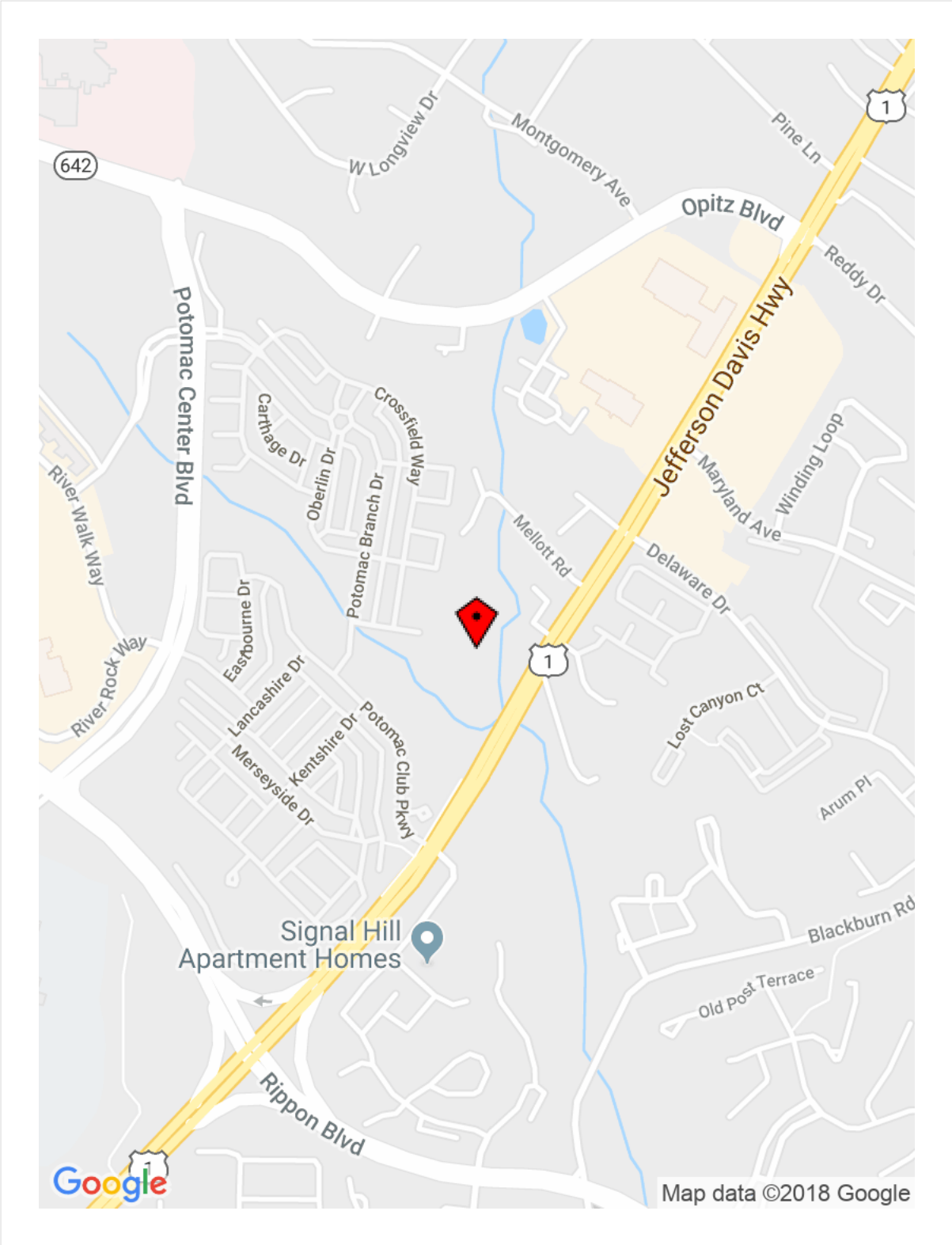
A handwritten signature in black ink, appearing to be 'BTG', is centered within a white rectangular box.

Signature Date/Time

05/01/2018 11:54 AM GMT-04:00

Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Location Map



Prince William Biological Monitoring Form



Stream Name	Dawkins Branch
Location	PC30
River Basin	
Investigators	Zachary Blanchet and John Miller
Date	05/03/2018
Time	01:13 PM GMT-04:00
Reason for Survey	Biological Monitoring
Weather Conditions	Clear / Sunny

GPS location



RIPARIAN VEGETATION
(18 meter buffer)

Dominant Type	Shrubs
----------------------	--------

INSTREAM FEATURES

Est. Stream Width (m)	4.3
Est. Stream Depth (m)	0.1
Surface Velocity (m/sec at thalweg)	0.38
Canopy Cover	Partly shaded
High Water Mark (m)	0.69
Channelized	<input type="radio"/> Yes <input checked="" type="radio"/> No
Dam Present	<input type="radio"/> Yes <input checked="" type="radio"/> No

Proportion of Reach by Stream Morphology Types

Riffle (%)	35
Run (%)	50
Pool (%)	15

AQUATIC VEGETATION

Dominant Type	Attached Algae
Portion of reach with aquatic veg	40

WATER QUALITY

Temperature	21.72
Specific Conductance	0.437
Dissolved Oxygen	11.13
pH	8.06
Turbidity	5.45
WQ Instrument Used	YSI 556mps
Water Odors	<input checked="" type="checkbox"/> Normal / None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Water Surface Oils

- Slick
- Sheen
- Globbs
- Flecks
- None
- Other

Inorganic Substrate Components

(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		
Boulder	>256 mm (10")	5.0
Cobble	64 - 256 mm (2.5" - 10")	10.0
Gravel	2 - 64 mm (0.1" - 2.5")	45.0
Sand	0.06 - 2 mm (gritty)	10.0
Silt	0.004 - 0.06 mm	10.0
Clay	< 0.004 mm (slick)	20.0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	13
Embeddedness	6
Velocity / Depth Regime	8
Sediment Deposition	12
Channel Flow Status	16

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category
Channel Alteration	15
Frequency of Riffles (or Bends)	8
Bank Stability (LEFT BANK)	7
Bank Stability (RIGHT BANK)	7
Vegetative Protection (LEFT BANK)	8
Vegetative Protection (RIGHT BANK)	8
Riparian Vegetative Zone Width (LEFT BANK)	9
Riparian Vegetative Zone Width (RIGHT BANK)	9

Field Photography

Image 1



Caption for Image 1

Downstream

Image 2



Image 3



Caption for Image 3

Upstream beaver dam

Image 4



Image 5



Report completed by:

John Miller

Signature

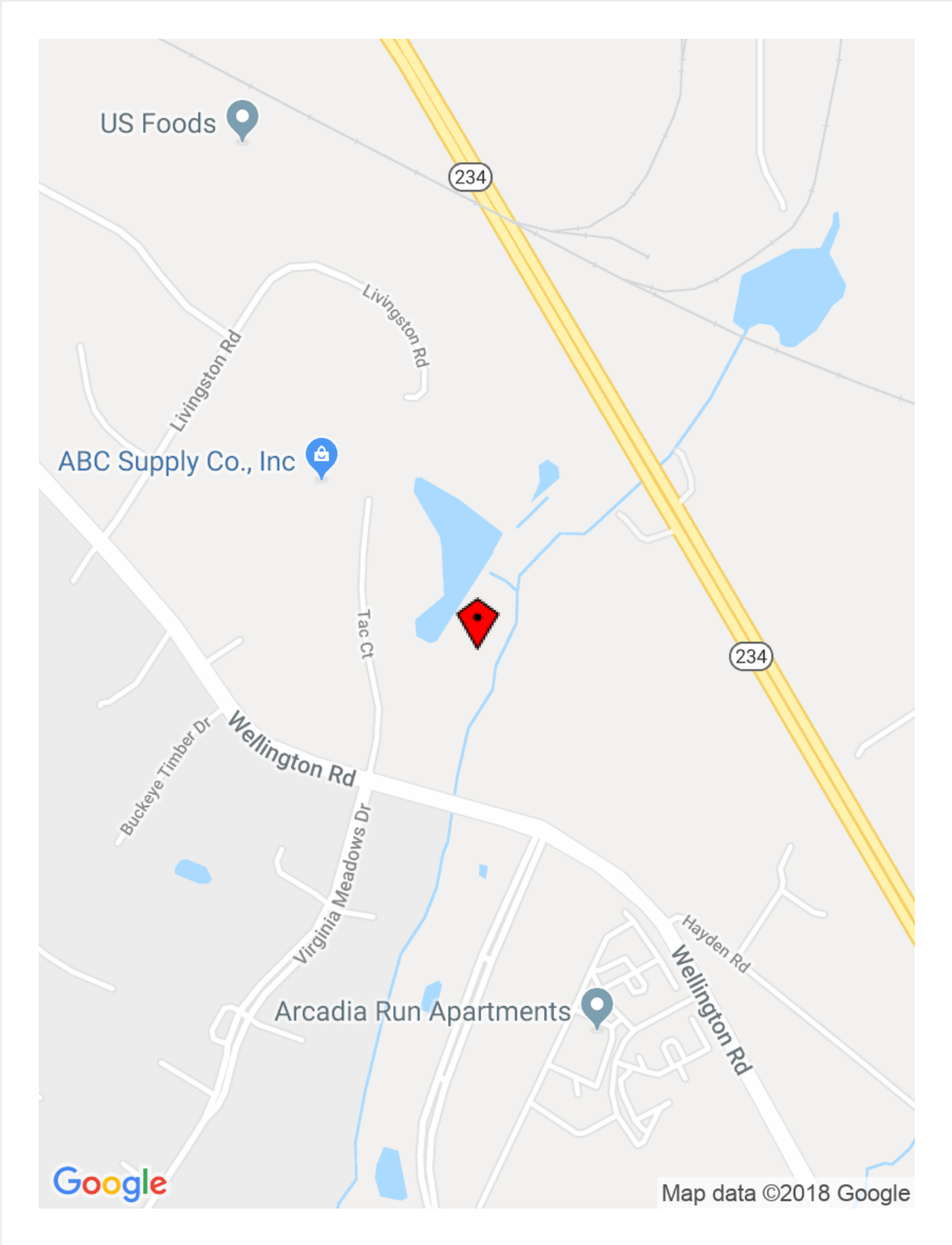
A handwritten signature in black ink that reads "John Miller". The signature is written in a cursive style with a large initial 'J' and 'M'.

Signature Date/Time

05/03/2018 12:06 PM GMT-04:00

Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Location Map

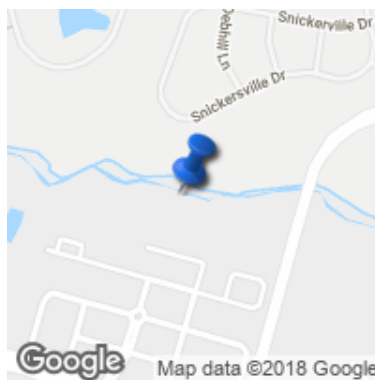


Prince William Biological Monitoring Form



Stream Name	Little Bull Run
Location	PC90
River Basin	Bull Run
Investigators	Zachary Blanchet and John Miller
Date	05/03/2018
Time	10:42 AM GMT-04:00
Reason for Survey	Biological monitoring
Weather Conditions	Clear / Sunny

GPS location



RIPARIAN VEGETATION
(18 meter buffer)

Dominant Type	Shrubs
----------------------	--------

INSTREAM FEATURES

Est. Stream Width (m)	7.28
Est. Stream Depth (m)	0.11
Surface Velocity (m/sec at thalweg)	0.44
Canopy Cover	Partly shaded
High Water Mark (m)	1.52
Channelized	<input type="radio"/> Yes <input checked="" type="radio"/> No
Dam Present	<input type="radio"/> Yes <input checked="" type="radio"/> No

Proportion of Reach by Stream Morphology Types

Riffle (%)	30
Run (%)	50
Pool (%)	20

AQUATIC VEGETATION

Dominant Type	Attached Algae
Portion of reach with aquatic veg	40

WATER QUALITY

Temperature	17.14
Specific Conductance	0.406
Dissolved Oxygen	9.70
pH	7.58
Turbidity	2.38
WQ Instrument Used	YSI 556 mps
Water Odors	<input checked="" type="checkbox"/> Normal / None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Inorganic Substrate Components
(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		10.0
Boulder	>256 mm (10")	0.0
Cobble	64 - 256 mm (2.5" - 10")	10.0
Gravel	2 - 64 mm (0.1" - 2.5")	50.0
Sand	0.06 - 2 mm (gritty)	10.0
Silt	0.004 - 0.06 mm	10.0
Clay	< 0.004 mm (slick)	10.0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	8
Embeddedness	6
Velocity / Depth Regime	10
Sediment Deposition	11
Channel Flow Status	15

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category
Channel Alteration	11
Frequency of Riffles (or Bends)	7
Bank Stability (LEFT BANK)	5
Bank Stability (RIGHT BANK)	3
Vegetative Protection (LEFT BANK)	7
Vegetative Protection (RIGHT BANK)	3
Riparian Vegetative Zone Width (LEFT BANK)	7
Riparian Vegetative Zone Width (RIGHT BANK)	10

Field Photography

Image 1



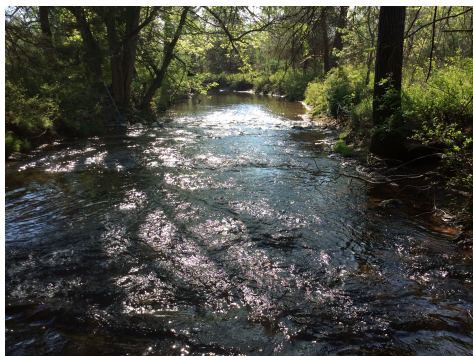
Caption for Image 1

Upstream

Image 2



Image 3



Caption for Image 3

Downstream end

Image 4



Caption for Image 4

Badly eroded bank

Image 5



Caption for Image 5

Middle

Report completed by:

John Miller

Signature

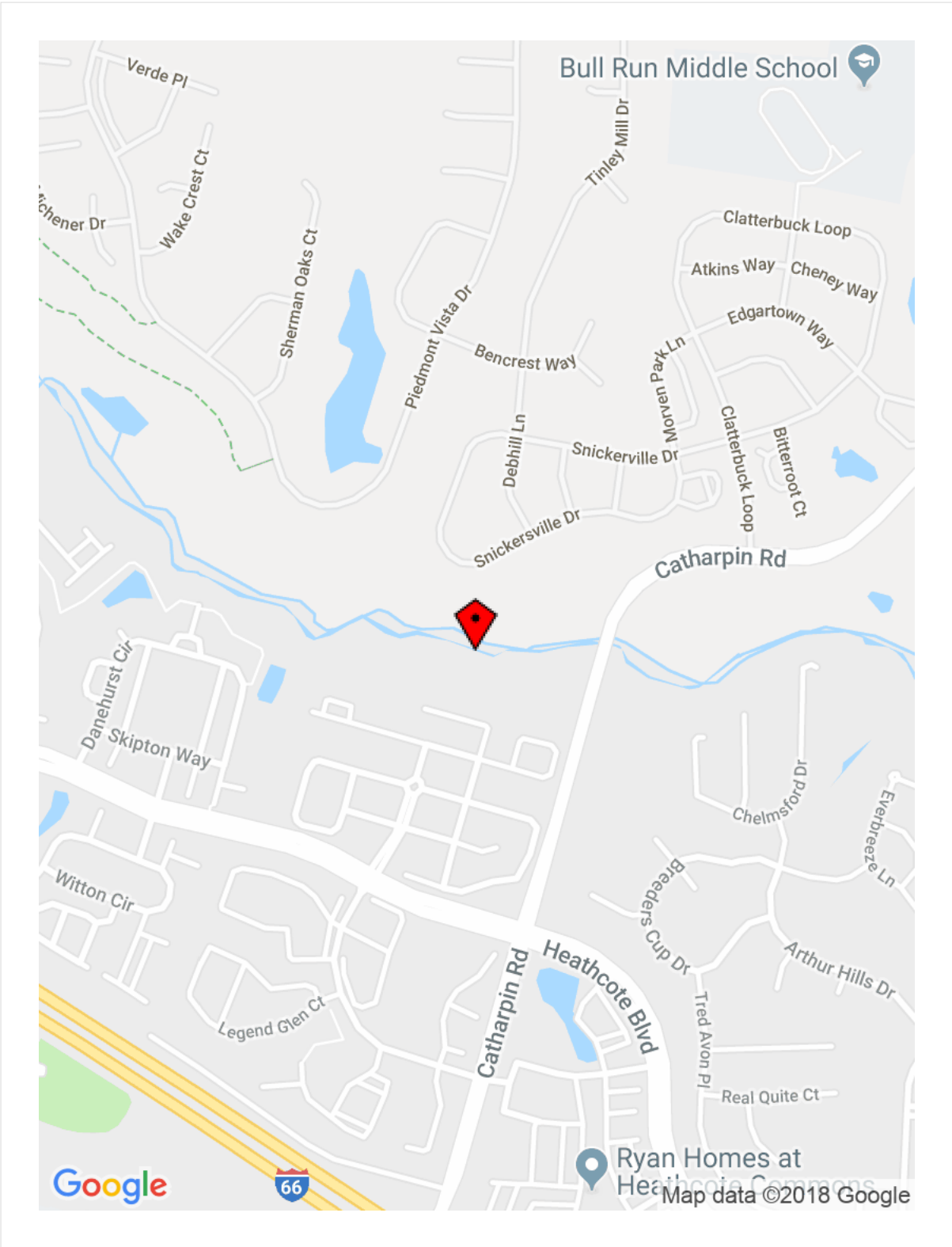
A handwritten signature in black ink that reads "John Miller". The signature is written in a cursive style with a large initial 'J' and 'M'.

Signature Date/Time

05/03/2018 09:29 AM GMT-04:00

Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Location Map

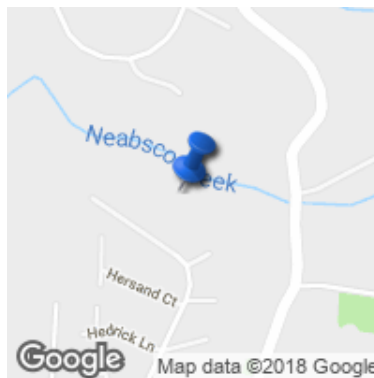


Prince William Biological Monitoring Form



Stream Name	Neabsco Creek
Location	Woodbridge
River Basin	Neabsco
Investigators	Ben Green and John Miller
Date	05/09/2018
Time	04:50 PM GMT-04:00
Reason for Survey	Biological Monitoring
Weather Conditions	Clear / Sunny

GPS location



RIPARIAN VEGETATION

(18 meter buffer)

INSTREAM FEATURES

Est. Stream Width (m)	5.51
Est. Stream Depth (m)	0.22
Surface Velocity (m/sec at thalweg)	0.58
Canopy Cover	Partly shaded
High Water Mark (m)	1.68
Channelized	<input type="radio"/> Yes <input checked="" type="radio"/> No
Dam Present	<input type="radio"/> Yes <input checked="" type="radio"/> No
Proportion of Reach by Stream Morphology Types	
Riffle (%)	60
Run (%)	20
Pool (%)	20

AQUATIC VEGETATION

Dominant Type	Attached Algae
Portion of reach with aquatic veg	30

WATER QUALITY

Temperature	16.07
Specific Conductance	0.171
Dissolved Oxygen	
pH	
Turbidity	3.36
WQ Instrument Used	YSI 556
Water Odors	<input checked="" type="checkbox"/> Normal / None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Water Surface Oils

- Slick
- Sheen
- Globbs
- Flecks
- None
- Other

Inorganic Substrate Components

(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		20.0
Boulder	>256 mm (10")	30.0
Cobble	64 - 256 mm (2.5" - 10")	15.0
Gravel	2 - 64 mm (0.1" - 2.5")	10.0
Sand	0.06 - 2 mm (gritty)	10.0
Silt	0.004 - 0.06 mm	10.0
Clay	< 0.004 mm (slick)	5.0

Parameters to be evaluated in sampling reach

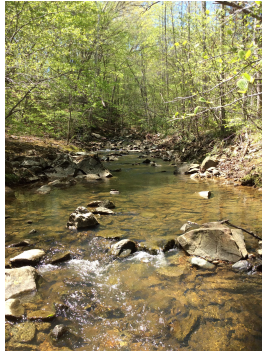
Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	12
Embeddedness	11
Velocity / Depth Regime	13
Sediment Deposition	12
Channel Flow Status	10

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category
Channel Alteration	9
Frequency of Riffles (or Bends)	12
Bank Stability (LEFT BANK)	6
Bank Stability (RIGHT BANK)	5
Vegetative Protection (LEFT BANK)	3
Vegetative Protection (RIGHT BANK)	5
Riparian Vegetative Zone Width (LEFT BANK)	6
Riparian Vegetative Zone Width (RIGHT BANK)	9

Field Photography

Image 1



Caption for Image 1

Upstream from sample point

Image 2



Caption for Image 2

Midway upstream.

Image 3

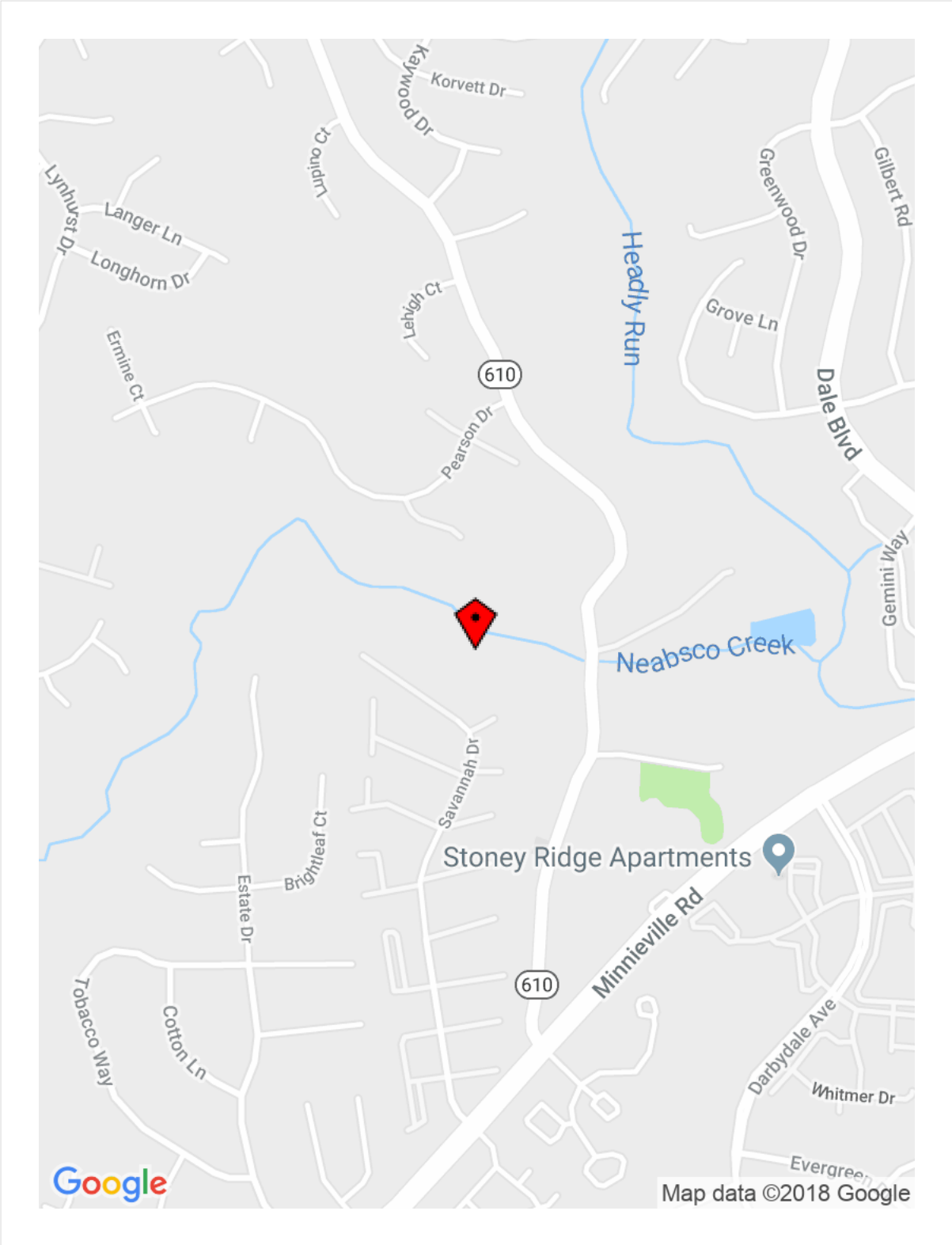


Caption for Image 3

Midway downstream. Scour from uphill outfall in foreground.

Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Location Map

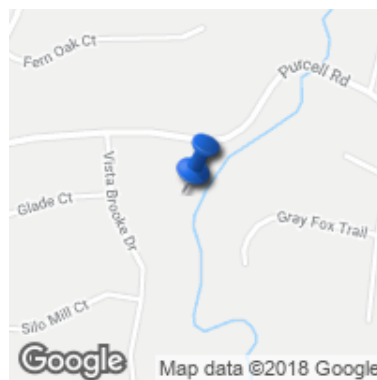


Prince William Biological Monitoring Form



Stream Name	Purcell Branch
Location	PC10
River Basin	
Investigators	Ben Green and Zachary Blanchet
Date	05/04/2018
Time	01:13 PM GMT-04:00
Reason for Survey	Biological Monitoring
Weather Conditions	% Cloud Cover

GPS location



RIPARIAN VEGETATION
(18 meter buffer)

Dominant Type	Trees
----------------------	-------

INSTREAM FEATURES

Est. Stream Width (m)	5.49
Est. Stream Depth (m)	0.17
Surface Velocity (m/sec at thalweg)	0.32
Canopy Cover	Partly open
High Water Mark (m)	1.27
Channelized	<input type="radio"/> Yes <input checked="" type="radio"/> No
Dam Present	<input type="radio"/> Yes <input checked="" type="radio"/> No

Proportion of Reach by Stream Morphology Types

Riffle (%)	45
Run (%)	50
Pool (%)	5

AQUATIC VEGETATION

Dominant Type	Attached Algae
Portion of reach with aquatic veg	75

WATER QUALITY

Temperature	18.13
Specific Conductance	.21
Dissolved Oxygen	9.54
pH	7.49
Turbidity	1
WQ Instrument Used	YSI 556 MPS
Water Odors	<input checked="" type="checkbox"/> Normal / None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other

Water Surface Oils

- Slick
- Sheen
- Globbs
- Flecks
- None
- Other

Inorganic Substrate Components
(should add up to 100%)

Substrate Type	Diameter	% Composition in sampling reach
Bedrock		5.0
Boulder	>256 mm (10")	15.0
Cobble	64 - 256 mm (2.5" - 10")	20.0
Gravel	2 - 64 mm (0.1" - 2.5")	20.0
Sand	0.06 - 2 mm (gritty)	30.0
Silt	0.004 - 0.06 mm	10.0
Clay	< 0.004 mm (slick)	0.0

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category
Epifaunal Substrate / Available Cover	7
Embeddedness	10
Velocity / Depth Regime	10
Sediment Deposition	11
Channel Flow Status	11

Parameters to be evaluated broader than sampling reach

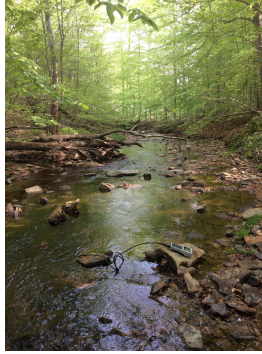
Habitat Parameter	Condition Category
Channel Alteration	12
Frequency of Riffles (or Bends)	10
Bank Stability (LEFT BANK)	5
Bank Stability (RIGHT BANK)	4
Vegetative Protection (LEFT BANK)	3
Vegetative Protection (RIGHT BANK)	4
Riparian Vegetative Zone Width (LEFT BANK)	10
Riparian Vegetative Zone Width (RIGHT BANK)	9

Field Photography

Image 1



Image 2



Report completed by:

Zachary Blanchet and Ben Green

Signature

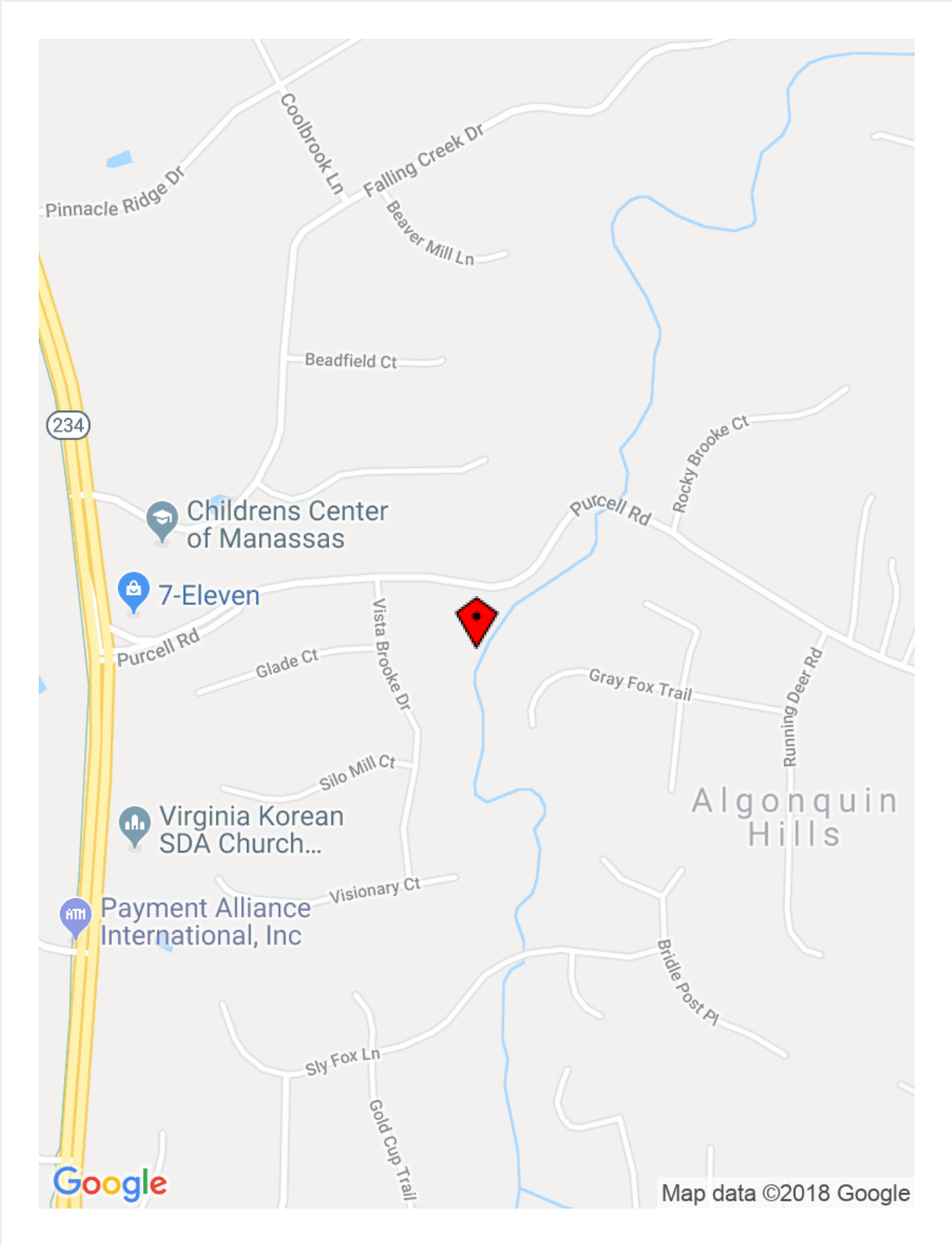
Handwritten signatures of Zachary Blanchet and Ben Green.

Signature Date/Time

05/04/2018 01:15 PM GMT-04:00

Please use the upper-right menu to "Save as complete and exit" to place this finalized form in the upload queue.

Location Map



Benthic Macroinvertebrate Population and Water Quality Monitoring Report
Fall 2008 and Spring 2009
Prince William County, Virginia

Sheet 1 of 1

XXXXXXXXXX **B**

XXXXXXXXXX **B**XXXXXXXXXX **S**XXXX**S**

Accoquan Water Monitoring Laboratory

Prince William State
 Management
 Department

Virginia Laboratory

Mr. Brian

Director of Environmental Infrastructure

10000 Arlington Pointe Suite

Farmington

Analysis Report

Report

Description	Sample Date	Sample ID	Result	Unit	Reporting Limit	Method	Analysis Date
Ammonia				mg/L		SM 4500-NH ₃ -F	
Bacteria				MPN/100 mL		SM 4500-B (MPN)	
Nitrate				mg/L		SM 4500-NO ₃ -F	
Orthophosphate				mg/L		SM 4500-PO ₄ -P	
Total Dissolved Nitrogen				mg/L		Facilitated	
Total Phosphate				mg/L		SM 4500-PO ₄ -P	
Total Suspended Solids				mg/L		SM 4500-SS	
Ammonia				mg/L		SM 4500-NH ₃ -F	
Bacteria				MPN/100 mL		SM 4500-B (MPN)	
Nitrate				mg/L		SM 4500-NO ₃ -F	
Orthophosphate				mg/L		SM 4500-PO ₄ -P	
Total Dissolved Nitrogen				mg/L		Facilitated	
Total Phosphate				mg/L		SM 4500-PO ₄ -P	
Total Suspended Solids				mg/L		SM 4500-SS	
Ammonia				mg/L		SM 4500-NH ₃ -F	
Bacteria				MPN/100 mL		SM 4500-B (MPN)	
Nitrate				mg/L		SM 4500-NO ₃ -F	
Orthophosphate				mg/L		SM 4500-PO ₄ -P	
Total Dissolved Nitrogen				mg/L		Facilitated	
Total Phosphate				mg/L		SM 4500-PO ₄ -P	
Total Suspended Solids				mg/L		SM 4500-SS	
Ammonia				mg/L		SM 4500-NH ₃ -F	
Bacteria				MPN/100 mL		SM 4500-B (MPN)	
Nitrate				mg/L		SM 4500-NO ₃ -F	
Orthophosphate				mg/L		SM 4500-PO ₄ -P	
Total Dissolved Nitrogen				mg/L		Facilitated	
Total Phosphate				mg/L		SM 4500-PO ₄ -P	
Total Suspended Solids				mg/L		SM 4500-SS	

Analysis Report

Report #

Description	Blank	Standard	Duplicate Result	Sample Result	Matrix Sample Result	Method	Analysis Date
Ammonia Nitrogen			n/a			SM 5511	
Corrected Range		±		±	±		
Coliform	n/a	n/a		n/a	n/a	SM 9223 B-M	
Corrected Range			n/a				
Nitrate Nitrogen			n/a			SM 4500-NO ₃ -F	
Corrected Range		±		±	±		
Ortho Phosphate			n/a			SM 4500-PO ₄ -P	
Corrected Range		±		±	±		
Total Ammonia Nitrogen	n/a	n/a	n/a	n/a	n/a	ac:at	
Corrected Range							
Total Chloride					n/a	SM 4500-CLORIMET	
Corrected Range		±	±	±	±		
Total Suspended Solids		n/a		n/a	n/a	SM 2540	
Corrected Range			±				

n/a = not applicable

Not a certified contractor to certified lab at Prince William County Sanitary Authority

Prepared by

Long

Laboratory Supervisor

(OWML) CHAIN OF CUSTODY RECORD

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
 The Charles E. Via Department of Civil Engineering
 Occoquan Watershed Monitoring Laboratory
 9408 Prince William St.
 Manassas, Virginia 20110
 Phone : (703) 361-5606
 Fax: (703) 361-7793

Project Name/Site: PWC AWE

Contact: John P. Miller E-mail: jpml09@vt.edu

Address: 1444 Albemarle Point Place, Suite 115

Address: Charlottesville, VA

Phone: (703) 307-9124 Fax: ()

Sampled By: John Miller (Print Name)

Sampled By: John P. Miller (Signature)

Sample ID (Location)	OWML Lab ID #	Date 1 (storm start)	Time 1 (storm start)	Date 2 (storm end)	Time 2 (storm end)	Time Collected	Volume (mls.)
<u>PC90 Green</u>							<u>~1000ml</u>
<u>↓ Muro</u>							<u>100ml</u>
<u>1280 Gab</u>							<u>~1000ml</u>
<u>↓ Micro</u>							<u>100ml</u>

Method of Delivery

Hand Delivery

UPS/UPS Overnight

Fed Ex Next/2nd Day

US Postal Service

Other _____

Comments & Notes:

Temperature Received: _____ °C

Relinquished by: <u>John P. Miller</u>	Date: <u>6 Oct 17</u>	Time: <u>1415</u>	Received by: <u>[Signature]</u>	Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received for laboratory by:

(OWML) CHAIN OF CUSTODY RECORD

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY,
 The Charles E. Via Department of Civil Engineering
 Occoquan Watershed Monitoring Laboratory
 9408 Prince William St.
 Manassas, Virginia 20110
 Phone : (703) 361-5606
 Fax: (703) 361-7793

Project Name/Site: Biomonitoring Prince William County-Arrec

Contact: John Miller

E-mail: *john.miller@woodplc.com*

Address: 14424 Albemarle Point Place-Suite 115, Chantilly

Address:

Phone: (703) 307-9124

Fax: ()

Sampled By: *John P. Miller*
 (Print Name)

Sampled By: *John P. Miller*
 (Signature)

Sample ID (Location)	OWML Lab ID #	Date 1 (storm start)	Time 1 (storm start)	Date 2 (storm end)	Time 2 (storm end)	Time Collected	Volume (mls.)
<i>PCID</i>							<i>1000 ml</i>
<i>PCID</i>							<i>1000 ml</i>
<i>↓ Mireo</i>							<i>100 ml</i>

Method of Delivery
 Hand Delivery
 UPS/UPS Overnight
 Fed Ex Next/2nd Day
 US Postal Service
 Other _____

Temperature Received: _____ °C

Comments & Notes:

Relinquished by: <i>John P. Miller</i>	Date: <i>10/13</i>	Time: <i>10:45am</i>	Received by: <i>Caroline</i>	Date: <i>10/13</i>	Time: <i>12:50pm</i>	Received by:
Relinquished by:	Date:	Time:	Received by:	Date:	Time:	Received for laboratory by:

AccoQuan Water Monitoring Laboratory

Virginia Laboratory #00000000

11111 Prince William St
 Manassas, VA 20108
 (703) 790-0000

Attn: Mr. Benja in Room
 10000 10000 10000 10000 10000 10000
 10000 10000 10000 10000 10000 10000
 10000 10000 10000 10000 10000 10000

Analysis Report

Report #00000000

Description	Sample Date	Sample ID	Result	Unit	Reporting		Analysis Date
					Limit	Method	
Coliforms	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
E. coli	11/11/2020	11111111	100	MFC	100	SM 9222 B	11/11/2020
Nitrate/Nitrite	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Ortho Phosphate	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Hardness	11/11/2020	11111111	100	g	100	Facit	11/11/2020
Total Chloride	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Suspended Solids	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Coliforms	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
E. coli	11/11/2020	11111111	100	MFC	100	SM 9222 B	11/11/2020
Nitrate/Nitrite	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Ortho Phosphate	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Hardness	11/11/2020	11111111	100	g	100	Facit	11/11/2020
Total Chloride	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Suspended Solids	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Coliforms	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
E. coli	11/11/2020	11111111	100	MFC	100	SM 9222 B	11/11/2020
Nitrate/Nitrite	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Ortho Phosphate	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Hardness	11/11/2020	11111111	100	g	100	Facit	11/11/2020
Total Chloride	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Suspended Solids	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Coliforms	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
E. coli	11/11/2020	11111111	100	MFC	100	SM 9222 B	11/11/2020
Nitrate/Nitrite	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Ortho Phosphate	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Hardness	11/11/2020	11111111	100	g	100	Facit	11/11/2020
Total Chloride	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Suspended Solids	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Coliforms	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
E. coli	11/11/2020	11111111	100	MFC	100	SM 9222 B	11/11/2020
Nitrate/Nitrite	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Ortho Phosphate	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Hardness	11/11/2020	11111111	100	g	100	Facit	11/11/2020
Total Chloride	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020
Total Suspended Solids	11/11/2020	11111111	100	g	100	SM 9222	11/11/2020

Description	Blank	Sample R	Duplicate Sample R	Matrix Sample R	Method	Analysis Date
Ammonia Nitrogen	0.00	0.00	n/a	0.00	SM 4500-NH ₃ -F	01/15/2010
Acceptable Range	0.00-0.00	0.00±0.00		0.00±0.00		
Coliform	n/a	n/a	n/a	n/a	SM 9222 Bacteriological Methods	01/15/2010
Acceptable Range						
Nitrate Nitrogen	0.00	0.00	n/a	0.00	SM 4500-NO ₃ -F	01/15/2010
Acceptable Range	0.00-0.00	0.00±0.00		0.00±0.00		
Orthophosphate	0.00	0.00	n/a	0.00	SM 4500-PO ₄ -F	01/15/2010
Acceptable Range	0.00-0.00	0.00±0.00		0.00±0.00		
Total Ammonia Nitrogen	n/a	n/a	n/a	n/a	acidat 4500-NH ₃ -F	01/15/2010
Acceptable Range						
Total Chloride	0.00	0.00	0	0.00	SM 4500-CLORIDE-F	01/15/2010
Acceptable Range	0.00-0.00	0.00±0.00	±0.00	0.00±0.00		
Total Suspended Solids	0.00	n/a	0	n/a	SM 2540	01/15/2010
Acceptable Range	0.00-0.00		±0.00			

n/a = not applicable

Not a contract; analyzed at Princeton, Illinois County Sanitary Authority

Prepared by

Longfield Lang

01/15/2010

Laboratory Supervisor

(OWML) CHAIN OF CUSTODY RECORD

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

The Charles E. Via Department of Civil Engineering
 Occoquan Watershed Monitoring Laboratory
 9408 Prince William St.
 Manassas, Virginia 20110
 Phone : (703) 361-5606
 Fax: (703) 361-7793

Project Name/Site: **WOODS (AMEC) PWC**

Contact: **DAN WEI A CV** E-mail: **DANWEI@VT.EDU**

Address: **9408 PRINCE WILLIAM STREET**

Address:

Phone: (703) 361-5606 x 118 Fax: ()

Sampled By: (Print Name) **John Miller** Sampled By: (Signature) *John Miller*

Sample ID (Location)	OWML Lab ID #	Date 1 (storm start)	Time 1 (storm start)	Date 2 (storm end)	Time 2 (storm end)	Time Collected	Volume (mls.)
PC 20		18-0713	11:45 AM			9:30 AM	2x1L
↓		18-0713	↓			↓	1x12oz
PC 20		18-0714	1:00			14:00	2x1L
↓		18-0714	↓			↓	1x12oz

Method of Delivery: Hand Delivery UPS/UPS Overnight Fed Ex Next/2nd Day US Postal Service Other _____

Comments & Notes:

Temperature Received: _____ °C

Relinquished by: <i>John Miller</i>	Date: 18-07-13	Time: 16:44	Received by: <i>[Signature]</i>	Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received for laboratory by:

(OWML) CHAIN OF CUSTODY RECORD

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
 The Charles E. Via Department of Civil Engineering
 Occoquan Watershed Monitoring Laboratory
 9408 Prince William St.
 Manassas, Virginia 20110
 Phone : (703) 361-5606
 Fax: (703) 361-7793

Project Name/Site: **WOOD (AMEC) PWC**

Contact: **Dougmai ALU1** E-mail: _____

Address: **9408 PRINCE WILLIAM ST**

Address: _____

Phone: **(703) 361-5606 X118** Fax: ()

Sampled By: **John P. Miller** Sampled By: **John P. Miller** (Signature)

Sample ID (Location)	OWML Lab ID #	Date 1 (storm start)	Time 1 (storm start)	Date 2 (storm end)	Time 2 (storm end)	Time Collected	Volume (m/s.)
PC30	18-0722	3MAY18	11:30				2x1L
↓	↓	↓	↓				1x12oz
PC90	18-0721	3MAY18	9:00				2x1L
↓	↓	↓	↓				1x12oz

Method of Delivery: Hand Delivery UPS/UPS Overnight Fed Ex Next/2nd Day US Postal Service Other _____

Temperature Received: _____ °C

Comments & Notes:
 Fraction Poured off FOR TRN at OWML for E&H
 Sample.

Relinquished by: John P. Miller	Date: 3MAY18	Time: 12:40	Received by: [Signature]	Relinquished by:	Date:	Time:	Received by:
Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received for laboratory by:

(OWML) CHAIN OF CUSTODY RECORD

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

The Charles E. Via Department of Civil Engineering
 Occoquan Watershed Monitoring Laboratory
 9408 Prince William St.
 Manassas, Virginia 20110
 Phone : (703) 361-5606
 Fax: (703) 361-7993

Project Name/Site:

WOOD FWC (AMEC)

Contact:

Dangwei Qiu E-mail: dangwei@vt.edu

Address:

9408 PRINCE WILLIAM STREET

Address:

MANASSAS VA

Phone:

(703) 361-5606 X120

Fax: ()

Sampled By:
(Print Name)

Benjamin Green

Sampled By:
(Signature)

[Signature]

Sample ID (Location)	OWML Lab ID #	Date 1 (storm start)	Time 1 (storm start)	Date 2 (storm end)	Time 2 (storm end)	Time Collected	Volume (mls.)
PC10	18-0735 18-0723	4 MAY 18	9 AM				4 x 1 Liter 2 x 20ml

Method of Delivery

Hand Delivery

UPS/UPS Overnight

Fed Ex Next/2nd Day

US Postal Service

Other _____

Temperature Received: _____ °C

Comments & Notes:
 Poured off + KN & Acidified to pH 2.0

Relinquished by:	Date	Time	Received by:	Relinquished by:	Date	Time	Received by:
<i>[Signature]</i>	4/18/18	11:18	<i>[Signature]</i>				
Relinquished by:	Date	Time	Received by:	Relinquished by:	Date	Time	Received for laboratory by:

Benthic Macroinvertebrate Population and Water Quality Monitoring Report
Fall 2008 and Spring 2009
Prince William County, Virginia

Sheet 1 of 1

XXXXXXXXXX

BXXXXXXXXXX **M**XXXXXXXXXX **B**XXXXXXXXXX **B**XXXXXXXXXX **S**XXXX**S**



amec
foster
wheeler

December 18, 2017

Mr. Ben Green
Amec Foster Wheeler
14424 Albemarle Point Place, Suite 115
Chantilly, VA 20151

Subject: Prince William County Multiple Habitat Sampling Method Report
Cow Branch, Dawkins Branch, Little Bull Run, Neabsco Creek, Purcell Branch
Amec Foster Wheeler Project No.: 151270003

Dear Mr. Green:

Amec Foster Wheeler (Gainesville office), Environment & Infrastructure, Inc. (Amec Foster Wheeler) completed benthic macroinvertebrate determinations for samples collected by Amec Foster Wheeler (Chantilly office), in October 2017. Amec Foster Wheeler received a total of five samples, one from each of the following locations: Cow Branch, Dawkins Branch, Little Bull Run, Neabsco Creek, and Purcell Branch. The results of the taxonomic analyses are presented in this report.

Multiple Habitat Sampling Method

Methods and Procedures

All samples collected by Amec Foster Wheeler, Chantilly office, in October 2017, were received by Amec Foster Wheeler taxonomy laboratory at Gainesville, Florida, where they were logged in and processed. The samples were sorted (i.e. organisms removed from debris) and organisms were identified and enumerated by a qualified taxonomist according to Section 7.2 of the U.S. Environmental Protection Agency's (USEPA) "*Rapid Bioassessment Protocol for Use in Wadeable Streams and Rivers*" (RBP) (Barbour *et al.*, 1999). Eight metrics were calculated including the Biotic Index, using guidance from Hilsenhoff (1987); the Percent Model Affinity (PMA), using guidance from Novak and Bode (1992); and the Virginia Stream Condition Index, using guidance from Virginia Department of Environmental Quality (2008). The scraper taxa and tolerance values were identified according to life history information from RBP (Barbour *et al.*, 1999); "*An Introduction to the Aquatic Insects of North America*" (Merritt *et al.*, 2008); "*Quality System Standard Operating Procedure for Macroinvertebrate Stream Surveys*" (Tennessee Department of Environment and Conservation, 2011); and "*Standard Operating Procedures for the Collection and Analysis of Benthic Macroinvertebrates*" (North Carolina Department of Environmental Quality, 2016). Quality assurance and quality control checks were conducted according to the EPA RBP on Laboratory Quality Control for Macroinvertebrate Taxonomic Identification (Barbour *et al.*, 1999). Quality assurance/quality control requirements for sample picking and taxonomic identification were conducted by an Amec Foster Wheeler Senior Taxonomist.

Benthic Macroinvertebrate Results

The benthic invertebrate community data were used to generate metrics outlined in the Amec Foster Wheeler draft sampling plan. The Multiple Habitat Sampling assessments conducted at the five locations are summarized below in **Table 1**.

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Table 1. Summary of Results of Multiple Habitat Samples

Metrics	Site Locations				
	Cow Branch	Dawkins Branch	Little Bull Run	Neabsco Creek	Purcell Branch
Taxa Richness	29	39	42	36	30
Abundance	174	202	200	240	209
EPT Index	4	6	11	8	8
EPT/EPT + Chironomidae Ratio	0.76	0.20	0.51	0.70	0.78
Percent Dominant Taxon	39.08	26.73	18.50	15.42	17.70
Percent Chironomidae	20.69	40.59	29.50	17.92	13.88
Biotic Index (BI)	5.78	5.63	5.73	5.68	4.81
Biotic Index (BI) Category	Fair	Fair	Fair	Fair	Good
Percent Model Affinity (PMA)	43.22	50.79	68.50	53.75	53.49
Percent Model Affinity (PMA) Category	Moderately Impacted	Slightly Impacted	Non-Impacted	Slightly Impacted	Slightly Impacted
VSCI	41.78	49.71	61.83	58.67	63.60

Source: Amec Foster Wheeler, 2017

Prepared by: JSD

Checked by: SEM

Taxonomic identifications and abundances of the benthic invertebrates and metric calculations for each sample are included in Attachment 1. References are listed in Attachment 2.

Closing

We appreciate the opportunity to provide ecological services to you. Please do not hesitate to contact me if you have questions, or need to request further information. You can reach me by phone at (352) 333-3634, or via email at shannon.mcmorrow@amecfw.com.

Sincerely,

Amec Foster Wheeler Environment & Infrastructure, Inc.



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Attachments:

- Attachment 1: Tabulated Data
- Attachment 2: References

**Attachment 1
Tabulated Data**

Multiple Habitat Sampling
 Samples Collected 10/2017
 Project #: 151270003

Metrics	Site Locations				
	Cow Branch	Dawkins Branch	Little Bull Run	Neabsco Creek	Purcell Branch
Taxa Richness	29	39	42	36	30
Abundance	174	202	200	240	209
EPT Index	4	6	11	8	8
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Biotic Index (BI)	5.78	5.63	5.73	5.68	4.81
Biotic Index (BI) Category	Fair	Fair	Fair	Fair	Good
Percent Model Affinity (PMA)	43.22	50.79	68.50	53.75	53.49
Percent Model Affinity (PMA) Category	Moderately Impacted	Slightly Impacted	Non-Impacted	Slightly Impacted	Slightly Impacted
VSCI	41.78	49.71	61.83	58.67	63.60

Cow Branch
 Multiple Habitat Sampling
 Samples Collected 10/10/2017
 Project #: 151270003

Results for Cow Branch

Phylum	Class	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Nemertea	Enopla	Hoplonemertea	Tetrastemmatidae	<i>Prostoma</i> spp.	1						6.1	0.04			1			
Annelida	Clitellata	Tubificida	Naididae	Tubificinae spp.	1						9.5	0.05		1				
Annelida	Clitellata	Tubificida	Naididae	<i>Nais communis</i>	2						8.7	0.10		2				
Annelida	Clitellata	Lumbriculida	Lumbriculidae	Lumbriculidae spp.	2						7.03	0.08		2				
Mollusca	Bivalvia	Veneroida	Sphaeriidae	Sphaeriidae spp.	1						6.6	0.04			1			
Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetidae spp.	2	2					6.1	0.07						
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	1						6.1	0.04			1			
Arthropoda	Insecta	Odonata	Coenagrionidae	<i>Enallagma</i> spp.	1						8.5	0.05			1			
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	68				68	68	6.6	2.58						68
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Hydropsyche</i> spp.	43			43			4.3	1.06						43
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Macrostemum</i> spp.	4			4			3.4	0.08						
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	1						5.6	0.03	1					1
Arthropoda	Insecta	Coleoptera	Hydrophilidae	Hydrophilidae spp.	1						5	0.03	1					
Arthropoda	Insecta	Coleoptera	Psephenidae	<i>Psephenus</i> spp.	1						2.35	0.01	1					1
Arthropoda	Insecta	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	14				14		6.6	0.53						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum flavum</i>	4				4		5.7	0.13						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum illinoense</i> group	2				2		8.7	0.10						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum aviceps</i>	1				1		3.6	0.02						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Rheotanytarsus</i> spp.	4				4		6.5	0.15						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Ablabesmyia mallochi</i>	1				1		7.4	0.04						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Dicrotendipes</i> spp.	1				1		7.2	0.04						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Cricotopus</i> spp.	2				2		5.78	0.07						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Thienemanniella</i> spp.	3				3		6.4	0.11						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	4				4		4.7	0.11						
Arthropoda	Insecta	Diptera	Tipulidae	Tipulidae spp.	2						4.9	0.06				2		
Arthropoda	Insecta	Diptera	Simuliidae	Simuliidae spp.	2						3.5	0.04				2		
Arthropoda	Insecta	Diptera	Empididae	<i>Hemerodromia</i> spp.	2						7.57	0.09				2		
Arthropoda	Insecta	Heteroptera	Mesoveliidae	<i>Mesovelia</i> spp.	1						6	0.03				1		
Arthropoda	Arachnida			Acariformes spp.	2							0.00				2		

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 38.85
Model % Plecoptera	5 5.00
Model % Trichoptera	10 56.09
Model % Chironomidae	20 0.69
Model % Coleoptera	10 8.28
Model % Oligochaeta	5 2.13
Model % Other	10 2.53
Sum of Difference	113.56
Sum of Difference * 0.5	56.78
Percent Model Affinity	43.22
Percent Model Affinity Category	Moderately Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	29	131.82	100.00
Total Abundance	174		
% Ephemeroptera	1.15	1.88	1.88
% Plecoptera	0.00		
% Trichoptera	66.09		
% Chironomidae	20.69	79.31	79.31
% Dominant Taxon	39.08		
Biotic Index	5.78	62.12	62.12
% Coleoptera	1.72		
% Oligochaeta	2.87		
% Other	7.47		
% Plecoptera + Trichoptera (less Hydropsychidae)	0.00	0.00	0.00
% Scrapers	1.15	2.23	2.23
% Top 2 Dominant Taxa	63.79	52.32	52.32
EPT Index	4	36.36	36.36
EPT/EPT + Chironomidae Ratio	0.76		

Hilsenhoff Biotic Index Category Fair

Final VSCI score 41.78

Dawkins Branch
 Multiple Habitat Sampling
 Samples Collected 10/06/2017
 Project #: 151270003

Results for Dawkins Branch

Phylum	Class	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Platyhelminthes				Platyhelminthes spp.	20							0.00			20			20
Nemertea	Enopla	Hoplonemertea	Tetrastemmatidae	<i>Prostoma</i> spp.	5						6.1	0.15			5			
Annelida	Clitellata	Tubificida	Naididae	Tubificinae spp.	1						9.5	0.05		1				
Annelida	Clitellata	Tubificida	Naididae	<i>Pristina americana</i>	1						7.7	0.04		1				
Annelida	Clitellata	Tubificida	Naididae	<i>Nais pardalis</i>	1						8.7	0.04		1				
Mollusca	Gastropoda			Gastropoda spp.	2						7	0.07			2		2	
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	7						7	0.24			7		7	
Mollusca	Bivalvia	Veneroida	Corbiculidae	<i>Corbicula fluminea</i>	4						6.6	0.13			4			
Mollusca	Bivalvia	Veneroida	Sphaeriidae	Sphaeriidae spp.	7						6.6	0.23			7			
Arthropoda	Insecta	Collembola		<i>Collembola</i> spp.	1						10	0.05			1			
Arthropoda	Insecta	Ephemeroptera	Caenidae	<i>Caenis</i> spp.	4	4					6.8	0.13						
Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetidae spp.	1	1					6.1	0.03						
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	5						6.1	0.15			5			
Arthropoda	Insecta	Odonata	Coenagrionidae	<i>Argia</i> spp.	4						8.3	0.16			4			
Arthropoda	Insecta	Odonata	Libellulidae	Libellulidae spp.	1						6.7	0.03			1			
Arthropoda	Insecta	Trichoptera	Leptoceridae	<i>Oecetis</i> spp.	2			2			5.1	0.05				2		
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsychidae spp.	10			10			4	0.20						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	2			2			6.6	0.07						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Hydropsyche</i> spp.	1			1			4.3	0.02						
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Dubiraphia</i> spp.	6						5.5	0.16	6					
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	13						5.6	0.36	13				13	
Arthropoda	Insecta	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	9				9		6.6	0.29						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum flavum</i>	1				1		5.7	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum illinoense</i> group	5				5		8.7	0.22						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Rheotanytarsus</i> spp.	54				54	54	6.5	1.74						54
Arthropoda	Insecta	Diptera	Chironomidae	<i>Dicrotendipes</i> spp.	1				1		7.2	0.04						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Pentaneura</i> spp.	1				1		4.7	0.02						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Corynoneura</i> spp.	2				2		5.7	0.06						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Thienemanniella xena</i>	7				7		8	0.28						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Labrundinia</i> spp.	1				1		6.2	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Cricotopus</i> or <i>Orthocladius</i>	1				1		4.86	0.02						
Arthropoda	Insecta	Diptera	Ceratopogonidae	Ceratopogonidae spp.	1						5.9	0.03			1			
Arthropoda	Insecta	Diptera	Tipulidae	<i>Tipula</i> spp.	1						7.5	0.04			1			
Arthropoda	Insecta	Diptera	Simuliidae	<i>Simulium</i> spp.	1						4.9	0.02			1			
Arthropoda	Insecta	Diptera	Empididae	<i>Hemerodromia</i> spp.	6						7.57	0.22			6			
Arthropoda	Insecta	Heteroptera	Veliidae	<i>Rhagovelia obesa</i>	1							0.00			1			
Arthropoda	Arachnida	Trombidiformes	Arrenuridae	<i>Arrenurus</i> spp.	1							0.00			1			
Arthropoda	Arachnida	Trombidiformes	Hygrobatidae	<i>Hygrobates</i> spp.	2							0.00			2			
Nematoda				Nematoda spp.	9						5	0.22			9			

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 37.52
Model % Plecoptera	5 5.00
Model % Trichoptera	10 2.57
Model % Chironomidae	20 20.59
Model % Coleoptera	10 0.59
Model % Oligochaeta	5 3.51
Model % Other	10 28.61
Sum of Difference	98.42
Sum of Difference * 0.5	49.21
Percent Model Affinity	50.79
Percent Model Affinity Category	Slightly Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	39	177.27	100.00
Total Abundance	202		
% Ephemeroptera	2.48	4.04	4.04
% Plecoptera	0.00		
% Trichoptera	7.43		
% Chironomidae	40.59	59.41	59.41
% Dominant Taxon	26.73		
Biotic Index	5.63	64.22	64.22
% Coleoptera	9.41		
% Oligochaeta	1.49		
% Other	38.61		
% Plecoptera + Trichoptera (less Hydropsychidae)	0.99	2.78	2.78
% Scrapers	10.89	21.11	21.11
% Top 2 Dominant Taxa	36.63	91.57	91.57
EPT Index	6	54.55	54.55
EPT/EPT + Chironomidae Ratio	0.20		

Hilsenhoff Biotic Index Category Fair

Final VSCI score 49.71

Little Bull Run
 Multiple Habitat Sampling
 Samples Collected 10/06/2017
 Project #: 151270003

Results for Little Bull Run

Phylum	Class	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Platyhelminthes				Platyhelminthes spp.	4							0.00			4			
Nemertea	Enopla	Hoploneurata	Tetrastemmatidae	<i>Prostoma</i> spp.	1						6.1	0.03			1			
Annelida	Clitellata	Tubificida	Naididae	<i>Nais communis</i>	1						8.7	0.04		1				
Annelida	Clitellata	Tubificida	Naididae	<i>Nais pardalis</i>	1						8.7	0.04		1				
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	1						7	0.04			1			1
Mollusca	Gastropoda	Hygrophila	Physidae	<i>Physella</i> spp.	1						8.84	0.04			1			1
Mollusca	Gastropoda	Hygrophila	Planorbidae	Planorbidae spp.	1						6.3	0.03			1			1
Mollusca	Bivalvia	Veneroidea	Corbiculidae	<i>Corbicula fluminea</i>	1						6.6	0.03			1			
Arthropoda	Insecta	Ephemeroptera	Caenidae	<i>Caenis</i> spp.	30	30					6.8	1.02						30
Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetidae spp.	2	2					6.1	0.06						
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	<i>Maccaffertium</i> spp.	2	2					3.15	0.03						
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Ephemerellidae spp.	1	1					1.9	0.01						
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	6						6.1	0.18			6			
Arthropoda	Insecta	Odonata	Coenagrionidae	<i>Enallagma</i> spp.	1						8.5	0.04			1			
Arthropoda	Insecta	Trichoptera	Leptoceridae	<i>Oecetis</i> spp.	7						5.1	0.18					7	
Arthropoda	Insecta	Trichoptera	Leptoceridae	<i>Mystacides sepulchralis</i>	1						2.6	0.01					1	
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	10				10		6.6	0.33						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Hydropsyche</i> spp.	4				4		4.3	0.09						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Macrostemum</i> spp.	1				1		3.4	0.02						
Arthropoda	Insecta	Trichoptera	Philopotamidae	<i>Chimarra</i> spp.	1				1		3.3	0.02					1	
Arthropoda	Insecta	Trichoptera	Rhyacophilidae	<i>Rhyacophila</i> spp.	2				2		0.73	0.01					2	
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Dubiraphia</i> spp.	37					37	5.5	1.02	37					37
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	13						5.6	0.36	13					13
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Ancyronyx</i> spp.	1						6.49	0.03	1					
Arthropoda	Insecta	Coleoptera	Halplidae	<i>Pelodytes</i> spp.	1						8.73	0.04	1					
Arthropoda	Insecta	Coleoptera	Psephenidae	<i>Psephenus</i> spp.	6						2.35	0.07	6					6
Arthropoda	Insecta	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	13				13		6.6	0.43						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum</i> spp.	1				1		5.69	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Rheotanytarsus</i> spp.	14				14		6.5	0.46						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Ablabesmyia mallochii</i>	9				9		7.4	0.33						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Dicrotendipes</i> spp.	2				2		7.2	0.07						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Cricotopus</i> spp.	5				5		5.78	0.14						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Corynoneura</i> spp.	2				2		5.7	0.06						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Pseudochironomus</i> spp.	2				2		4.9	0.05						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Thienemanniella</i> spp.	1				1		6.4	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Apedilum</i> spp.	1				1		5.69	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Labrundinia</i> spp.	5				5		6.2	0.16						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	3				3		4.7	0.07						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Xylotopus par</i>	1				1		6.1	0.03						
Arthropoda	Insecta	Diptera	Simuliidae	Simuliidae spp.	2						3.5	0.04			2			
Arthropoda	Insecta	Heteroptera	Veliidae	<i>Microvelia</i> spp.	1						6	0.03			1			
Arthropoda	Arachnida			Acariformes spp.	1							0.00			1			

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 22.50
Model % Plecoptera	5 5.00
Model % Trichoptera	10 3.00
Model % Chironomidae	20 9.50
Model % Coleoptera	10 19.00
Model % Oligochaeta	5 4.00
Model % Other	10 0.00
Sum of Difference	63.00
Sum of Difference * 0.5	31.50
Percent Model Affinity	68.50
Percent Model Affinity Category	Non-Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	42	190.91	100.00
Total Abundance	200		
% Ephemeroptera	17.50	28.55	28.55
% Plecoptera	0.00		
% Trichoptera	13.00		
% Chironomidae	29.50	70.50	70.50
% Dominant Taxon	18.50		
Biotic Index	5.73	62.73	62.73
% Coleoptera	29.00		
% Oligochaeta	1.00		
% Other	10.00		
% Plecoptera + Trichoptera (less Hydropsychidae)	5.50	15.45	15.45
% Scrapers	11.00	21.32	21.32
% Top 2 Dominant Taxa	33.50	96.10	96.10
EPT Index	11	100.00	100.00
EPT/EPT + Chironomidae Ratio	0.51		

Hilsenhoff Biotic Index Category Fair

Final VSCI score 61.83

Neabsco Creek
 Multiple Habitat Sampling
 Samples Collected 10/10/2017
 Project #: 151270003

Results for Neabsco Creek

Phylum	Class	Order	Family	Taxa	Raw Abundance	Reduced Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Nemertea	Enopla	Hoplonemertea	Tetrastemmatidae	<i>Prostoma</i> spp.	7	7						6.1	0.18			7			
Annelida	Clitellata	Tubificida	Naididae	<i>Pristina americana</i>	1	1						7.7	0.03		1				
Annelida	Clitellata	Tubificida	Naididae	<i>Nais communis</i>	13	11						8.7	0.40		11				
Annelida	Clitellata	Tubificida	Naididae	<i>Nais pardalis</i>	1	1						8.7	0.04		1				
Annelida	Clitellata	Tubificida	Naididae	<i>Slavina appendiculata</i>	2	2						8.4	0.07		2				
Mollusca	Gastropoda			Gastropoda spp.	3	3						7	0.09			3			3
Mollusca	Gastropoda	Hygrophila	Ancylidae	Ancylidae spp.	7	7						7	0.20			7			7
Mollusca	Gastropoda	Hygrophila	Physidae	Physidae spp.	1	1						8	0.03			1			1
Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetidae spp.	20	19	19					6.1	0.48						
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Heptageniidae spp.	1	1		1				4	0.02						1
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	11	11						6.1	0.28			11			
Arthropoda	Insecta	Trichoptera		Trichoptera spp.	4	4				4			0.00						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsychidae spp.	14	14				14		4	0.23						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	24	24				24		6.6	0.66						24
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Hydropsyche</i> spp.	6	6				6		4.3	0.11						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Hydropsyche betteni</i>	10	9				9		7.9	0.30						
Arthropoda	Insecta	Trichoptera	Philopotamidae	<i>Chimarra</i> spp.	21	21				21		3.3	0.29				21		
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Dubiraphia</i> spp.	1	1						5.5	0.02	1					
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	5	4						5.6	0.09	4					4
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Ancyronyx variegatus</i>	1	1						6.8	0.03	1					
Arthropoda	Insecta	Diptera		Diptera spp.	1	1						7	0.03			1			
Arthropoda	Insecta	Diptera	Chironomidae	Chironomidae spp.	2	2				2		6.2	0.05						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	1	1				1		6.6	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum flavum</i>	10	10				10		5.7	0.24						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum illinoense</i> group	2	2				2		8.7	0.07						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Rheotanytarsus</i> spp.	10	9				9		6.5	0.24						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Thienemanniella xena</i>	7	7				7		8	0.23						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Parakiefferiella</i> spp.	1	1				1		4.8	0.02						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Labrundinia</i> spp.	3	3				3		6.2	0.08						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	7	7				7		4.7	0.14						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Cricotopus</i> or <i>Orthocladus</i>	1	1				1		4.86	0.02						
Arthropoda	Insecta	Diptera	Tipulidae	Tipulidae spp.	8	7						4.9	0.14			7			
Arthropoda	Insecta	Diptera	Tipulidae	<i>Antocha</i> spp.	1	1						4.4	0.02			1			
Arthropoda	Insecta	Diptera	Simuliidae	<i>Simulium</i> spp.	39	37					37	4.9	0.76			37			37
Arthropoda	Insecta	Lepidoptera		Lepidoptera spp.	1	1						6	0.03			1			
Nematoda				Nematoda spp.	2	2						5	0.04			2			

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 31.67
Model % Plecoptera	5 5.00
Model % Trichoptera	10 22.50
Model % Chironomidae	20 2.08
Model % Coleoptera	10 7.50
Model % Oligochaeta	5 1.25
Model % Other	10 22.50
Sum of Difference	92.50
Sum of Difference * 0.5	46.25
Percent Model Affinity	53.75
Percent Model Affinity Category	Slightly Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	36	163.64	100.00
Total Abundance	249		
% Ephemeroptera	8.33	13.59	13.59
% Plecoptera	0.00		
% Trichoptera	32.50		
% Chironomidae	17.92	82.08	82.08
% Dominant Taxon	15.42		
Biotic Index	5.68	63.48	63.48
% Coleoptera	2.50		
% Oligochaeta	6.25		
% Other	32.50		
% Plecoptera + Trichoptera (less Hydropsychidae)	8.75	24.58	24.58
% Scrapers	6.67	12.92	12.92
% Top 2 Dominant Taxa	25.42	107.78	100.00
EPT Index	8	72.73	72.73
EPT/EPT + Chironomidae Ratio	0.70		

Hilsenhoff Biotic Index Category Fair

Final VSCI score 58.67

Purcell Branch
 Multiple Habitat Sampling
 Samples Collected 10/13/2017
 Project #: 151270003

Results for Purcell Branch

Phylum	Class	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Nemertea	Enopla	Hoplonemertea	Tetrastematidae	<i>Prostoma</i> spp.	6						6.1	0.18			6			
Annelida	Clitellata	Tubificida	Naididae	<i>Nais communis</i>	2						8.7	0.08		2				
Mollusca	Gastropoda	Hygrophila	Planorbidae	Planorbidae spp.	1						6.3	0.03			1		1	
Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetidae spp.	5	5					6.1	0.15						
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	<i>Maccaffertium</i> spp.	20	20					3.15	0.30						
Arthropoda	Insecta	Trichoptera	Leptoceridae	<i>Oecetis</i> spp.	1			1			5.1	0.02				1		
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	36			36		36	6.6	1.14						36
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Hydropsyche</i> spp.	1			1			4.3	0.02						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	<i>Macrostemum</i> spp.	2			2			3.4	0.03						
Arthropoda	Insecta	Trichoptera	Philopotamidae	<i>Chimarra</i> spp.	36			36			3.3	0.57				36		36
Arthropoda	Insecta	Trichoptera	Rhyacophilidae	<i>Rhyacophila</i> spp.	1			1			0.73	0.00				1		
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Dubiraphia</i> spp.	6						5.5	0.16	6					
Arthropoda	Insecta	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	7						5.6	0.19	7					7
Arthropoda	Insecta	Coleoptera	Psephenidae	<i>Psephenus</i> spp.	1						2.35	0.01	1					1
Arthropoda	Insecta	Diptera	Chironomidae	Chironomidae spp.	1				1		6.2	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum flavum</i>	1				1		5.7	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum illinoense</i> group	6				6		8.7	0.25						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Polypedilum aviceps</i>	1				1		3.6	0.02						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Rheotanytarsus</i> spp.	8				8		6.5	0.25						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Corynoneura</i> spp.	5				5		5.7	0.14						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Thienemanniella xena</i>	1				1		8	0.04						
Arthropoda	Insecta	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	6				6		4.7	0.13						
Arthropoda	Insecta	Diptera	Tipulidae	Tipulidae spp.	12						4.9	0.28			12			
Arthropoda	Insecta	Diptera	Simuliidae	Simuliidae spp.	35						3.5	0.59			35			
Arthropoda	Insecta	Diptera	Empididae	<i>Hemerodromia</i> spp.	1					1	7.57	0.04			1			
Arthropoda	Insecta	Diptera	Dixidae	Dixidae spp.	1						2.55	0.01			1			
Arthropoda	Insecta	Heteroptera	Veliidae	<i>Rhagovelia</i> spp.	1						6	0.03			1			
Arthropoda	Insecta	Heteroptera	Veliidae	<i>Microvelia</i> spp.	2						6	0.06			2			
Arthropoda	Insecta	Megaloptera	Corydalidae	<i>Corydalis</i> spp.	2						5.16	0.05			2			
Arthropoda	Arachnida			Acariformes spp.	1							0.00			1			

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 28.04
Model % Plecoptera	5 5.00
Model % Trichoptera	10 26.84
Model % Chironomidae	20 6.12
Model % Coleoptera	10 3.30
Model % Oligochaeta	5 4.04
Model % Other	10 19.67
Sum of Difference	93.01
Sum of Difference * 0.5	46.51
Percent Model Affinity	53.49
Percent Model Affinity Category	Slightly Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	30	136.36	100.00
Total Abundance	209		
% Ephemeroptera	11.96	19.51	19.51
% Plecoptera	0.00		
% Trichoptera	36.84		
% Chironomidae	13.88	86.12	86.12
% Dominant Taxon	17.70		
Biotic Index	4.81	76.29	76.29
% Coleoptera	6.70		
% Oligochaeta	0.96		
% Other	29.67		
% Plecoptera + Trichoptera (less Hydropsychidae)	18.18	51.07	51.07
% Scrapers	4.31	8.35	8.35
% Top 2 Dominant Taxa	34.45	94.73	94.73
EPT Index	8	72.73	72.73
EPT/EPT + Chironomidae Ratio	0.78		

Hilsenhoff Biotic Index Category | Good

Final VSCI score | 63.60

Attachment 2
References

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- Merritt, R. W., K. W. Cummings and M. B. Berg. 2008. An introduction to the aquatic insects of North America. 4th ed. Kendall Hunt Publishing Company, Dubuque, IA.
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- Novak, M. A. and R. W. Bode. 1992. Percent model affinity: a new measure of macroinvertebrate community composition. *Journal of North American Benthological Society* 11 (1): 80-85.
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- Virginia Department of Environmental Quality. 2008. Biological monitoring program: quality assurance project plan for wadeable streams and rivers. Division of Water Quality, Office of Water Quality Monitoring and Assessment Programs, Richmond, VA.
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August 16, 2018

Mr. Benjamin Green
Wood Environment & Infrastructure Solutions, Inc.
14424 Albemarle Point Place, Suite 115
Chantilly, VA 20151

Subject: Prince William County Multiple Habitat Sampling Method Report
Wood Project No.: 15123000

Dear Mr. Green:

Wood Environment & Infrastructure Solutions, Inc. (Wood) (Gainesville office) completed benthic macroinvertebrate determinations for samples collected by Wood (Chantilly office), in May 2018. Wood (Gainesville office) received a total of six samples, one from each of the following locations: Cow Branch, Dawkins Branch, Little Bull Run, Neabsco Creek, Purcell Branch, and a duplicate sample from Purcell Branch. The results of the taxonomic analyses are presented in this report.

1.0 Multiple Habitat Sampling Method

1.1 Methods and Procedures

All samples collected by Wood, Chantilly office, in May 2018, were received by Wood's taxonomy laboratory at Newberry, Florida, where they were logged in and processed. The samples were sorted (i.e. organisms removed from debris) and organisms were identified and enumerated by a qualified taxonomist according to Section 7.2 of the U.S. Environmental Protection Agency's (USEPA) *"Rapid Bioassessment Protocol for Use in Wadeable Streams and Rivers"* (RBP) (Barbour *et al.*, 1999). Eight metrics were calculated including the Biotic Index, using guidance from Hilsenhoff (1987); the Percent Model Affinity (PMA), using guidance from Novak and Bode (1992); and the Virginia Stream Condition Index, using guidance from Virginia Department of Environmental Quality (2008). The scraper taxa and tolerance values were identified according to life history information from RBP (Barbour *et al.*, 1999); *"An Introduction to the Aquatic Insects of North America"* (Merritt *et al.*, 2008); *"Quality System Standard Operating Procedure for Macroinvertebrate Stream Surveys"* (Tennessee Department of Environment and Conservation, 2011); and *"Standard Operating Procedures for the Collection and Analysis of Benthic Macroinvertebrates"* (North Carolina Department of Environmental Quality, 2016). Quality assurance and quality control checks were conducted according to the EPA RBP on Laboratory Quality Control for Macroinvertebrate Taxonomic Identification (Barbour *et al.*, 1999). Quality assurance/quality control requirements for sample picking and taxonomic identification were conducted by a Wood Senior Taxonomist.

1.2 Benthic Macroinvertebrate Results

The benthic macroinvertebrate community data were used to generate metrics outlined in the Wood draft sampling plan. The Multiple Habitat Sampling assessments conducted for the six samples are summarized below in **Table 1**.



Table 1. Summary of Results of Multiple Habitat Samples

Metric	Site Locations					
	Cow Branch	Dawkins Branch	Little Bull Run	Neabsco Creek	Purcell Branch	Purcell Branch (duplicate)
Taxa Richness	34	46	31	28	32	46
Abundance	180	233	230	228	200	205
EPT Index	3	4	5	6	9	10
EPT/EPT + Chironomidae Ratio	0.22	0.14	0.29	0.31	0.11	0.14
Percent Dominant Taxon	15.56	26.18	19.57	48.25	30.50	23.41
Percent Chironomidae	55.00	21.89	44.35	26.75	77.00	67.32
Biotic Index (BI)	6.42	6.59	6.06	7.32	4.96	5.24
BI Category	Fair	Fairly Poor	Fair	Fairly Poor	Good	Good
Percent Model Affinity (PMA)	45.00	48.43	63.26	40.26	45.00	48.41
PMA Category	Moderately Impacted	Moderately Impacted	Slightly Impacted	Moderately Impacted	Moderately Impacted	Moderately Impacted
VSCI	40.61	48.25	52.47	42.94	48.40	53.85

Source: Wood, 2018

Prepared By: JSD

Checked By: SEM

Taxonomic identifications and abundances of the benthic macroinvertebrates and metric calculations for each sample are included in Attachment 1. References are listed in Attachment 2.

1.3 Corrigendum to Prince William County Multiple Habitat Sampling Report – Spring 2017

A few oligochaete worms found in two of the Spring 2017 samples were initially identified as *Nais pseudobtusa*. Other worms found in the Spring 2018 samples were identified as *Nais behningi*, a morphologically similar species found in the same genus. The Spring 2017 worms identified as *N. pseudobtusa* were compared with the Spring 2018 worms identified as *N. behningi* and were found to be the same. To figure out which species identification was correct, specimens from both the Spring 2017 and Spring 2018 samples were compared with *N. pseudobtusa* in our voucher collection and were not morphologically similar to this species. We concluded that the worms from the Spring 2017 samples were initially misidentified, and should have been identified as *N. behningi*. To further confirm this, we sent representative specimens to an outside expert and received confirmation that these worms were truly *N. behningi*. Because *N. behningi* has only a slightly different tolerance value as *N. pseudobtusa* (0.18 less), changing the identification to *N. behningi* and the corresponding tolerance values does not change the final calculated metrics for the two Spring 2017 samples that this species was found in (Neabsco Creek and Purcell Branch). The tabulated data for the Spring 2017 samples was revised to reflect the correct identification, and is included as Attachment 3.

Closing

We appreciate the opportunity to provide ecological services to you. Please do not hesitate to contact me if you have questions, or need to request further information. You can reach me by phone at (352) 333-3634, or via email at shannon.mcmorrow@woodplc.com.

Sincerely

Wood Environment & Infrastructure Solutions, Inc.



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Attachments:

- Attachment 1: Tabulated Data
- Attachment 2: References
- Attachment 3: Corrigendum to Spring 2017 Report



wood.

**Attachment 1
Tabulated Data**

Multiple Habitat Sampling
 Samples Collected 05/2018
 Project #: 151270003

Metrics	Site Locations					
	Cow Branch	Dawkins Branch	Little Bull Run	Neabsco Creek	Purcell Branch	Purcell Branch (duplicate)
Taxa Richness	34	46	31	28	32	46
Abundance	180	233	230	228	200	205
EPT Index	3	4	5	6	9	10
EPT/EPT + Chironomidae Ratio	0.22	0.14	0.29	0.31	0.11	0.14
Percent Dominant Taxon	15.56	26.18	19.57	48.25	30.50	23.41
Percent Chironomidae	55.00	21.89	44.35	26.75	77.00	67.32
Biotic Index (BI)	6.42	6.59	6.06	7.32	4.96	5.24
Biotic Index (BI) Category	Fair	Fairly Poor	Fair	Fairly Poor	Good	Good
Percent Model Affinity (PMA)	45.00	48.43	63.26	40.26	45.00	48.41
Percent Model Affinity (PMA) Category	Moderately Impacted	Moderately Impacted	Slightly Impacted	Moderately Impacted	Moderately Impacted	Moderately Impacted
VSCI	40.61	48.25	52.47	42.94	48.40	53.85

Created By: JSD
 Checked By: SEM
 Source: Wood, 2018

Cow Branch
 Multiple Habitat Sampling
 Sample Collected 05/01/2018
 Project #: 151270003

Results for Cow Branch

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Nemertea		Enopla		Hoplonemertea	Tetrastemmatidae	<i>Prostoma</i> spp.	1						6.1	0.03			1	0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	1						9.5	0.05		1		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	5						8.7	0.24		5		0		
Annelida		Clitellata	Oligochaeta	Lumbriculida	Lumbriculidae	Lumbriculidae spp.	5						7.03	0.20		5		0		
Annelida		Clitellata	Oligochaeta	Enchytraeida	Enchytraeidae	Enchytraeidae spp.	3						9.84	0.16		3		0		
Annelida		Clitellata	Oligochaeta	Opisthopora	Sparganophilidae	<i>Sparganophilus</i> spp.	8							0.00		8		0		
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Amphipoda	Crangonyctidae	<i>Stygobromus</i> spp.	1							0.00			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	Hydropsychidae spp.	1	1					4	0.02				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	11	11					6.6	0.40				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Hydropsyche betteni</i>	16	16					7.9	0.70				0		16
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Diptera spp.	Diptera spp.	3						7	0.12			3	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	7				7		6.2	0.24				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Chironomus</i> spp.	1				1		9.3	0.05				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tanytarsus buckleyi</i>	7				7		6.76	0.26				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Cryptochironomus</i> spp.	1				1		6.4	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum scalaenum</i> group	4				4		8.5	0.19				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum flavum</i>	11				11		5.7	0.35				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum illinoense</i> group	28				28	28	8.7	1.35				0		28
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exiguus</i> group	14				14		5.89	0.46				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Dicratendipes</i> spp.	2				2		7.2	0.08				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Orthocladius</i> spp.	10				10		4.4	0.24				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemanniella xena</i>	1				1		8	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tvetenia</i> spp.	4				4		3.65	0.08				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemanniella</i> grp. sp.	5				5		8.4	0.23				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Parametrioctonus</i> spp.	2				2		3.9	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	1				1		4.7	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Cricotopus</i> or <i>Orthocladius</i>	1				1		4.86	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Tipulidae	Tipulidae spp.	3						4.9	0.08			3	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	Simuliidae spp.	7						3.5	0.14			7	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Empididae	<i>Hemerodromia</i> spp.	11						7.57	0.46			11	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Lepidoptera	Lepidoptera spp.	Lepidoptera spp.	1						6	0.03			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Lepidoptera	Noctuidae	<i>Bellura</i> spp.	1							0.00			1	0		
Arthropoda	Hexapoda	Collembola		Poduromorpha	Neanuridae	<i>Sensillanura barberi</i>	1							0.00			1	0		
Nematoda						Nematoda spp.	2						5	0.06			2	0		

Percent Model Affinity		Difference from Model %
Model % Ephemeroptera	40	40.00
Model % Plecoptera	5	5.00
Model % Trichoptera	10	5.56
Model % Chironomidae	20	35.00
Model % Coleoptera	10	10.00
Model % Oligochaeta	5	7.22
Model % Other	10	7.22
Sum of Difference		110.00
Sum of Difference * 0.5		55.00
Percent Model Affinity		45.00
Percent Model Affinity Category		Moderately Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	34	154.55	100.00
Total Abundance	180		
% Ephemeroptera	0.00	0.00	0.00
% Plecoptera	0.00		
% Trichoptera	15.56		
% Chironomidae	55.00	45.00	45.00
% Dominant Taxon	15.56		
Biotic Index	6.42	52.63	52.63
% Coleoptera	0.00		
% Oligochaeta	12.22		
% Other	17.22		
% Plecoptera + Trichoptera (less Hydropsychidae)	0.00	0.00	0.00
% Scrapers	0.00	0.00	0.00
% Top 2 Dominant Taxa	24.44	109.18	100.00
EPT Index	3	27.27	27.27
EPT/EPT + Chironomidae Ratio	0.22		

Hilsenhoff Biotic Index Category | Fair

Final VSCI score | 40.61

Created By: JSD
 Checked By: SEM
 Source: Wood, 2018

Dawkins Branch
 Multiple Habitat Sampling
 Sample Collected 05/03/2018
 Project #: 151270003

Results for Dawkins Branch

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Platyhelminthes						Platyhelminthes spp.	16							0.00			16	0		
Nemertea		Enopla		Hoplonemertea	Tetrastemmatidae	<i>Prostoma</i> spp.	2						6.1	0.05			2	0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	1						9.5	0.04		1		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais</i> spp.	1						8.7	0.04			1	0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	61					61	8.7	2.28		61		0		61
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais pardalis</i>	10						8.7	0.37			10	0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Dero</i> spp.	1						9.8	0.04			1	0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Slavina appendiculata</i>	12						8.4	0.43			12	0		
Annelida		Clitellata	Oligochaeta	Enchytraeida	Enchytraeidae	Enchytraeidae spp.	2						9.84	0.08			2	0		
Annelida		Clitellata	Oligochaeta	Opisthoptera	Sparganophilidae	<i>Sparganophilus</i> spp.	2							0.00			2	0		
Mollusca		Gastropoda				Gastropoda spp.	2						7	0.06			2	0	2	
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Physidae	<i>Physella acuta</i>	1						8.84	0.04			1	0	1	
Mollusca		Bivalvia	Heterodonta	Veneroida	Corbiculidae	<i>Corbicula</i> spp.	1						6.12	0.03			1	0		
Mollusca		Bivalvia	Heterodonta	Veneroida	Sphaeriidae	Sphaeriidae spp.	2						6.6	0.06			2	0		
Mollusca		Bivalvia	Heterodonta	Veneroida	Sphaeriidae	<i>Sphaerium</i> spp.	3						7.2	0.09			3	0		
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Isopoda	Asellidae	<i>Caecidotea</i> spp.	1						8.4	0.04			1	0		
Arthropoda	Crustacea	Malacostraca	Eumalacostraca	Decapoda	Cambaridae	Cambaridae spp.	1						7.5	0.03			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	<i>Caenis</i> spp.	3	3					6.8	0.09				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	Coenagrionidae spp.	1						6.1	0.03			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	<i>Argia</i> spp.	1						8.3	0.04			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Aeshnidae	<i>Boyeria vinosa</i>	1						5.8	0.02			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera		Trichoptera spp.	1			1				0.00				1		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	1			1			6.6	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Hydropsyche betteni</i>	3			3			7.9	0.10				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Dubiraphia</i> spp.	2						5.5	0.05	2			0	2	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	26						5.6	0.62	26			0	26	26
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Haliplidae	<i>Pelodytes</i> spp.	1						8.73	0.04	1			0		
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Psephenidae	<i>Ectopria</i> spp.	1						4.16	0.02	1			0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Psephenidae	<i>Psephenus</i> spp.	1						2.35	0.01	1			0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera		Diptera spp.	5						7	0.15			5	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	5				5		6.2	0.13				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum flavum</i>	3				3		5.7	0.07				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum illinoense</i> group	7				7		8.7	0.26				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exiguus</i> group	7				7		5.89	0.18				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Dicrotendipes</i> spp.	1				1		7.2	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Orthocladus</i> spp.	2				2		4.4	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Parachironomus</i> spp.	1				1		8	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemannimyia</i> grp. sp.	7				7		8.4	0.25				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Parametrioctonus</i> spp.	6				6		3.9	0.10				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	4				4		4.7	0.08				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Cricotopus</i> or <i>Orthocladus</i>	8				8		4.86	0.17				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	Ceratopogonidae spp.	3						5.9	0.08				3	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	<i>Simulium</i> spp.	9						4.9	0.19				9	0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Empididae	<i>Hemerodromia</i> spp.	2						7.57	0.06				2	0	
Arthropoda	Chelicerata	Arachnida	Acari	Trombidiformes	Arrenuridae	<i>Arrenurus</i> spp.	1							0.00				1	0	
Arthropoda	Chelicerata	Arachnida	Acari	Trombidiformes	Hygrobatidae	<i>Hygrobates</i> spp.	1						8	0.03				1	0	

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 38.71
Model % Plecoptera	5 5.00
Model % Trichoptera	10 7.85
Model % Chironomidae	20 1.89
Model % Coleoptera	10 3.30
Model % Oligochaeta	5 33.63
Model % Other	10 12.75
Sum of Difference	103.13
Sum of Difference * 0.5	51.57
Percent Model Affinity	48.43
Percent Model Affinity Category	Moderately Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	46	209.09	100.00
Total Abundance	233		
% Ephemeroptera	1.29	2.10	2.10
% Plecoptera	0.00		
% Trichoptera	2.15		
% Chironomidae	21.89	78.11	78.11
% Dominant Taxon	26.18		
Biotic Index	6.59	50.19	50.19
% Coleoptera	13.30		
% Oligochaeta	38.63		
% Other	22.75		
% Plecoptera + Trichoptera (less Hydropsychidae)	0.43	1.21	1.21
% Scrapers	14.16	27.45	27.45
% Top 2 Dominant Taxa	37.34	90.55	90.55
EPT Index	4	36.36	36.36
EPT/EPT + Chironomidae Ratio	0.14		

Hilsenhoff Biotic Index Category: Fairly Poor

Final VSCI score: 48.25

Created By: JSD
 Checked By: SEM
 Source: Wood, 2018

Little Bull Run
 Multiple Habitat Sampling
 Sample Collected 05/03/2018
 Project #: 151270003

Results for Little Bull Run

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Platyhelminthes						Platyhelminthes spp.	13							0.00			13	0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	4						9.5	0.17		4		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	1						8.7	0.04		1		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais pardalis</i>	13						8.7	0.49		13		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Slavina appendiculata</i>	3						8.4	0.11		3		0		
Mollusca		Gastropoda	Heterobranchia	Hygrophila	Physidae	Physidae spp.	4						8	0.14			4	0	4	
Mollusca		Bivalvia	Heterodonta	Veneroida	Sphaeriidae	<i>Sphaerium</i> spp.	1						7.2	0.03			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	<i>Caenis</i> spp.	34	34					6.8	1.01				0		34
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	<i>Baetis</i> spp.	5	5					4.51	0.10				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Odonata	Coenagrionidae	Coenagrionidae spp.	1						6.1	0.03			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Leptoceridae	Leptoceridae spp.	1				1		4	0.02				1		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Leptoceridae	<i>Mystacides sepulchralis</i>	1				1		2.6	0.01				1		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	<i>Hydroptila</i> spp.	1				1		6.5	0.03				1	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Dubiraphia</i> spp.	5						5.5	0.12		5		0	5	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	28						5.6	0.68		28		0	28	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Psephenidae	<i>Psephenus</i> spp.	3						2.35	0.03		3		0	3	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Diptera spp.	Diptera spp.	2						7	0.06			2	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	6				6		6.2	0.16				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	7				7		6.6	0.20				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium flavum</i>	9				9		5.7	0.22				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedium illinoense</i> group	5				5		8.7	0.19				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exiguus</i> group	5				5		5.89	0.13				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Dicrotendipes</i> spp.	45				45	45	7.2	1.41				0		45
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Orthocladus</i> spp.	13				13		4.4	0.25				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	4				4		4.7	0.08				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Cricotopus</i> or <i>Orthocladus</i>	8				8		4.86	0.17				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	Ceratopogonidae spp.	2						5.9	0.05			2	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	<i>Simulium</i> spp.	1						4.9	0.02			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Empididae	<i>Hemerodromia</i> spp.	1						7.57	0.03			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Lepidoptera	Lepidoptera spp.	Lepidoptera spp.	1						6	0.03			1	0		
Nematoda						Nematoda spp.	3						5	0.07			3	0		

Percent Model Affinity		Difference from Model %
Model % Ephemeroptera	40	23.04
Model % Plecoptera	5	5.00
Model % Trichoptera	10	8.70
Model % Chironomidae	20	24.35
Model % Coleoptera	10	5.65
Model % Oligochaeta	5	4.13
Model % Other	10	2.61
Sum of Difference		73.48
Sum of Difference * 0.5		36.74
Percent Model Affinity		63.26
Percent Model Affinity Category		Slightly Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	31	140.91	100.00
Total Abundance	230		
% Ephemeroptera	16.96	27.66	27.66
% Plecoptera	0.00		
% Trichoptera	1.30		
% Chironomidae	44.35	55.65	55.65
% Dominant Taxon	19.57		
Biotic Index	6.06	57.91	57.91
% Coleoptera	15.65		
% Oligochaeta	9.13		
% Other	12.61		
% Plecoptera + Trichoptera (less Hydropsychidae)	1.30	3.66	3.66
% Scrapers	17.83	34.55	34.55
% Top 2 Dominant Taxa	34.35	94.87	94.87
EPT Index	5	45.45	45.45
EPT/EPT + Chironomidae Ratio	0.29		

Hilsenhoff Biotic Index Category Fair

Final VSCI score 52.47

Created By: JSD
 Checked By: SEM
 Source: Wood, 2018

Purcell Branch
 Multiple Habitat Sampling
 Sample Collected 05/04/2018
 Project #: 151270003

Results for Purcell Branch

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Naidinae spp.	1						6.1	0.03		1		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	110					110	8.7	4.20		110		0		110
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais pardalis</i>	2						8.7	0.08		2		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais behningi</i>	2						8.7	0.08		2		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Slavina appendiculata</i>	10						8.4	0.37		10		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Chaetogaster diaphanus</i>	2						4	0.04		2		0		
Annelida		Clitellata	Oligochaeta	Enchytraeida	Enchytraeidae	Enchytraeidae spp.	2						9.84	0.09		2		0		
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	Baetidae spp.	2	2					6.1	0.05				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	10				10		6.6	0.29				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Hydropsyche</i> spp.	2			2			4.3	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Hydropsyche betteni</i>	4			4			7.9	0.14				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Philopotamidae	Philopotamidae spp.	1			1			1.4	0.01				1		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Philopotamidae	<i>Chimarra</i> spp.	9			9			3.3	0.13				9		
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Ancyronyx variegatus</i>	2						6.8	0.06	2			0		2
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera		Diptera spp.	1						7	0.03			1		0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	3				3		6.2	0.08				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	1				1		6.6	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum flavum</i>	22				22		5.7	0.55				0		22
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum illinoense</i> group	8				8		8.7	0.31				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exiguus</i> group	3				3		5.89	0.08				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Orthocladus</i> spp.	5				5		4.4	0.10				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemanniella xena</i>	2				2		8	0.07				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Parametriocnemus</i> spp.	3				3		3.9	0.05				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	10				10		4.7	0.21				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Cricotopus</i> or <i>Orthocladus</i>	4				4		4.86	0.09				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Tipulidae	Tipulidae spp.	2						4.9	0.04			2		0	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	<i>Simulium</i> spp.	3						4.9	0.06			3		0	
Nematoda						Nematoda spp.	2						5	0.04			2		0	

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 39.12
Model % Plecoptera	5 5.00
Model % Trichoptera	10 1.40
Model % Chironomidae	20 6.75
Model % Coleoptera	10 9.12
Model % Oligochaeta	5 51.58
Model % Other	10 6.49
Sum of Difference	119.47
Sum of Difference * 0.5	59.74
Percent Model Affinity	40.26
Percent Model Affinity Category	Moderately Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	28	127.27	100.00
Total Abundance	228		
% Ephemeroptera	0.88	1.43	1.43
% Plecoptera	0.00		
% Trichoptera	11.40		
% Chironomidae	26.75	73.25	73.25
% Dominant Taxon	48.25		
Biotic Index	7.32	39.46	39.46
% Coleoptera	0.88		
% Oligochaeta	56.58		
% Other	3.51		
% Plecoptera + Trichoptera (less Hydropsychidae)	4.39	12.32	12.32
% Scrapers	0.88	1.70	1.70
% Top 2 Dominant Taxa	57.89	60.85	60.85
EPT Index	6	54.55	54.55
EPT/EPT + Chironomidae Ratio	0.31		

Hilsenhoff Biotic Index Category Fairly Poor

Final VSCI score 42.94

Created By: JSD
 Checked By: SEM
 Source: Wood, 2018

Purcell Branch
 Multiple Habitat Sampling
 Sample Collected 05/04/2018
 Project #: 151270003

Results for Purcell Branch

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	1						9.5	0.05		1		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	4						8.7	0.17		4		0		
Mollusca		Gastropoda				Gastropoda spp.	2						7	0.07			2	0	2	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	Baetidae spp.	6	6					6.1	0.18				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	Heptageniidae spp.	1		1				4	0.02				0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	<i>Maccoffertium</i> spp.	2		2				3.15	0.03				0	2	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	Hydropsychidae spp.	1			1			4	0.02				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	1			1			6.6	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Hydropsyche</i> spp.	1			1			4.3	0.02				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Diplectrona modesta</i>	1			1			2.3	0.01				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Philopotamidae	<i>Chimarra</i> spp.	4			4			3.3	0.07				4		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Thremmatidae	<i>Neophylax</i> spp.	3			3			1.6	0.02				3		
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	9						5.6	0.25	9			0	9	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Macronychus glabratus</i>	1						4.7	0.02	9			0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	6				6		6.2	0.19				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum flavum</i>	33				33		5.7	0.94				0		33
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum illinoense</i> group	1				1		8.7	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exiguus</i> group	7				7		5.89	0.21				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Dicrotendipes</i> spp.	1				1		7.2	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Orthocladus</i> spp.	12				12		4.4	0.26				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemanniella xena</i>	5				5		8	0.20				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tvetenia</i> spp.	2				2		3.65	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemanimyia</i> grp. sp.	1				1		8.4	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Parametriocnemus</i> spp.	61				61	61	3.9	1.19				0		61
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	11				11		4.7	0.26				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Cricotopus</i> or <i>Orthocladus</i>	10				10		4.86	0.24				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Diplocladius cultriger</i>	1				1		8	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Nilotanytus</i> spp.	3				3		4.1	0.06				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Tipulidae	<i>Tipula</i> spp.	1						7.5	0.04			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	<i>Simulium</i> spp.	5						4.9	0.12			5	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Megaloptera	Corydalidae	<i>Corydalis cornutus</i>	2						5.2	0.05			2	0		
Nematoda						Nematoda spp.	1						5	0.03			1	0		

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 35.50
Model % Plecoptera	5 5.00
Model % Trichoptera	10 4.50
Model % Chironomidae	20 57.00
Model % Coleoptera	10 1.00
Model % Oligochaeta	5 2.50
Model % Other	10 4.50
Sum of Difference	110.00
Sum of Difference * 0.5	55.00
Percent Model Affinity	45.00
Percent Model Affinity Category	Moderately Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	32	145.45	100.00
Total Abundance	200		
% Ephemeroptera	4.50	7.34	7.34
% Plecoptera	0.00		
% Trichoptera	5.50		
% Chironomidae	77.00	23.00	23.00
% Dominant Taxon	30.50		
Biotic Index	4.96	74.09	74.09
% Coleoptera	9.00		
% Oligochaeta	2.50		
% Other	5.50		
% Plecoptera + Trichoptera (less Hydropsychidae)	3.50	9.83	9.83
% Scrapers	7.50	14.53	14.53
% Top 2 Dominant Taxa	47.00	76.59	76.59
EPT Index	9	81.82	81.82
EPT/EPT + Chironomidae Ratio	0.11		

Hilsenhoff Biotic Index Category | Good

Final VSCI score | 48.40

Created By: JSD
 Checked By: SEM
 Source: Wood, 2018

Purcell Branch (duplicate)
 Multiple Habitat Sampling
 Sample Collected 05/04/2018
 Project #: 151270003

Results for Purcell Branch (duplicate)

Phylum	Subphylum	Class	Subclass	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	Tubificinae spp.	1						9.5	0.05		1		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais communis</i>	6						8.7	0.25		6		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais parvialis</i>	1						8.7	0.04		1		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Nais behningi</i>	9						8.7	0.38		9		0		
Annelida		Clitellata	Oligochaeta	Tubificida	Naididae	<i>Slavina appendiculata</i>	1						8.4	0.04		1		0		
Annelida		Aphanoneura			Aeolosomatidae	<i>Aeolosoma</i> spp.	1						4	0.02		1		0		
Mollusca		Gastropoda				Gastropoda spp.	2						7	0.07			2	0	2	
Mollusca		Bivalvia	Heterodonta	Veneroida	Sphaeriidae	Sphaeriidae spp.	1						6.6	0.03		1		0		
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Caenidae	<i>Caenis</i> spp.	1	1					6.8	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	Baetidae spp.	7	7					6.1	0.21				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Baetidae	<i>Baetis</i> spp.	5	5					4.51	0.11				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	Heptageniidae spp.	2	2					4	0.04				0	2	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Heptageniidae	<i>Maccaffertium</i> spp.	2	2					3.15	0.03				0	2	
Arthropoda	Hexapoda	Insecta	Pterygota	Ephemeroptera	Ephemerellidae	<i>Eurylophella</i> spp.	1	1					4	0.02				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydropsychidae	<i>Cheumatopsyche</i> spp.	1			1			6.6	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Hydroptilidae	<i>Hydroptila</i> spp.	1			1			6.5	0.03				1	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Philopotamidae	<i>Chimarra</i> spp.	1			1			3.3	0.02				1		
Arthropoda	Hexapoda	Insecta	Pterygota	Trichoptera	Thremmatidae	<i>Neophylax</i> spp.	2			2			1.6	0.02				2		
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Dubiraphia</i> spp.	1						5.5	0.03	1			0	1	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Elmidae	<i>Stenelmis</i> spp.	9						5.6	0.25	9			0	9	
Arthropoda	Hexapoda	Insecta	Pterygota	Coleoptera	Psephenidae	<i>Psephenus</i> spp.	2						2.35	0.02	2			0	2	
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Diptera spp.	Diptera spp.	1						7	0.03			1	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	Chironomidae spp.	8				8		6.2	0.24				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Cladotanytarsus</i> spp.	1				1		4	0.02				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tanytarsus</i> spp.	2				2		6.6	0.06				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum halterale</i> group	1				1		7.4	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Polypedilum flavum</i>	16				16		5.7	0.44				0		16
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheotanytarsus exiguus</i> group	7				7		5.89	0.20				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Ablabesmyia mallochii</i>	1				1		7.4	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Dicrotendipes</i> spp.	3				3		7.2	0.11				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Corynoneura</i> spp.	3				3		5.7	0.08				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Orthocladius</i> spp.	8				8		4.4	0.17				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemanniella xena</i>	3				3		8	0.12				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Tvetenia</i> spp.	4				4		3.65	0.07				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Thienemannimyia</i> grp. sp.	1				1		8.4	0.04				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Parametricnemus</i> spp.	48				48	48	3.9	0.91				0		48
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Rheocricotopus</i> spp.	10				10		4.7	0.23				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Paratendipes</i> spp.	1				1		5.6	0.03				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Cricotopus</i> or <i>Orthocladius</i>	12				12		4.86	0.28				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Chironomidae	<i>Nilotanytus</i> spp.	9				9		4.1	0.18				0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Ceratopogonidae	Ceratopogonidae spp.	2						5.9	0.06			2	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Simuliidae	<i>Simulium</i> spp.	3						4.9	0.07			3	0		
Arthropoda	Hexapoda	Insecta	Pterygota	Diptera	Empididae	Empididae spp.	1						7.6	0.04			1	0		
Arthropoda	Hexapoda	Collembola				Collembola spp.	1						10	0.05			1	0		
Arthropoda	Chelicerata	Arachnida	Acari	Trombidiformes	Sperchonidae	<i>Sperchonopsis</i> spp.	1							0.00			1	0		
Arthropoda	Chelicerata	Arachnida	Acari	Sarcoptiformes		Oribatida spp.	1							0.00			1	0		

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 31.22
Model % Plecoptera	5 5.00
Model % Trichoptera	10 7.56
Model % Chironomidae	20 47.32
Model % Coleoptera	10 4.15
Model % Oligochaeta	5 4.27
Model % Other	10 3.66
Sum of Difference	103.17
Sum of Difference * 0.5	51.59
Percent Model Affinity	48.41
Percent Model Affinity Category	Moderately Impacted

Metric	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	46	209.09	100.00
Total Abundance	205		
% Ephemeroptera	8.78	14.32	14.32
% Plecoptera	0.00		
% Trichoptera	2.44		
% Chironomidae	67.32	32.68	32.68
% Dominant Taxon	23.41		
Biotic Index	5.24	70.06	70.06
% Coleoptera	5.85		
% Oligochaeta	9.27		
% Other	6.34		
% Plecoptera + Trichoptera (less Hydropsychidae)	1.95	5.48	5.48
% Scrapers	9.27	17.96	17.96
% Top 2 Dominant Taxa	31.22	99.39	99.39
EPT Index	10	90.91	90.91
EPT/EPT + Chironomidae Ratio	0.14		

Hilsenhoff Biotic Index Category | Good

Final VSCI score | 53.85

Created By: JSD
 Checked By: SEM
 Source: Wood, 2018



wood.

**Attachment 2
References**

Attachment 2 - References

- Barbour, M. T., J. Gerritsen, B. D. Snyder and J. B. Stribling. 1999. Rapid bioassessment protocols for use in wadeable streams and rivers: periphyton, benthic macroinvertebrates, and fish. 2nd ed. EPA 841-B-99-002. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.
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- Merritt, R. W., K. W. Cummings and M. B. Berg. 2008. An introduction to the aquatic insects of North America. 4th ed. Kendall Hunt Publishing Company, Dubuque, IA.
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- Virginia Department of Environmental Quality. 2008. Biological monitoring program: quality assurance project plan for wadeable streams and rivers. Division of Water Quality, Office of Water Quality Monitoring and Assessment Programs, Richmond, VA.



**Attachment 3
Corrigendum to Spring 2017 Report
Revised Tabulated Data**

Multi-Point Sampling
 Sampling Protocol
 Project

Metrics	Site Locations				
	Cow Branch	Dawkins Branch	Little Bull Run	Neabsco Creek	Purcell Branch
Taxa Richness	22	24	27	33	28
Abundance	161	190	193	161	167
EPT Index	3	5	2	6	4
EPT/EPT + Chironomidae Ratio	0.14	0.09	0.08	0.22	0.03
Percent Dominant Taxon	42.24	47.37	28.50	17.39	26.95
Percent Chironomidae	43.48	61.05	57.51	51.55	68.26
Biotic Index (BI)	6.54	5.15	6.10	5.96	5.28
Biotic Index (BI) Category	Fairly Poor	Good	Fair	Fair	Good
Percent Model Affinity (PMA)	37.42	50.79	49.33	48.91	39.67
Percent Model Affinity (PMA) Category	Moderately Impacted	Slightly Impacted	Moderately Impacted	Moderately Impacted	Moderately Impacted
VSCI	37.17	39.85	38.66	47.03	41.72

Branch
 Multi--at Sa-ling
 Sa--oll-ct-d
 ro-ct

ult or Branch

Phylum	Class	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Annelida	Clitellata	Tubificida	Naididae	Tubificinae spp.	1						6.1	0.04		1				
Annelida	Clitellata	Tubificida	Naididae	Naidinae spp.	1							0.00		1				
Annelida	Clitellata	Tubificida	Naididae	Nais communis	68					68	8.7	3.67		68				68
Annelida	Clitellata	Opisthopora	Sparganophilidae	Sparganophilus spp.	1							0.00		1				
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche spp.	7			7			6.6	0.29						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Macrostemum spp.	1			1			3.4	0.02						
Arthropoda	Insecta	Trichoptera	Hydroptilidae	Hydroptila spp.	3			3			6.5	0.12				3		
Arthropoda	Insecta	Coleoptera	Elmidae	Dubiraphia spp.	1						5.5	0.03	1					
Arthropoda	Insecta	Coleoptera	Elmidae	Microcyloepus spp.	1						4	0.02	1					
Arthropoda	Insecta	Coleoptera	Dytiscidae	Uvarus spp.	1						8	0.05	1					
Arthropoda	Insecta	Diptera	Chironomidae	Chironomidae spp.	4				4		6	0.15						
Arthropoda	Insecta	Diptera	Chironomidae	Chironomus spp.	1				1		9.3	0.06						
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum flavum	1				1		5.7	0.04						
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum illinoense group	2				2		8.7	0.11						
Arthropoda	Insecta	Diptera	Chironomidae	Dicrotendipes spp.	1				1		7.2	0.04						
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius spp.	21				21		4.4	0.57						
Arthropoda	Insecta	Diptera	Chironomidae	Thienemanniella xena	3				3		8	0.15						
Arthropoda	Insecta	Diptera	Chironomidae	Parametrioctonus spp.	3				3		3.9	0.07						
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus spp.	5				5		4.7	0.15						
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus or Orthocladius	29				29		4.1	0.74						29
Arthropoda	Insecta	Diptera	Simuliidae	Simulium spp.	1						4.4	0.03			1			
Arthropoda	Insecta	Diptera	Empididae	Hemerodromia spp.	5						6	0.19			5			

Percent Model Affinity	Difference from Model %
Model % Ephemeroptera	40 40.00
Model % Plecoptera	5 5.00
Model % Trichoptera	10 3.17
Model % Chironomidae	20 23.48
Model % Coleoptera	10 8.14
Model % Oligochaeta	5 39.10
Model % Other	10 6.27
Sum of Difference	125.16
Sum of Difference * 0.5	62.58
Percent Model Affinity	
100 - (Sum of Difference * 0.5)	37.42
Percent Model Affinity Category	Moderately Impacted

	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	22	100.00	100.00
Total Abundance	161		
% Ephemeroptera	0.00	0.00	0.00
% Plecoptera	0.00		
% Trichoptera	6.83		
% Chironomidae	43.48	56.52	56.52
% Dominant Taxon	42.24		
Biotic Index	6.54	50.90	50.90
% Coleoptera	1.86		
% Oligochaeta	44.10		
% Other	3.73		
% Plecoptera + Trichoptera (less Hydropsychidae)	1.86	5.23	5.23
% Scrapers	0.00	0.00	0.00
% Top 2 Dominant Taxa	60.25	57.44	57.44
EPT Index	3	27.27	27.27
EPT/EPT + Chironomidae Ratio	0.14		

Hilsenhoff Biotic Index Category	Fairly Poor
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Final VSCI score	37.17
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Little Bull Run
 Multi-Station Sampling
 Sample Collection
 Project

Report for Little Bull Run

Phylum	Class	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Platyhelminthes				Platyhelminthes spp.	2							0.00			2			
Annelida	Clitellata	Tubificida	Naididae	Tubificinae spp.	1						6.1	0.03		1				
Annelida	Clitellata	Tubificida	Naididae	Pristina osborni	1						9.56	0.05		1				
Annelida	Clitellata	Tubificida	Naididae	Nais pardalis	6						8.7	0.27		6				
Mollusca	Gastropoda	Hygrophila	Physidae	Physella spp.	24						8.84	1.10			24			24
Mollusca	Gastropoda	Hygrophila	Planorbidae	Planorbella scalaris	1						6.82	0.04			1			
Mollusca	Bivalvia	Veneroida	Corbiculidae	Corbicula fluminea	2						6.6	0.07			2			
Arthropoda	Insecta	Ephemeroptera	Caenidae	Caenis spp.	7	7					6.8	0.25						
Arthropoda	Insecta	Odonata	Coenagrionidae	Coenagrionidae spp.	1						6.1	0.03			1			
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche spp.	3			3			6.6	0.10						
Arthropoda	Insecta	Coleoptera	Elmidae	Dubiraphia spp.	11						5.5	0.31	11					
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis spp.	16						5.6	0.46	16					
Arthropoda	Insecta	Coleoptera	Psephenidae	Psephenus spp.	2						2.35	0.02	2					
Arthropoda	Insecta	Diptera	Chironomidae	Chironomidae spp.	9				9		6	0.28						
Arthropoda	Insecta	Diptera	Chironomidae	Chironomus spp.	3				3		9.3	0.14						
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus spp.	4				4		6.6	0.14						
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum scalaenum group	1				1		8.5	0.04						
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus exiguus group	3				3		6.5	0.10						
Arthropoda	Insecta	Diptera	Chironomidae	Dicrotendipes spp.	3				3		7.2	0.11						
Arthropoda	Insecta	Diptera	Chironomidae	Stenochironomus spp.	1				1		6.4	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura spp.	1				1		6.01	0.03						
Arthropoda	Insecta	Diptera	Chironomidae	Thienemanniella xena	23				23		8	0.95						
Arthropoda	Insecta	Diptera	Chironomidae	Nanocladius spp.	1				1		7.2	0.04						
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus spp.	7				7		4.7	0.17						
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus or Orthocladius	55				55	55	4.1	1.17						55
Arthropoda	Insecta	Diptera	Ceratopogonidae	Ceratopogonidae spp.	2						5.7	0.06			2			
Arthropoda	Insecta	Diptera	Empididae	Hemerodromia spp.	3						6	0.09			3			

Percent Model Affinity		Difference from Model %
Model % Ephemeroptera	40	36.37
Model % Plecoptera	5	5.00
Model % Trichoptera	10	8.45
Model % Chironomidae	20	37.51
Model % Coleoptera	10	5.03
Model % Oligochaeta	5	0.85
Model % Other	10	8.13
Sum of Difference		101.35
Sum of Difference * 0.5		50.67
Percent Model Affinity 100 - (Sum of Difference * 0.5)		49.33
Percent Model Affinity Category		Moderately Impacted

	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	27	122.73	100.00
Total Abundance	193		
% Ephemeroptera	3.63	5.92	5.92
% Plecoptera	0.00		
% Trichoptera	1.55		
% Chironomidae	57.51	42.49	42.49
% Dominant Taxon	28.50		
Biotic Index	6.10	57.33	57.33
% Coleoptera	15.03		
% Oligochaeta	4.15		
% Other	18.13		
% Plecoptera + Trichoptera (less Hydropsychidae)	0.00	0.00	0.00
% Scrapers	0.00	0.00	0.00
% Top 2 Dominant Taxa	40.93	85.36	85.36
EPT Index	2	18.18	18.18
EPT/EPT + Chironomidae Ratio	0.08		

Hilsenhoff Biotic Index Category	Fair
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Final VSCI score	38.66
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Curculionid Branch
 Multi-trophic Sampling
 Sampling Method
 Project

Output for Curculionid Branch

Phylum	Class	Order	Family	Taxa	Raw Abundance	Ephemeroptera	Plecoptera	Trichoptera	Chironomidae	Dominant Taxon	Tolerance Values	Tolerance Values * Individual Abundance/Total Abundance	Coleoptera	Oligochaeta	Other	Plecoptera & Trichoptera (less Hydropsychidae)	Scrapers	Top 2 Dominant Taxa
Annelida	Clitellata	Tubificida	Naididae	Tubificinae spp.	11						6.1	0.40		11				
Annelida	Clitellata	Tubificida	Naididae	Nais communis	3						8.7	0.16		3				
Annelida	Clitellata	Tubificida	Naididae	Nais pardalis	2						8.7	0.10		2				
Annelida	Clitellata	Tubificida	Naididae	Nais behningi	6						8.7	0.31		6				
Annelida	Clitellata	Enchytraeida	Enchytraeidae	Enchytraeidae spp.	1						10	0.06		1				
Arthropoda	Insecta	Ephemeroptera	Baetidae	Baetidae spp.	10	1					4	0.24						
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Maccaffertium spp.	2	1					3.15	0.04						
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche spp.	1			1			4	0.02						
Arthropoda	Insecta	Trichoptera	Hydroptilidae	Hydroptila spp.	2			1			6.5	0.08				2		
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis spp.	8						5.6	0.27	8					
Arthropoda	Insecta	Coleoptera	Psephenidae	Psephenus spp.	1						2.35	0.01	1					
Arthropoda	Insecta	Diptera	Chironomidae	Chironomidae spp.	6				6		6	0.22						
Arthropoda	Insecta	Diptera	Chironomidae	Cladotanytarsus spp.	1				1		4	0.02						
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus spp.	2				2		6.6	0.08						
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum scalaenum group	2				2		8.5	0.10						
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum flavum	2				2		5.7	0.07						
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum illinoense group	1				1		8.7	0.05						
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus exiguus group	4				4		6.5	0.16						
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura spp.	4				4		6.01	0.14						
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius spp.	12				12		4.4	0.32						
Arthropoda	Insecta	Diptera	Chironomidae	Thienemanniella xena	2				2		8	0.10						
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia grp. sp.	9				9		8.4	0.45						
Arthropoda	Insecta	Diptera	Chironomidae	Parametricnemus spp.	17				17		3.9	0.40						17
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus spp.	7				7		4.7	0.20						
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus or Orthocladius	45				45	45	4.1	1.10						45
Arthropoda	Insecta	Diptera	Ceratopogonidae	Ceratopogonidae spp.	2						5.7	0.07				2		
Arthropoda	Insecta	Diptera	Tipulidae	Tipulidae spp.	1						4.9	0.03				1		
Arthropoda	Insecta	Diptera	Simuliidae	Simulium spp.	3						4.4	0.08				3		

Percent Model Affinity		Difference from Model %
Model % Ephemeroptera	40	38.80
Model % Plecoptera	5	5.00
Model % Trichoptera	10	8.80
Model % Chironomidae	20	48.26
Model % Coleoptera	10	4.61
Model % Oligochaeta	5	8.77
Model % Other	10	6.41
Sum of Difference		120.66
Sum of Difference * 0.5		60.33
Percent Model Affinity		
100 - (Sum of Difference * 0.5)		39.67
Percent Model Affinity Category		Moderately Impacted

	Value	VSCI metrics	Adjusted VSCI metrics
Species Richness	28	127.27	100.00
Total Abundance	167		
% Ephemeroptera	1.20	1.95	1.95
% Plecoptera	0.00		
% Trichoptera	1.20		
% Chironomidae	68.26	31.74	31.74
% Dominant Taxon	26.95		
Biotic Index	5.28	69.46	69.46
% Coleoptera	5.39		
% Oligochaeta	13.77		
% Other	3.59		
% Plecoptera + Trichoptera (less Hydropsychidae)	1.20	3.36	3.36
% Scrapers	0.00	0.00	0.00
% Top 2 Dominant Taxa	37.13	90.86	90.86
EPT Index	4	36.36	36.36
EPT/EPT + Chironomidae Ratio	0.03		

Hilsenhoff Biotic Index Category	Good
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Final VSCI score	41.72
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To: Robert Jocz, Environmental Engineer, Prince William County
 From: Lynne Mowery, Amec Foster Wheeler
 Cc:
 Date: 2/5/16
 Re: Site Reconnaissance Technical Memorandum

Prince William County (County) is required to conduct biological stream monitoring through Section I.C.1 of its MS4 permit, dated December 17, 2014. The permit requires the County to monitor five stream sites twice per year using an approach based on ‘USEPA’s Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers’ (RBP). The monitoring shall include an assessment of the benthic macroinvertebrate community and habitat assessment.

The County has selected five sites for biological monitoring that correspond to the locations of its stream monitoring program:

- A. Cow Branch at Mellot Road
- B. Neabsco Creek at Delaney Road
- C. Purcell Branch at Purcell Road
- D. Dawkins Branch at Wellington Road
- E. Little Bull Run at Catharpin Road

Amec Foster Wheeler staff conducted site reconnaissance visits during the week of 12/14/15, and selected five sampling locations pending County approval. Prior to conducting site visits, Amec Foster Wheeler developed a site evaluation protocol based on the RBP. This protocol incorporates three components used to characterize water quality within a watershed: (1) physical and chemical data, (2) habitat assessment, and (3) benthic macroinvertebrate collection. These initial reconnaissance visits focused on the first two components since they are indicative of a stream reach’s suitability for supporting a diverse aquatic community.

Amec Foster Wheeler completed a desktop analysis of the five proposed sites prior to conducting site reconnaissance. This included delineating total catchment area draining to each stream branch, characterizing the surrounding land use, and identifying potential ‘problem areas’ along each stream reach that could be the result of tributaries and stormwater outfalls.

Before conducting a habitat evaluation at each site, site investigators identified a stream reach located greater than 100 meters upstream from road crossings or major tributaries that contained a variety of habitat types. Site evaluations involved recording representative measurements of physical channel characteristics (width, depth, velocity) and completing a ‘baseline’ habitat assessment *according to RBP Appendix A-1: Habitat Assessment and Physicochemical Characterization Field Data Sheets*. These habitat assessments are designed to allow an assessor to objectively score each stream on a number of parameters (e.g. bank stability, velocity/depth regime, channel alteration, etc.) which evaluate the stream’s suitability to support a diverse aquatic community representative of water quality throughout its contributing catchment. These baseline analyses were compiled within Amec Foster Wheeler’s database and will inform future water quality investigations at these monitoring sites.

Suitable monitoring reaches spanning greater than 100 meters were identified at each of the County-recommended sites, though Amec Foster Wheeler has offered alternative initial sampling points due to field observations of contributing features surrounding the stream within the upstream, downstream, or riparian areas.

Appendix A: Site Recommendations

Location	Little Bull Run; Gainesville (sampled 12/14)
Accessibility	Via roadway, wide shoulder at crossing.
Surrounding Landscape	High density development and golf courses immediately surrounding site. Upstream representative reach is heavily forested.
Instream Conditions	Sanitary sewer crossing immediately upstream of bridge creates a backwater effect. Upstream reach has good mix of riffles and runs.
Recommended Site	Upstream from bridge and sewer crossing backwater.
Other	Potential illicit discharge – foamy deposit observed.

Location	Dawkins Branch; Manassas (sampled 12/14)
Accessibility	Via roadway, pull off point to gated entry. Site has been used for illegal dumping (TV and refuse observed).
Surrounding Landscape	Surrounding industrial/commercial land use. Construction contractor storage site downstream of representative reach where silt fence appears to be only partially effective.
Instream Conditions	Beaver dam upstream of representative reach which acts as additional in-line detention. Dam is susceptible to overtopping and breaching during larger storm events. Downstream reach is starved of sediment during periods of lower flow due to the trapping efficiency of the beaver dam. Additional flow impediments downstream such as LWD in channel.
Recommended Site	Downstream from beaver dam. May be subject to influence from large sediment slug flows following dam rupture.
Other	Unmapped outfall discovered downstream from representative reach, unknown contribution from surrounding development.

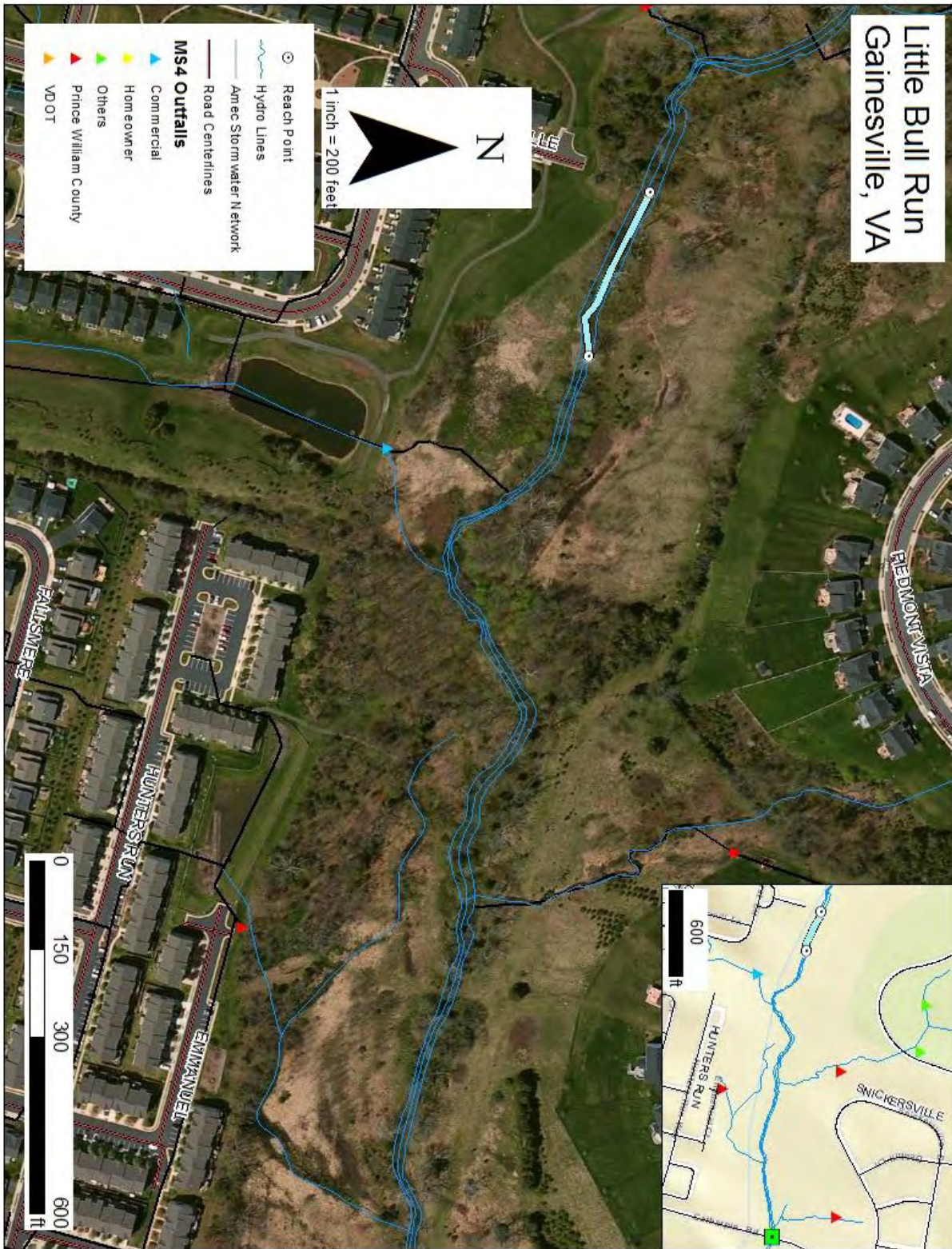
Location	Purcell Branch; Manassas (sampled 12/16)
Accessibility	Via roadway, wide shoulder after bridge.
Surrounding Landscape	Old agricultural fencing is evidence of previous land usage as pasture. Surrounding watershed contains low density development and forested areas.
Instream Conditions	Banks are severely incised (>2m) at first bend, apparently resulting from stormwater drainage from residential development outfall. Old silt fencing visible along bank. Long, deep run lies upstream, containing significant leaf pack and numerous fish. Suitable stretch identified upstream from deeper run, with mixture of riffles, runs, and pools.
Recommended Site	Representative reach lies ~1/4 mile upstream from county-recommended site, but other reaches do not capture habitat diversity.
Other	Some stormwater outfalls downstream of recommended site, but site is >100m from potential mixing points.

Location	Neabsco Creek; Dale City / Woodbridge (sampled 12/16)
Accessibility	Accessed via trail at end of Savannah Drive, limited public parking available.
Surrounding Landscape	Watershed contains highest proportion of forested to developed area.
Instream Conditions	Well forested riparian border provides ideal bank conditions, and best-observed habitat variability. Furthest downstream reach has a sanitary sewer crossing creating a backwater area, also fed by heavily incised urban stream and the accompanying sediment. Little to no fish observed in reach despite habitat variability, likely due to presence of sewer crossing acting as migration barrier
Recommended Site	Upstream from backwater area.
Other	Insignificant contributions from outfalls running down into stream valley.

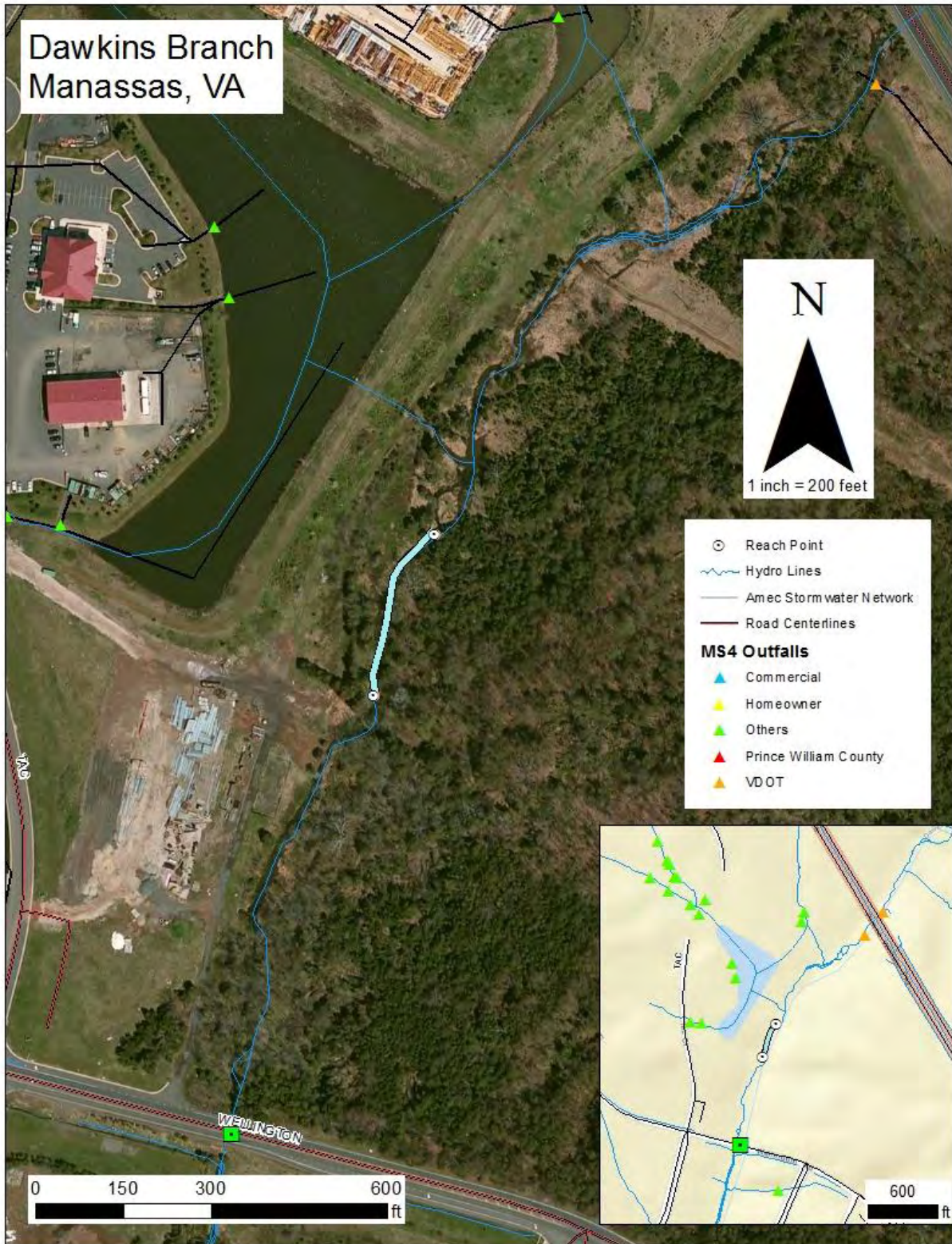
Location	Cow Branch; Woodbridge (sampled 12/16)
Accessibility	Mellot Road is private drive, but property owner indicated we had permission. Future notification is recommended.
Surrounding Landscape	Rapidly developed high-density housing contributes high volume and intensity of stormwater runoff.
Instream Conditions	Evidence of heavy bank armoring using VDOT CLASS I & II riprap along majority of branch between Opitz Blvd. and Jefferson Davis Hwy. Heavily armored banks, denuded riparian area upstream from bridge at Mellot Rd. Stormwater outfall proximity is unfavorable to benthic macroinvertebrate sampling. Habitat downstream of bridge is more suitable, with a mature forested riparian area.
Recommended Site	~200m downstream from bridge provides adequate habitat variety, although macroinvertebrate population likely to be smaller due to recent restoration efforts.
Other	Has any benthic monitoring of the recommended reach been conducted before or after recent stream restoration?

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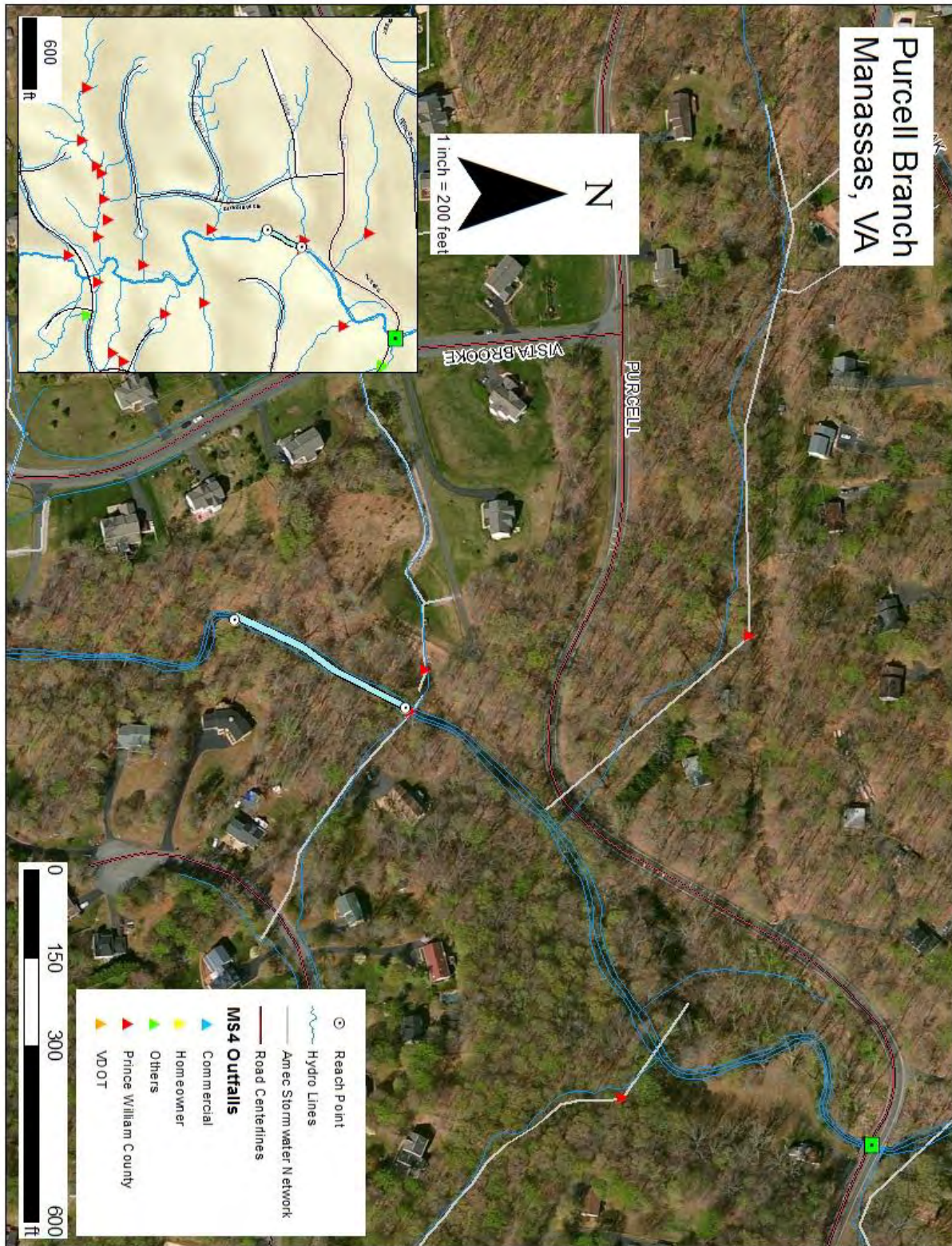
Appendix B: Site Maps



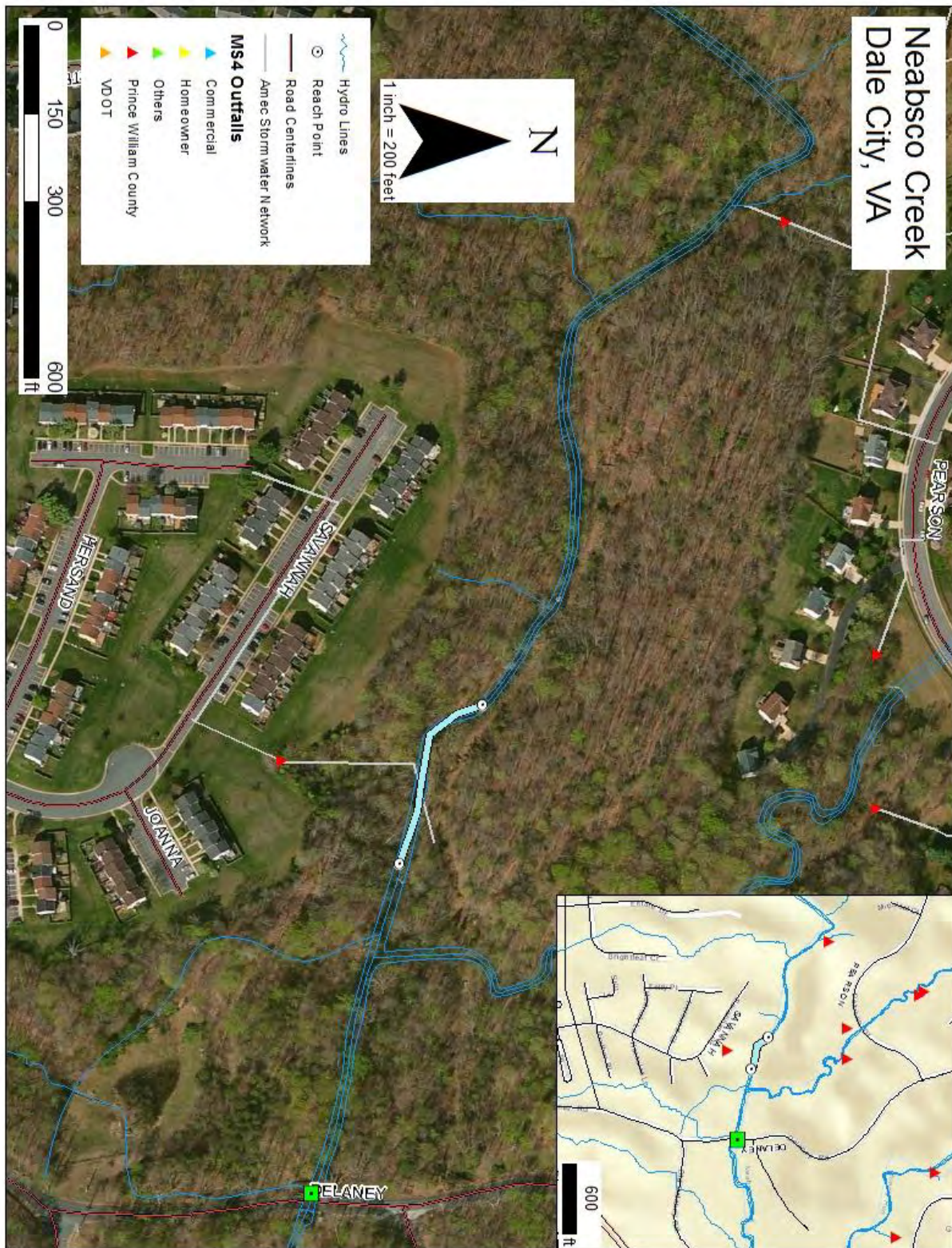
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Appendix C: Site Photos

Little Bull Run



Figure 1: Backwater area created by sanitary sewer crossing. Sampling reach lies upstream.



Figure 2: Looking upstream at beginning of sampling reach along the riffle consisting of larger gravel, cobble, and bedrock.



Figure 3: Looking downstream near beginning of sampling reach along the riffle containing large gravel, cobble, and bedrock.

Dawkins Branch



Figure 4: Large woody debris downstream from sampling reach.



Figure 5: Looking upstream near beginning of sampling reach.



Figure 6: Upstream from initial sampling point.



Figure 7: Looking downstream towards Figure 6.



Figure 8: Construction contractor storage site adjacent to stream reach. Site was contributing noticeable amount of silt to stream.

Purcell Branch



Figure 9: Stream bank incision >6 feet (vertical instability) from bed. Photo was taken downstream from sampling reach.



Figure 10: Upstream view of large pool filled with leaf pack. Photo was taken downstream of sampling reach.



Figure 11: Past leaf-packed pool, looking upstream towards initial sampling point.



Figure 12: Bank incision upstream of sampling reach. Suspected cause of incision is boulder creating flow redirection and backwater eddies, located behind photographer, impeding flow during high energy events.



Figure 13: Upstream view about 75 meters from initial sampling point.



Figure 14: Looking downstream through sampling reach from approx. same location as Figure 13.

Cow Branch



Figure 15: Looking downstream from most recent bed and bank armoring. Sampling reach lies downstream from where photo location.



Figure 16: Technician standing at initial sampling point. Jefferson Davis Hwy. lies in the background.



Figure 17: Brief inspection of benthic macroinvertebrate habitat upstream from initial sampling point.



Biological Monitoring Site Habitat Assessment
Prince William County; October 2017

		Little Bull Run	Dawkins Branch	Purcell Branch	Neabsco Creek	Cow Branch						
Habitat Parameters	Epifaunal Substrate / Available Cover		11	13	7	13	11					
	Embeddedness		6	9	6	6	6					
	Velocity/ Depth Regime		10	9	10	15	10					
	Sediment Deposition		7	7	6	10	9					
	Channel Flow Status		9	10	8	9	11					
	Channel Alteration		12	13	8	14	2					
	Frequency of Riffles (or bends)		8	10	7	13	13					
	Bank Stability	LB	5	7	7	12	3	7	7	14	8	16
		RB	2	5	4	7	8					
	Vegetative Protection	LB	6	12	8	15	6	10	3	6	3	6
		RB	6	7	4	3	3					
	Riparian Vegetative Zone	LB	7	16	9	18	7	11	6	14	7	17
		RB	9	9	4	8	10					
	Total Score (out of 200)			98	116	80	114	101				
VSCI Score			61.83	49.71	63.60	58.67	41.78					

Condition Categories	Value Range
Optimal	16 - 20
Suboptimal	11 - 15
Marginal	6 - 10
Poor	0 - 5

Notes: Collected from 10/6 - 10/13/2017



Biological Monitoring Site Habitat Assessment
Prince William County; May 2018

		Little Bull Run	Dawkins Branch	Purcell Branch	Neabsco Creek	Cow Branch						
Habitat Parameters	Epifaunal Substrate / Available Cover		8	13	7	12	7					
	Embeddedness		6	6	10	11	8					
	Velocity/ Depth Regime		10	8	10	13	13					
	Sediment Deposition		11	12	11	12	9					
	Channel Flow Status		15	16	11	10	10					
	Channel Alteration		11	15	12	9	1					
	Frequency of Riffles (or bends)		7	8	10	12	10					
	Bank Stability	LB	5	8	7	14	5	9	6	11	7	13
		RB	3	7	4	5	6					
	Vegetative Protection	LB	7	10	8	16	3	7	3	8	4	7
		RB	3	8	4	5	3					
	Riparian Vegetative Zone	LB	7	17	9	18	10	19	6	15	6	15
		RB	10	9	9	9	9					
	Total Score (out of 200)			103	126	106	113	93				
VSCI Score												

Condition Categories	Value Range
Optimal	16 - 20
Suboptimal	11 - 15
Marginal	6 - 10
Poor	0 - 5

Notes: Collected from 5/3 - 5/9/2018

Sampling Plan Benthic Macroinvertebrate Population and Water Quality Monitoring

Prepared for:



Prince William County Department of Public Works
Virginia

Prepared by

Eric Ostrander, Environmental Infrastructure
1000 Big Sandy Road, Suite 100
Manassas, Virginia
20108

Contact: [redacted]

Project: [redacted]

B

ag

- R
 - B
 - R S B S
- S B R S
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 - Physical and Chemical Data Collection
 - Water Quality Control
 - Benthic Macroinvertebrate Sampling
 - Field Duplicate
 - Water Quality Assurance Quality Control Procedures
 - Benthic Macroinvertebrate Sampling Evaluation
 - R R
- R R S

S

- Sampling Station
 - Field
 - Laboratory

1.0 Purpose and Objectives

The purpose of this monitoring and infrastructure program is to provide a framework for compliance with the requirements of the Virginia Stormwater Management Program (MSMP) and the Municipal Separate Storm Sewer System (MS4) permit issued by the Virginia Department of Environmental Quality (DEQ) to Prince William County, Virginia. Section 401 of the Clean Water Act requires the continuation of a biological stream monitoring program that includes an annual assessment of the habitat and benthic macroinvertebrate community of the stream. Prince William County's stream monitoring program is a detailed description of the sampling and analytical activities that will be a technical approach and a method to scientifically evaluate natural conditions in Prince William County streams.

2.0 Background

The United States Environmental Protection Agency (EPA) is delegated the authority to implement Section 401 of the Clean Water Act and to the Commonwealth of Virginia on March 1, 2003. Subsequently, Section 401 of the Virginia Stormwater Management Act authorized the DEQ to issue any and all orders, rules, and regulations for the control of stormwater discharges from MS4s. The MS4 permit issued to the DEQ is a joint source discharge permit and certain non-stormwater discharges from the MS4s operated or owned by Prince William County are included in the MS4 permit. The monitoring requirements are guided by Section 401 of the MS4 permit and the MS4 permit regulations.

3.0 Stream Sampling and Benthic Macroinvertebrates

The purpose of this sampling plan is to outline a plan of study that will be used to comply with the biological stream monitoring and infrastructure monitoring requirements outlined in Prince William County's permit. The specific objectives are to gather sufficient data to evaluate and subsequently develop a stream management and practice plan.

S **B** **S**

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1.0 **SM** **SS**

1.1 Section description activities for the biological stream monitoring and in-stream monitoring required by Part 111 and 112 of the MS permit.

1.1 **SM** **S**

Benthic macroinvertebrate and surface water samples will be collected from the location in Prince William County indicated below.

- Little Bull Run at Carlin Road in Arlington, Virginia
- Oak Branch at Arlington Road in Manassas, Virginia
- Currier Branch at Currier Road in Manassas, Virginia
- Oakgrove at Danby Road in Alexandria, Virginia
- Oak Branch at Millott Road in Woodbridge, Virginia

Benthic macroinvertebrate sampling locations will be placed at the most downstream location possible upstream from road or bridge crossings and away from tributaries discharging to the reach. Sampling locations will be marked using a standard global positioning system (GPS) unit. If it is not possible to mark the location using a GPS, an appropriate alternative marking method will be used. Sampling stations and their locations will be marked using a standard GPS and will be marked in accordance with the following:

1.1 **SM** **S**

Sampling and field data collection activities will include physical and chemical data collection, habitat assessment, and benthic macroinvertebrate sampling. Sampling will be conducted following the requirements of the MS permit and procedures outlined in the Standard Rapid Bioassessment Protocol (RBAP) Barbour et al.

1.1 **Physical and Chemical Data Collection**

Physical and chemical data collection includes collection of in situ water quality readings, collection of surface water samples, and documentation of stream characteristics. Equipment needed for collection of physical data includes a SMod water quality meter for electrical conductivity, turbidity meter for electrical conductivity collection, optical glucose RBAP physical characterization and water quality field data. Standardized Benthic Macroinvertebrate Sampling and Observation will be recorded in individual in a bound field logbook.

3.2.1.1 Water Quality

Water quality readings and surface water samples will be collected prior to disturbance of the stream reach. In-stream monitoring is required to be conducted at a stream site for the following parameters: SM, MS, and it.

- Dissolved oxygen
- Temperature
- Total suspended solids (TSS)
- ammonia and nitrogen
- nitrate and nitrite nitrogen
- total dissolved nitrogen
- total nitrogen (calculation)
- dissolved phosphorus
- total phosphorus and
- *Escherichia (E.) coli*.

RB typical characterization and water quality field data Sheet Appendix B requires the following parameters and temperature and all the following parameters in addition to those required by SM, MS, and it.

- conductivity or specific conductance and
- turbidity

In situ water quality data will be collected using a multi-parameter water quality meter (SM Model or equivalent) and a handheld turbidity meter (Hanna or equivalent). The multi-parameter meter will be calibrated daily using standard solution calibration (or included in Appendix B). Multi-parameter readings are taken in duplicate and the unit should be allowed to stabilize before recording readings.

Surface water samples to be collected for laboratory analysis of TSS, ammonia, nitrate, nitrite, total dissolved nitrogen, dissolved phosphorus, total phosphorus, and *E. coli* should be collected at a site and at the same location in an area of low flow and low velocity, and all field water samples will be placed in coolers on ice and stored overnight under certain custody procedures to a qualified laboratory licensed in the Commonwealth of Virginia. The laboratory will be employed to collect or take during the event. Samples will be analyzed in accordance with the appropriate certification for on-site or off-site laboratory or accreditation for on-site or off-site.

Iron and nitrate analytical methods used for each analysis will be those approved by either the Federal or State Regulatory Department or alternative methods approved by the State.

3.2.1.2 Stream Characteristics

Stream and downstream photographs will be taken at each sampling location to document conditions at the time of sampling. Physical characteristics of the stream will be recorded on the physical characterization and water quality field data Sheet of the RB. The field sheet should include a description of the sampling location, water conditions, stream characterization, water temperature, surrounding land use, non-point source pollution, riparian vegetation in stream, water temperature, stream morphology, velocity, canopy cover, annularization, and data on large woody debris, aquatic vegetation, water quality, and substrate (odor, oil, and other contaminants) in the stream. Data to be recorded on the form includes a 100-foot critical distance from the channel margin of the stream bank to the first obstacle indicated by debris changing in riparian or floodplain vegetation and deposition of silt or soil.

On sites with large woody debris in contact with the stream, data is recorded on the physical characterization and water quality field data Sheet. The debris bank area is defined as the area in the stream channel that is larger than 100 square feet. Data is recorded on the stream reach drawing. It is the debris in contact with the stream channel. Only the portion in contact with the stream is measured. Large woody debris is a length or width less than 100 feet is not counted. Root, dead and log-like in the stream margin that are in contact with the stream are arbitrarily given a width of 100 feet length and width of 100 feet. Branches are multiplied and the resulting product are used to give the aquatic habitat area influenced. Area is divided by the stream reach area. It is the reach to obtain the large woody debris density.

Stream Habitat Assessment

Habitat characteristics will be assessed using the habitat assessment sheet field data Sheet. The assessment is conducted in the RB. The habitat assessment is performed along the reach from the first biological sampling point to the conductive bar. It is taken not to disturb the benthic macroinvertebrate sampling habitat during the habitat assessment.

The habitat assessment sheet field data Sheet of the RB will be completed at each location. The reach and log gradient reach and low gradient reach portion of the reach is the reach gradient for the upper reach or reach located in the upper to the reach gradient land cover. The reach gradient for the lower reach or reach that are located in the lower to the reach gradient.

gradient land cover and cover in quadrats appropriate data for or each sampling location will be determined during the site reconnaissance.

Each habitat area will be incorporated into a natural or artificial sampling reach or reach network. Parameters of the habitat area will be recorded and included in the annual quadrat count data or pool quadrat characterization. Locality data to region or pool variability should be determined and recorded. Habitat alteration, riparian frequency or channel sinuosity and stability and vegetation protection and riparian cover should be recorded. Data should be collected by a trained or qualified personnel that contribute to a continuous determination of quality.

Benthic Macroinvertebrate Sampling Collection

Biological stream monitoring will be conducted twice per year during and fall at the location. Benthic collection should be for scientific and/or educational purposes in Virginia. A scientific collection permit is required for a permit to collect in Virginia. Part of the permit and inland riparian stream and should be submitted at least 30 days prior to benthic macroinvertebrate sampling collection. The permit requires annual renewal and a permit annual catch report should be submitted to the notified person in advance of each sampling event.

The multi-habitat sampling method will be used to characterize the benthic macroinvertebrate community as outlined in the SBBB RB Section. The method is used to collect benthic macroinvertebrates from various substrates and microhabitats available in a sampling reach. Sampling begins at the downstream end of the reach and proceeds upstream. A habitat will be sampled using a 0.5m wide, 0.5m deep, 0.5m high, 0.5m diameter net. The total number of samples taken from all major habitat types in the reach will be conducted or manually turning the net into a production habitat for a linear distance of 0.5m or 1m, depending on the condition of the net and disturbing the substrate for a distance of 0.5m or 1m upstream of the net.

Different types of habitat are to be sampled in a proportion to their representation of the area of total macroinvertebrate habitat in the reach. Habitat sampled typically consist of loose cobble, alluvial log and tree litter, snag, vegetated bank or undercut bank, riparian plant root material and silt bottom material and submerged macrophyte. Other habitat that may be sampled include macroalgae, rock, board and litter and detrital, silt, and log. The RB Benthic Macroinvertebrate Field Data Sheet should be collected for each sampling event or include a summary of the current reach.

Qualitative or quantitative information in each category and field observation aquatic biota

For each of the following categories: Shallow areas with coarse substrate are sampled by holding the cotton net against the substrate and dipping the substrate under a net. Sufficient woody debris can be added by dipping a net into the stream or by rinsing the woody debris directly into the fine mesh bucket. Sample bags are placed into the bucket. Benthic macroinvertebrates are collected in the stream to a depth of 100 cm. Sand and silt can be added by dipping the net along the surface of the substrate.

For each of the following categories: A sample of the fine mesh bucket to obtain a single sample of the net will be thoroughly washed into the fine mesh bucket every day to facilitate collection of benthic macroinvertebrates that are not readily visible. The net will be rinsed and returned to the fine mesh bucket. Benthic macroinvertebrates will be collected from the net into a bag and placed in a labeled bag in a container. Sample bags will be transferred from the fine mesh bucket to the bag in a container. An index card indicating the date, identification data, stream name, location, and date of collection will be placed in the bag. The container will be printed in pencil to prevent dissolution of the label by precipitation. The bag will be added by the analytical laboratory.

Benthic macroinvertebrates will be placed on ice in cooler and shipped overnight under the procedure to an accredited benthic macroinvertebrate laboratory. Today's date will be displayed to check for timing during shipment.

Field Duplication

Duplications are collected in the field for surface water analytical data and benthic macroinvertebrate data at a frequency of one per ten days. Since there are five sample locations, duplications will be collected every other day at one sample location. Surface water duplications will be collected by filling a 200 mL bottle for each analytical benthic macroinvertebrate duplication will be collected from a sample location with a available for a total of five samples in the sample rack.

BSMSS

The laboratory will sort, count, identify, and classify benthic macroinvertebrates in addition to sorting and identification of benthic macroinvertebrates. The laboratory will also perform appropriate benthic macroinvertebrate index calculation and will perform and interpret statistical analysis of benthic macroinvertebrate data.

Laboratory data will also utilize the habitat description and evaluation and the field
typical chemical water data parameters collected by field sampling personnel in the evaluation
of benthic macroinvertebrates in the context of their typical chemical habitat at the sampling
location.

Sample collection should be logged in on a designated form or logbook such as the RB Benthic
Macroinvertebrate Sample Collection Worksheet. The logbook should contain the information
for the sample label and the number of containers used. The number of percent organisms
will be reported for each benthic macroinvertebrate sample including the station number for station
identification, station number for collection, station number for the grid, a gridded sheet of
plastic tray that accommodates the frame, a square metal "cookie cutter" (cutter), and a metal
cookie cutter. The cutter will be tied onto the station number sheet and attached to the
station and collection number. The tray and cutter will then be placed into the tray and
enough water added to cover the sample content. The content will be evenly distributed over
the tray. The tray will then be lifted from the tray and water to the sample content will settle onto
the tray. The tray is divided into sections for each collection grid. The grid is randomly
selecting four grids and locating them using an alphanumeric designation and cross-section on
the top of the tray. The content of each grid will be removed using a cutter and a ruler.
The number of organisms will be used to obtain the collection number. The grid do not
contain any percent organisms. The grid will be placed in a bag to acquire the number.
The grid contain too many organisms. The grid will be placed into a bag for collection or
similar design and four grids randomly collect for sorting.

The content for each grid will be transferred to a container and enough water will be added
to cover the organisms. The content will be sorted during the sorting process. The content will then be
taken to the sorting station. The sample will be placed into a gridded sheet and the
organisms removed, counted and placed into a plastic bag containing 70 percent ethanol by
a group. The group will be placed into a bag. The bag will be placed into a bag. The bag will be
dated and grouped. The number of individual and the number of RB Benthic
Macroinvertebrate Laboratory Bench Sheet Worksheet should be collected, sorted and
unsorted portion of the sample will be reported separately using the original station

Organisms will be identified to the generic scientific level except for groups such as nematodes
and diatoms or very small individual organisms such as oligochaetes and cironomid larvae
will be identified using a microscopic oligochaetes and cironomid larvae will be counted
on a microscope slide using a microscope. Prior to identification using a compound
microscope.

Quality Assurance Quality Control Procedures

Subsequent to benthic macroinvertebrate sampling, the reporting technician shall review the data for a minimum of 10 percent of the data and will be required to document that 10 percent of the total number of organisms are shown to be identified in an error of greater than 1 percent. In all other cases, the data collected by that particular technician will be reviewed in duplicate for the collection will be recorded on the laboratory bench sheet and will be recorded into the data in the report.

For each collection for Prince William County data, the technician conducting the collection for each location will be required in accordance with the RB procedures to identify the organisms for the remaining identification and noted on the laboratory bench sheet. The technician is not responsible for the original identification, but of course, according to the identification on the bench sheet.

Data will be entered into a standardized excel spreadsheet and double-checked for accuracy.

Benthic Macroinvertebrate Sampling Results Evaluation

Metrics are biological attributes that represent the structure and function of the benthic macroinvertebrate assemblage. Metrics are specific measures of diversity, composition, and tolerance to pollution, and can be combined into a multi-metric index. An integrated biological composition characteristic and measure of overall response of the community to environmental stressors. Biological metrics include:

- Abundance** – The number of taxa reflect the overall community through a measure of the variety of taxa present. Abundance generally increases with increasing water quality, habitat diversity, and/or habitat suitability.
- Richness** – The number of individual organisms found at each location. Abundance can indicate the presence of an area supporting a large and diverse community.
- Number of Genera, Number of Families, Number of Orders, Number of Classes, Number of Species** – The number of distinct taxa in the sample. The order of the taxa in the sample is generally considered to be related to the sensitivity to pollution.
- Percent of Irony, Index of Biotic Integrity** – The abundance ratio of the taxa to grouping indicates the balance of the benthic community diversity.

The Virginia Stream Condition Index (VSCI) is a multi-metric index that predicts the health of Virginia's non-coastal streams. The VSCI is a biological and chemical condition index that is a fast, direct reference point in the region and is a statistically calibrated by stream data. The VSCI is a multi-metric approach to identify biological impairment and is a direct measure of stream health. The VSCI is a multi-metric index that is a fast, direct reference point in the region and is a statistically calibrated by stream data. The VSCI is a multi-metric approach to identify biological impairment and is a direct measure of stream health. The VSCI is a multi-metric index that is a fast, direct reference point in the region and is a statistically calibrated by stream data. The VSCI is a multi-metric approach to identify biological impairment and is a direct measure of stream health.

Annual Report

An annual summary report will be prepared following each year of sampling. The report will summarize the VSCI and in-stream monitoring results and analyses and include an interpretation of the data with respect to long-term patterns and trends. Initial or first year results for each stream and analysis will be provided at each station for each year of sampling and for comparative analysis performed on a station-by-station basis. Report appendices will include data and documentation for that year of sampling.

Appendix S

Barbour, M., Gerritsen, B., Snyder and B. Strickling. 1999. Rapid Bioassessment Protocols for Streams and Rivers. *Stream Benthic Macroinvertebrates and Benthic Macroinvertebrates*. Second Edition. EPA-823-B-99-001. Environmental Protection Agency, Office of Water, Washington, DC.

Bodrossy, M. 2000. *Quality Assurance and Quality Control for Biological Stream Monitoring in the State of Virginia*. Second Edition. Office of Water, Virginia Department of Environmental Quality.

Chapman, P. 2000. *Standard Sampling Methods for the EPA "Rapid Bioassessment" Benthic Protocol*. *Benthic Biological Society*.

Chapman, P. 2000. *Standard Biotic Index and Organic Stream Pollution Rating Scales*. *Environmental Science*.

Chapman, P. 2000. *Standard Methods for Macroinvertebrate Field and Laboratory Methods for Evaluating the Biological Integrity of Surface Waters*. Second Edition. EPA-823-B-00-001. Environmental Protection Agency, Cincinnati, OH.

North Carolina Department of Environment and Natural Resources. Standard Operating Procedures for Benthic Invertebrate and R. Biological Monitoring Unit.

North Carolina Department of Environment and Natural Resources. *Quality Control System Standard Operating Procedures for Macroinvertebrate Stream Survey*.

Virginia Department of Environmental Quality. *Stream Condition Index for Virginia Nonpoint Source Pollution*. *Stream Condition Index*.

Virginia Department of Environment and Natural Resources. *Quality Assurance Project Plan for Stream and River Condition Index Quality Control Unit Quality Monitoring and Reporting Unit*.

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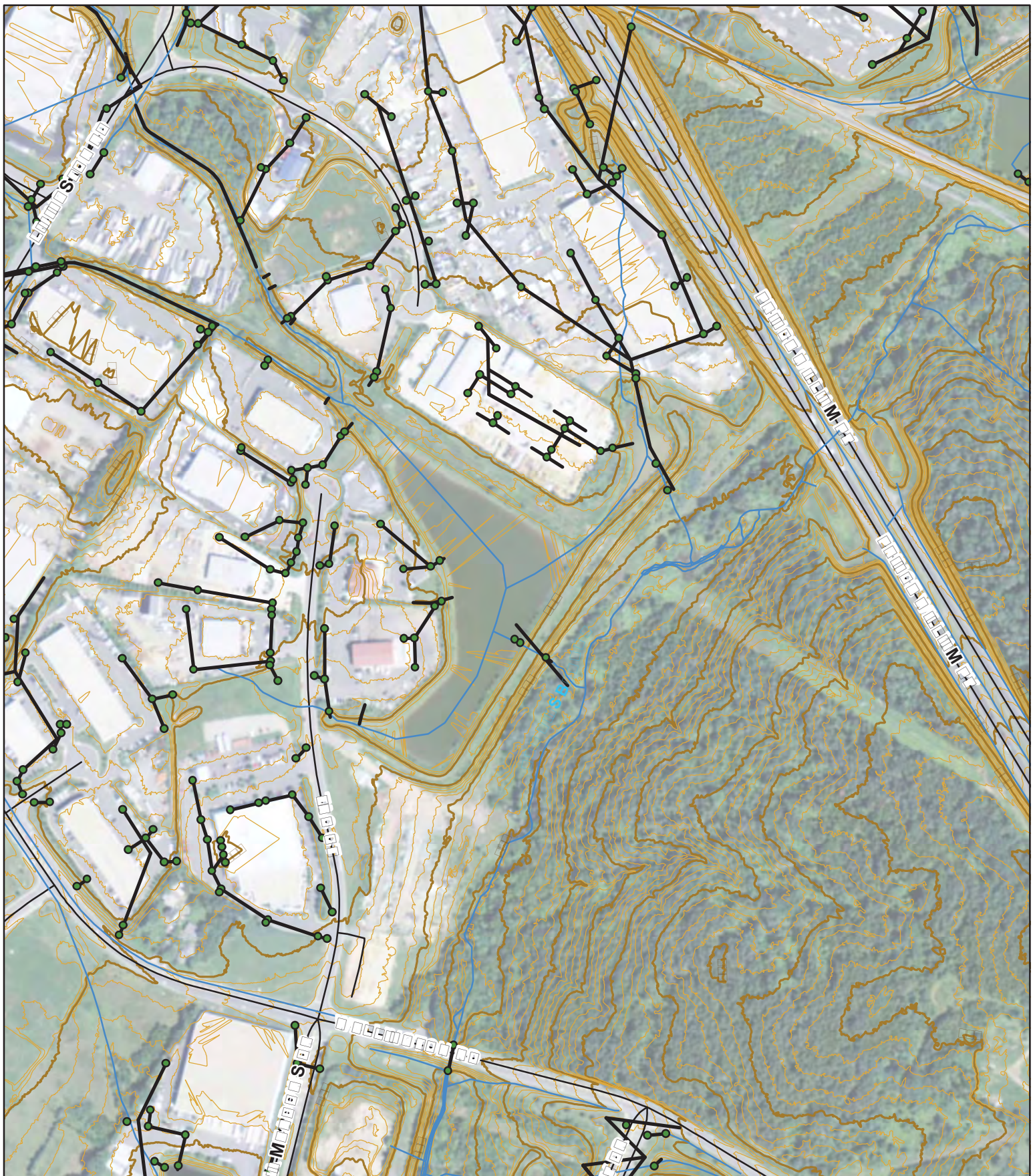


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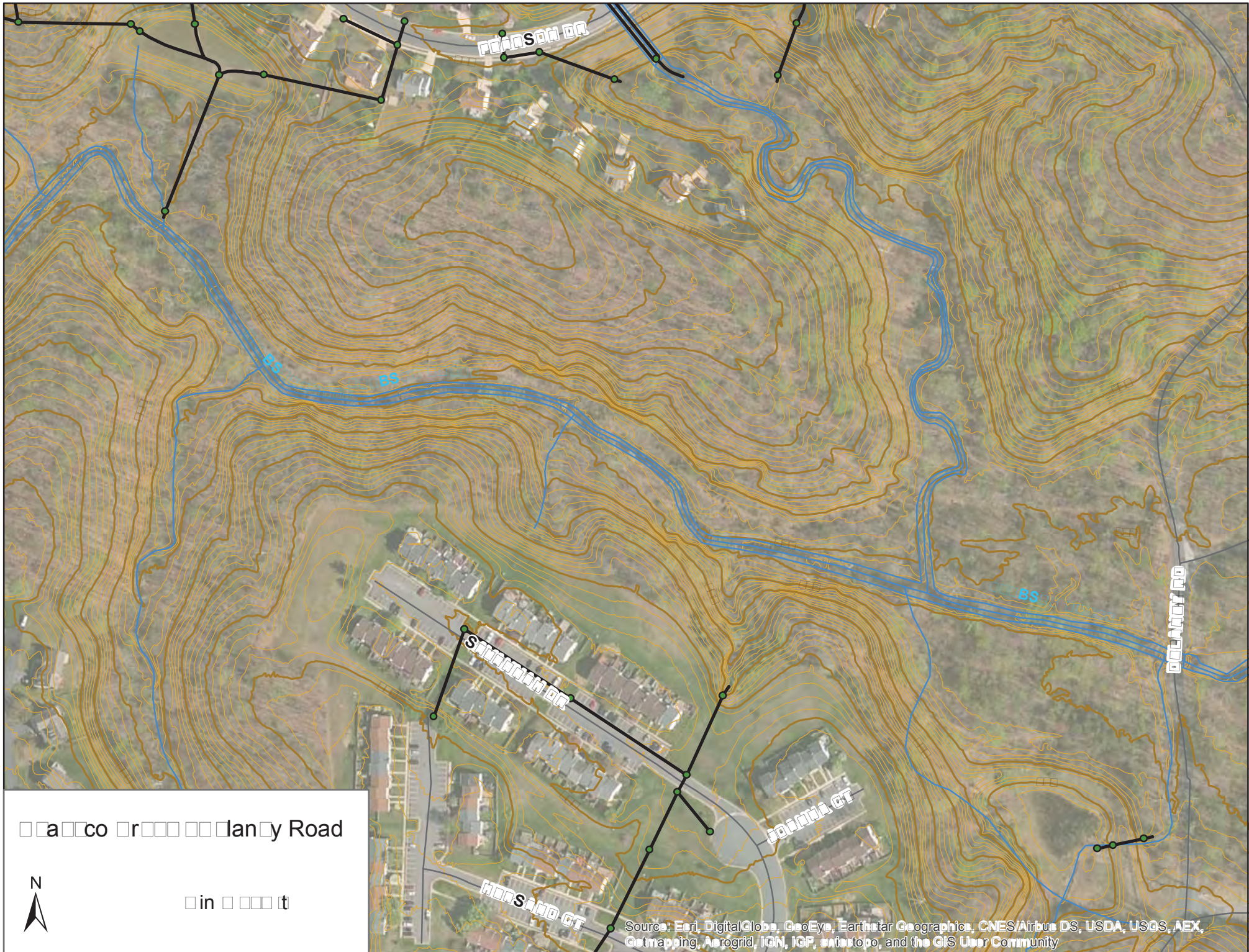


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**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)**

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____	
INSTREAM FEATURES	Estimated Reach Length _____ m Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width _____ m Sampling Reach Area _____ m ² High Water Mark _____ m Area in km ² (m ² x1000) _____ km ² Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____% <input type="checkbox"/> Run _____% <input type="checkbox"/> Pool _____% Estimated Stream Depth _____ m Surface Velocity _____ m/sec Channelized <input type="checkbox"/> Yes <input type="checkbox"/> No (at thalweg) Dam Present <input type="checkbox"/> Yes <input type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD _____ m ² Density of LWD _____ m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _____%	
WATER QUALITY	Temperature _____ °C Water Odors <input type="checkbox"/> Normal/None <input type="checkbox"/> Sewage Specific Conductance _____ <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Dissolved Oxygen _____ pH _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid WQ Instrument Used _____ <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
SEDIMENT/SUBSTRATE	Odors <input type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME _____		LOCATION _____	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____			
FORM COMPLETED BY _____		DATE _____ TIME _____ AM PM	REASON FOR SURVEY _____

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

	Habitat Parameter	Condition Category																																					
		Optimal				Suboptimal				Marginal				Poor																									
Parameters to be evaluated broader than sampling reach	6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.				Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.				Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.				Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.																									
	SCORE																	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.				Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.				Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.				Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.																									
	SCORE																	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.				Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.				Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.				Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.																									
	Note: determine left or right side by facing downstream.																	Left Bank				Right Bank																	
	SCORE ___ (LB)																	10	9	8	7	6	5	4	3	2	1	0	10	9	8	7	6	5	4	3	2	1	0
SCORE ___ (RB)	10	9	8	7	6	5	4	3	2	1	0	10	9	8	7	6	5	4	3	2	1	0																	
	9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.				70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.				50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.				Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.																									
	SCORE ___ (LB)																	10	9	8	7	6	5	4	3	2	1	0	10	9	8	7	6	5	4	3	2	1	0
	SCORE ___ (RB)																	10	9	8	7	6	5	4	3	2	1	0	10	9	8	7	6	5	4	3	2	1	0
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.				Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.				Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.				Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.																									
	SCORE ___ (LB)																	10	9	8	7	6	5	4	3	2	1	0	10	9	8	7	6	5	4	3	2	1	0
	SCORE ___ (RB)																	10	9	8	7	6	5	4	3	2	1	0	10	9	8	7	6	5	4	3	2	1	0

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME _____		LOCATION _____	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____			
FORM COMPLETED BY _____		DATE _____ TIME _____ AM PM	REASON FOR SURVEY _____

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

	Habitat Parameter	Condition Category																			
		Optimal				Suboptimal				Marginal				Poor							
Parameters to be evaluated broader than sampling reach	6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.				Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.				Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.				Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.							
	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)				The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.				The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.				Channel straight; waterway has been channelized for a long distance.							
	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.				Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.				Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.				Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.							
	SCORE __ (LB)	Left Bank		10	9	8	7	6	5	4	3	2	1	0							
	SCORE __ (RB)	Right Bank		10	9	8	7	6	5	4	3	2	1	0							
	9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.				70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.				50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.				Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.							
	SCORE __ (LB)	Left Bank		10	9	8	7	6	5	4	3	2	1	0							
	SCORE __ (RB)	Right Bank		10	9	8	7	6	5	4	3	2	1	0							
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.				Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.				Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.				Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.							
	SCORE __ (LB)	Left Bank		10	9	8	7	6	5	4	3	2	1	0							
	SCORE __ (RB)	Right Bank		10	9	8	7	6	5	4	3	2	1	0							

Total Score _____

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME _____		LOCATION _____	
STATION # _____	RIVERMILE _____	STREAM CLASS _____	
LAT _____	LONG _____	RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____		LOT NUMBER _____	
FORM COMPLETED BY _____		DATE _____ TIME _____ AM PM	REASON FOR SURVEY _____

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____% <input type="checkbox"/> Snags _____% <input type="checkbox"/> Vegetated Banks _____% <input type="checkbox"/> Sand _____% <input type="checkbox"/> Submerged Macrophytes _____% <input type="checkbox"/> Other (_____) _____%
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

SS Calibration Form

Product: _____
Date: _____
Inlet Calibration: _____
Outlet Calibration: _____

Instrument: _____
Inlet and Outlet: _____
Battery Voltage: _____

Prior to Installation: Complete following items

- Ensure instrument is calibrated prior to Mobilisation as required by _____
- Attach Parameter to Sensor
- Attach Safety Pin when additional condition or additional condition
- Check Battery/Batteries

Order of use

Always use and set and cond in the order not in use. Do not cool product in...
Do not use sensor data before reading process to ensure accuracy of instrument.
Do not use the clotted cover on the condensation reading or fit sensor during mobilisation.
The calibration is "out of range" call in on instrument at _____ or _____ for assistance or for instruction to reset the default calibration setting.



Inlet Calibration Outlet Calibration

SS	Inlet Calibration	Outlet Calibration
Actual range changed _____ at _____	<input type="checkbox"/>	<input type="checkbox"/>
Current Barometric Pressure		
Current Barometric Pressure	<input type="checkbox"/>	<input type="checkbox"/>
Correction to Barometric Pressure		
Concentration or Calibration mg/m ³		
Concentration after Calibration mg/m ³		
Outlet Calibration		
Reading or Calibration S.c.c. [°]		
Reading after Calibration S.c.c. [°]		
Batteries		
Accuracy Standard	<input type="checkbox"/>	<input type="checkbox"/>
Accuracy Standard	<input type="checkbox"/>	<input type="checkbox"/>
Accuracy Standard	<input type="checkbox"/>	<input type="checkbox"/>
Accuracy Standard	<input type="checkbox"/>	<input type="checkbox"/>

Calibrated By: _____

Outlet Calibrated By: _____

Checked by: _____

□□□□□□□□ □

□□**B**□□□□□□ □□□**MS**

BENTHIC MACROINVERTEBRATE SAMPLE LOG-IN SHEET

Date Collected	Collected By	Number of Containers	Preservation	Station #	Stream Name and Location	Date Received by Lab	Lot Number	Date of Completion		
								sorting	mounting	identification

Serial Code Example: B0754001(1)
 B = Benthos (F = Fish; P = Periphyton) ■ 0754 = project number ■ 001 = sample number ■ (1) = lot number (e.g., winter 1996 = 1; summer 1996 = 2)

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BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

page _____ of _____

STREAM NAME _____	LOCATION _____
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT _____ LONG _____	RIVER BASIN _____
STORET # _____	AGENCY _____
COLLECTED BY _____ DATE _____	LOT # _____
TAXONOMIST _____ DATE _____	SUBSAMPLE TARGET <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> 300 <input type="checkbox"/> Other _____

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR
Oligochaeta					Megaloptera				
Hirudinea					Coleoptera				
Isopoda									
Amphipoda					Diptera				
Decapoda									
Ephemeroptera					Gastropoda				
					Pelecypoda				
Plecoptera									
					Other				
Trichoptera									
Hemiptera									

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms _____

Total No. Taxa _____

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

<p>SUBSAMPLING/SORTING INFORMATION</p> <p>Sorter _____</p> <p>Date _____</p>	<p>Number of grids picked: _____</p> <p>Time expenditure _____ No. of organisms _____</p> <p>Indicate the presence of large or obviously abundant organisms:</p> <p>_____</p> <hr/> <p>QC: <input type="checkbox"/> YES <input type="checkbox"/> NO QC Checker _____</p> <div style="text-align: center;"> <p># organisms originally sorted $\left(\begin{matrix} \# \text{ organisms recovered by checker} \\ \# \text{ organisms originally sorted} \end{matrix} \right)$ % sorting efficiency</p> <p> <input type="text"/> \div $\left(\begin{matrix} \input{type="text"} \\ + \input{type="text"} \end{matrix} \right) = \input{type="text"}$ </p> </div> <p>$\geq 90\%$, sample passes _____</p> <p>$< 90\%$, sample fails, action taken _____</p> <hr/>
<p>TAXONOMY</p> <p>ID _____</p> <p>Date _____</p>	<p>Explain TCR ratings of 3-5:</p> <p>Other Comments (e.g. condition of specimens):</p> <p>_____</p> <hr/> <p>QC: <input type="checkbox"/> YES <input type="checkbox"/> NO QC Checker _____</p> <p>Organism recognition <input type="checkbox"/> pass <input type="checkbox"/> fail Verification complete <input type="checkbox"/> YES <input type="checkbox"/> NO</p>

General Comments (use this space to add additional comments):

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME _____		LOCATION _____	
STATION # _____	RIVERMILE _____	STREAM CLASS _____	
LAT _____	LONG _____	RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____			
FORM COMPLETED BY _____		DATE _____ AM _____ PM	REASON FOR SURVEY _____

WEATHER CONDITIONS	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature _____ °C Other _____
	SITE LOCATION/MAP Draw a map of the site and indicate the areas sampled (or attach a photograph)		
STREAM CHARACTERIZATION	Stream Subsystem <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Tidal	Stream Type <input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater	
	Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____	Catchment Area _____ km ²	

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)**

WATERSHED FEATURES	Predominant Surrounding Landuse <input type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present _____	
INSTREAM FEATURES	Estimated Reach Length _____ m Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width _____ m High Water Mark _____ m Sampling Reach Area _____ m ² Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle _____% <input type="checkbox"/> Run _____% <input type="checkbox"/> Pool _____% Area in km ² (m ² x1000) _____ km ² Estimated Stream Depth _____ m Surface Velocity _____ m/sec Channelized <input type="checkbox"/> Yes <input type="checkbox"/> No (at thalweg) Dam Present <input type="checkbox"/> Yes <input type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD _____ m ² Density of LWD _____ m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation _____%	
WATER QUALITY	Temperature _____ °C Water Odors <input type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Specific Conductance _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input type="checkbox"/> None <input type="checkbox"/> Other _____ Dissolved Oxygen _____ pH _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ Turbidity _____ WQ Instrument Used _____	
SEDIMENT/SUBSTRATE	Odors <input type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Sand <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input type="checkbox"/> No Oils <input type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")				
Cobble	64-256 mm (2.5"-10")		Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")				
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME _____	LOCATION _____	
STATION # _____ RIVERMILE _____	STREAM CLASS _____	
LAT _____ LONG _____	RIVER BASIN _____	
STORET # _____	AGENCY _____	
INVESTIGATORS _____		
FORM COMPLETED BY _____	DATE _____ AM _____ PM _____	REASON FOR SURVEY _____

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0	

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

	Habitat Parameter	Condition Category																							
		Optimal					Suboptimal					Marginal					Poor								
Parameters to be evaluated broader than sampling reach	6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.								
	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0			
	7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.								
	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0			
	8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.								
	Note: determine left or right side by facing downstream.																								
	SCORE ___ (LB)	Left Bank	10	9				8	7	6				5	4	3				2	1	0			
SCORE ___ (RB)	Right Bank	10	9				8	7	6				5	4	3				2	1	0				
	9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.								
	SCORE ___ (LB)	Left Bank	10	9				8	7	6				5	4	3				2	1	0			
	SCORE ___ (RB)	Right Bank	10	9				8	7	6				5	4	3				2	1	0			
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.								
	SCORE ___ (LB)	Left Bank	10	9				8	7	6				5	4	3				2	1	0			
	SCORE ___ (RB)	Right Bank	10	9				8	7	6				5	4	3				2	1	0			

Total Score _____

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (FRONT)

STREAM NAME _____		LOCATION _____	
STATION # _____ RIVERMILE _____		STREAM CLASS _____	
LAT _____ LONG _____		RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____			
FORM COMPLETED BY _____		DATE _____ TIME _____ AM PM	REASON FOR SURVEY _____

	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
Parameters to be evaluated in sampling reach	1. Epifaunal Substrate/ Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than <20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—LOW GRADIENT STREAMS (BACK)

	Habitat Parameter	Condition Category																			
		Optimal				Suboptimal				Marginal				Poor							
Parameters to be evaluated broader than sampling reach	6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.				Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.				Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.				Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.							
	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)				The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.				The bends in the stream increase the stream length 1 to 2 times longer than if it was in a straight line.				Channel straight; waterway has been channelized for a long distance.							
	SCORE	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
	8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.				Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.				Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.				Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.							
	SCORE __ (LB)	Left Bank		10	9	8	7	6	5	4	3	2	1	0							
	SCORE __ (RB)	Right Bank		10	9	8	7	6	5	4	3	2	1	0							
	9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.				70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.				50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.				Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.							
	SCORE __ (LB)	Left Bank		10	9	8	7	6	5	4	3	2	1	0							
	SCORE __ (RB)	Right Bank		10	9	8	7	6	5	4	3	2	1	0							
	10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.				Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.				Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.				Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.							
	SCORE __ (LB)	Left Bank		10	9	8	7	6	5	4	3	2	1	0							
	SCORE __ (RB)	Right Bank		10	9	8	7	6	5	4	3	2	1	0							

Total Score _____

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME _____		LOCATION _____	
STATION # _____	RIVERMILE _____	STREAM CLASS _____	
LAT _____	LONG _____	RIVER BASIN _____	
STORET # _____		AGENCY _____	
INVESTIGATORS _____		LOT NUMBER _____	
FORM COMPLETED BY _____		DATE _____ TIME _____ AM PM	REASON FOR SURVEY _____

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble _____% <input type="checkbox"/> Snags _____% <input type="checkbox"/> Vegetated Banks _____% <input type="checkbox"/> Sand _____% <input type="checkbox"/> Submerged Macrophytes _____% <input type="checkbox"/> Other (_____) _____%
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other _____ How were the samples collected? <input type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (_____) _____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	1	2	3	4	Slimes	0	1	2	3	4
Filamentous Algae	0	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	0	1	2	3	4	Fish	0	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

SS Calibration Form

Product: _____
 Date: _____
 Instrument Location: _____
 Calibration Location: _____

Instrument ID: _____
 Instrument Model: _____
 Battery Voltage: _____

Procedure

- Ensure instrument is powered prior to Mobilization
- Attach parameter to Sensor
- Attach Safety in/on/on adapter condition
- Connect Battery/Batteries



Notes

Temperature and humidity conditions not in use. Do not cool product in...
 Do not store data on instrument reading...
 Do not store data on instrument reading or during mobilization.
 The calibration is "out of range" call in on instrument at... or... for assistance or for instruction to reset the default calibration setting.

Initial Calibration Final Calibration

SS			
Parameter Name	Unit	Initial	Final
Current Barometric Pressure	hPa		
Corrected Barometric Pressure	hPa		
Concentration	mg/m ³		
Concentration after calibration	mg/m ³		
Other Calibration			
Temperature	°C		
Reading	°C		
Reading	°C		
Calibration			
Calibration	°C		
Reading	°C		
Reading after calibration	°C		
Batteries			
Capacity Standard	Standard	Before	After
Capacity Standard	Standard	Before	After
Capacity Standard	Standard	Before	After
Capacity Standard	Standard	Before	After

Calibrated By: _____

Out of Range By: _____

Checked by: _____

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BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (FRONT)

page _____ of _____

STREAM NAME _____	LOCATION _____
STATION # _____ RIVERMILE _____	STREAM CLASS _____
LAT _____ LONG _____	RIVER BASIN _____
STORET # _____	AGENCY _____
COLLECTED BY _____ DATE _____	LOT # _____
TAXONOMIST _____ DATE _____	SUBSAMPLE TARGET <input type="checkbox"/> 100 <input type="checkbox"/> 200 <input type="checkbox"/> 300 <input type="checkbox"/> Other _____

Enter Family and/or Genus and Species name on blank line.

Organisms	No.	LS	TI	TCR	Organisms	No.	LS	TI	TCR
Oligochaeta					Megaloptera				
Hirudinea					Coleoptera				
Isopoda									
Amphipoda					Diptera				
Decapoda									
Ephemeroptera					Gastropoda				
					Pelecypoda				
Plecoptera									
					Other				
Trichoptera									
Hemiptera									

Taxonomic certainty rating (TCR) 1-5: 1=most certain, 5=least certain. If rating is 3-5, give reason (e.g., missing gills). LS= life stage: I = immature; P = pupa; A = adult TI = Taxonomists initials

Total No. Organisms _____

Total No. Taxa _____

BENTHIC MACROINVERTEBRATE LABORATORY BENCH SHEET (BACK)

<p>SUBSAMPLING/SORTING INFORMATION</p> <p>Sorter _____</p> <p>Date _____</p>	<p>Number of grids picked: _____</p> <p>Time expenditure _____ No. of organisms _____</p> <p>Indicate the presence of large or obviously abundant organisms:</p> <p>_____</p> <hr/> <p>QC: <input type="checkbox"/> YES <input type="checkbox"/> NO QC Checker _____</p> <p style="text-align: center;"> $\begin{matrix} \# \text{ organisms} \\ \text{originally sorted} \end{matrix} \div \left(\begin{matrix} \# \text{ organisms} \\ \text{recovered by} \\ \text{checker} \end{matrix} + \begin{matrix} \# \text{ organisms} \\ \text{originally sorted} \end{matrix} \right) = \begin{matrix} \% \text{ sorting} \\ \text{efficiency} \end{matrix}$ </p> <p style="text-align: center;"> <input type="text"/> ÷ (<input type="text"/> + <input type="text"/>) = <input type="text"/> </p> <p>≥90%, sample passes _____</p> <p><90%, sample fails, action taken _____</p> <hr/>
<p>TAXONOMY</p> <p>ID _____</p> <p>Date _____</p>	<p>Explain TCR ratings of 3-5:</p> <p>_____</p> <p>Other Comments (e.g. condition of specimens):</p> <p>_____</p> <hr/> <p>QC: <input type="checkbox"/> YES <input type="checkbox"/> NO QC Checker _____</p> <p>Organism recognition <input type="checkbox"/> pass <input type="checkbox"/> fail Verification complete <input type="checkbox"/> YES <input type="checkbox"/> NO</p>

General Comments (use this space to add additional comments):

Appendix 2 – In-Stream Monitoring

Appendix 3 – Floatables and Solids Monitoring

Floatables Monitoring Site Selection Data Sheets

The initial candidate Floatables Monitoring Program site locations were provided by PWCSWCD as part of their stream stewards program. These sites were first screened to include those who receive discharges from MS-4 Regulated Outfalls. Potential alternative sites are included as suggestions from PWC as additional sampling locations. These sites allow for a wider range of land uses to be included in the Floatables program analysis. Other sites will be considered upon discussion with stakeholders and County Staff if needed. These sites will be added at the end of this analysis document.

Maps are to be marked with important locations such as:

- Estimated Stream Stewards sampling location
- Ingress-egress for monitoring staff
- Potential sampling locations
- Trash hotspots
- Regulated outfall Locations
- Any dangerous or suspicious areas
- Other areas of interest

Scoring is determined by averaging the score from each individual scoring category. The score in each scoring category is selected from a scale of 1 to 5, with a score of 1 representing a least favored outcome, and a score of 5 representing a most desired outcome. If any qualifications are not met (i.e. a score of 0 is recorded for a site) then the site is disqualified from being used as a final site. The top 5 sites will be selected for the Floatables Monitoring Program.

Site 1: Bull Run, Ben Lomond Park



Quality of upstream MS-4 outfalls: _____ []

Upstream land uses: _____ []

Opportunity to reduce floatables sources: _____ []

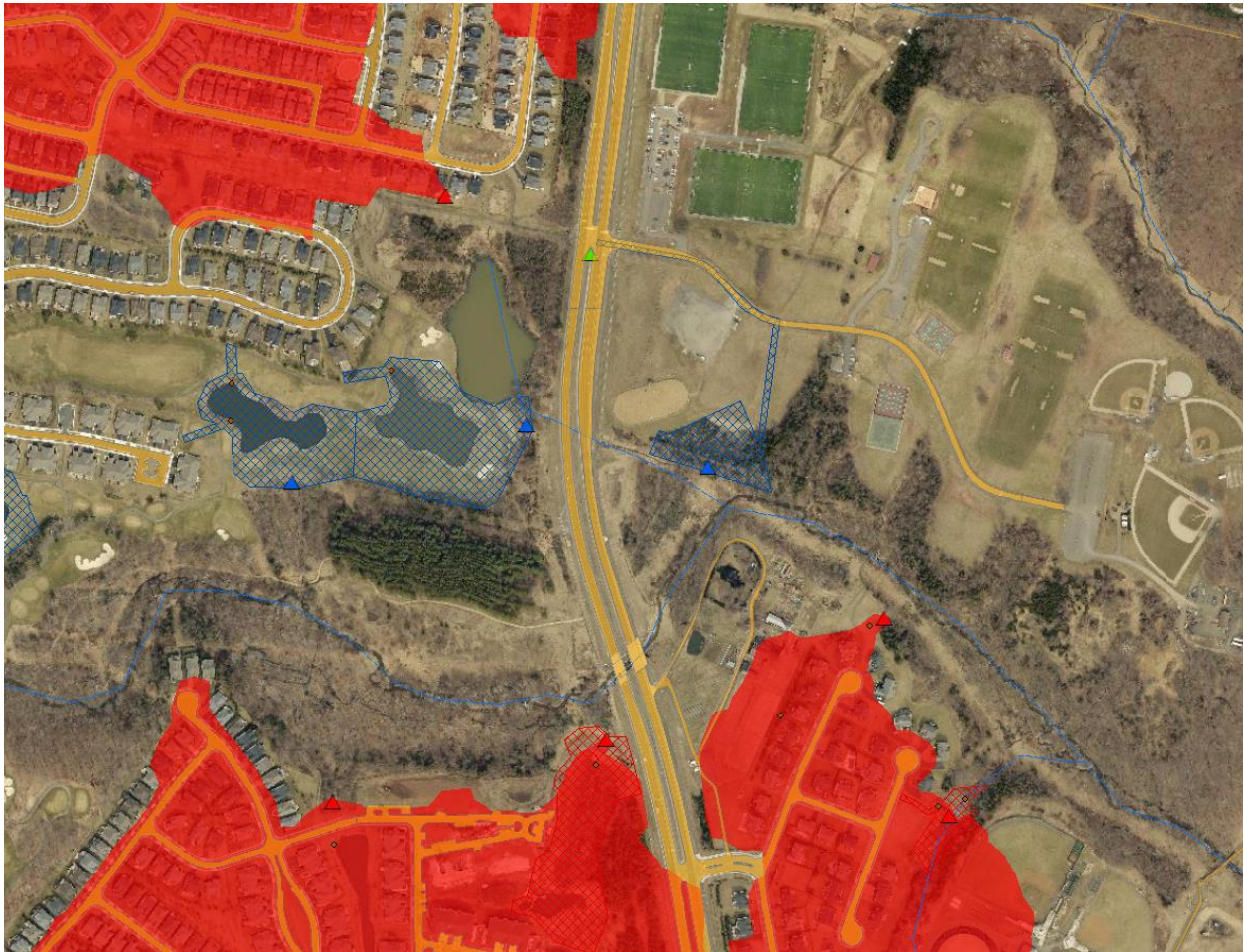
Access and feasibility: _____ []

Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 2: Catharpin Creek, James Long Park



Quality of upstream MS-4 outfalls: _____ []

Upstream land uses: _____ []

Opportunity to reduce floatables sources: _____ []

Access and feasibility: _____ []

Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 3: Dawkins Branch, Victory Elementary School



- Quality of upstream MS-4 outfalls: _____ []
- Upstream land uses: _____ []
- Opportunity to reduce floatables sources: _____ []
- Access and feasibility: _____ []
- Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 4: Dewey's Creek, Wayside Drive



- Quality of upstream MS-4 outfalls: _____ []
- Upstream land uses: _____ []
- Opportunity to reduce floatables sources: _____ []
- Access and feasibility: _____ []
- Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 5: Hooes Run, Castile Court

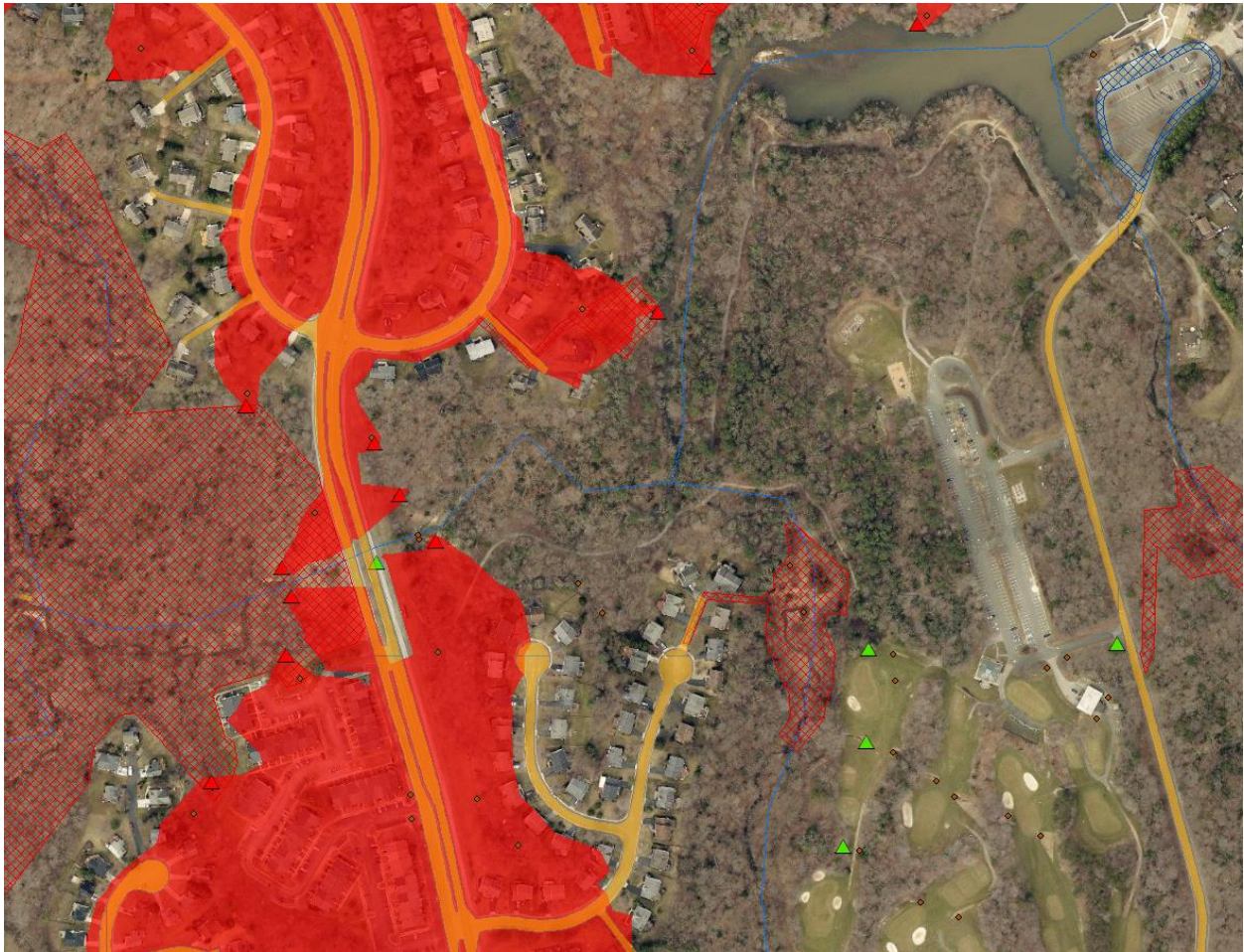


- Quality of upstream MS-4 outfalls: _____ []
- Upstream land uses: _____ []
- Opportunity to reduce floatables sources: _____ []
- Access and feasibility: _____ []
- Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 6: Hooes Run, Springwood Drive



Quality of upstream MS-4 outfalls: _____ []

Upstream land uses: _____ []

Opportunity to reduce floatables sources: _____ []

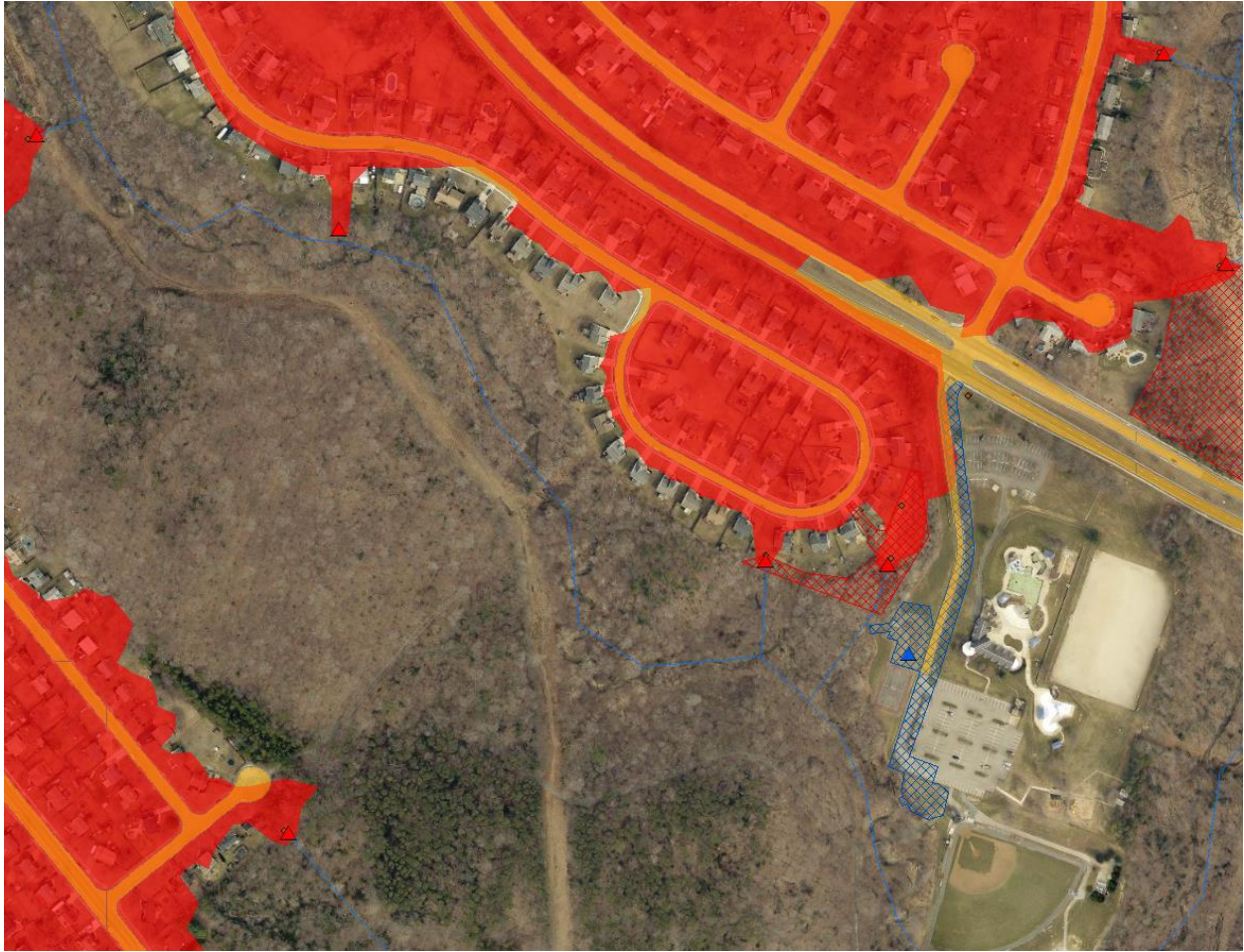
Access and feasibility: _____ []

Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 7: Neabsco Creek, Andrew Leitch Park



- Quality of upstream MS-4 outfalls: _____ []
- Upstream land uses: _____ []
- Opportunity to reduce floatables sources: _____ []
- Access and feasibility: _____ []
- Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 8: Neabsco Creek, Cloverdale Park



Quality of upstream MS-4 outfalls: _____ []

Upstream land uses: _____ []

Opportunity to reduce floatables sources: _____ []

Access and feasibility: _____ []

Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 9: Powells Creek, Monclair



Quality of upstream MS-4 outfalls: _____ []

Upstream land uses: _____ []

Opportunity to reduce floatables sources: _____ []

Access and feasibility: _____ []

Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 10:



Quality of upstream MS-4 outfalls: _____ []

Upstream land uses: _____ []

Opportunity to reduce floatables sources: _____ []

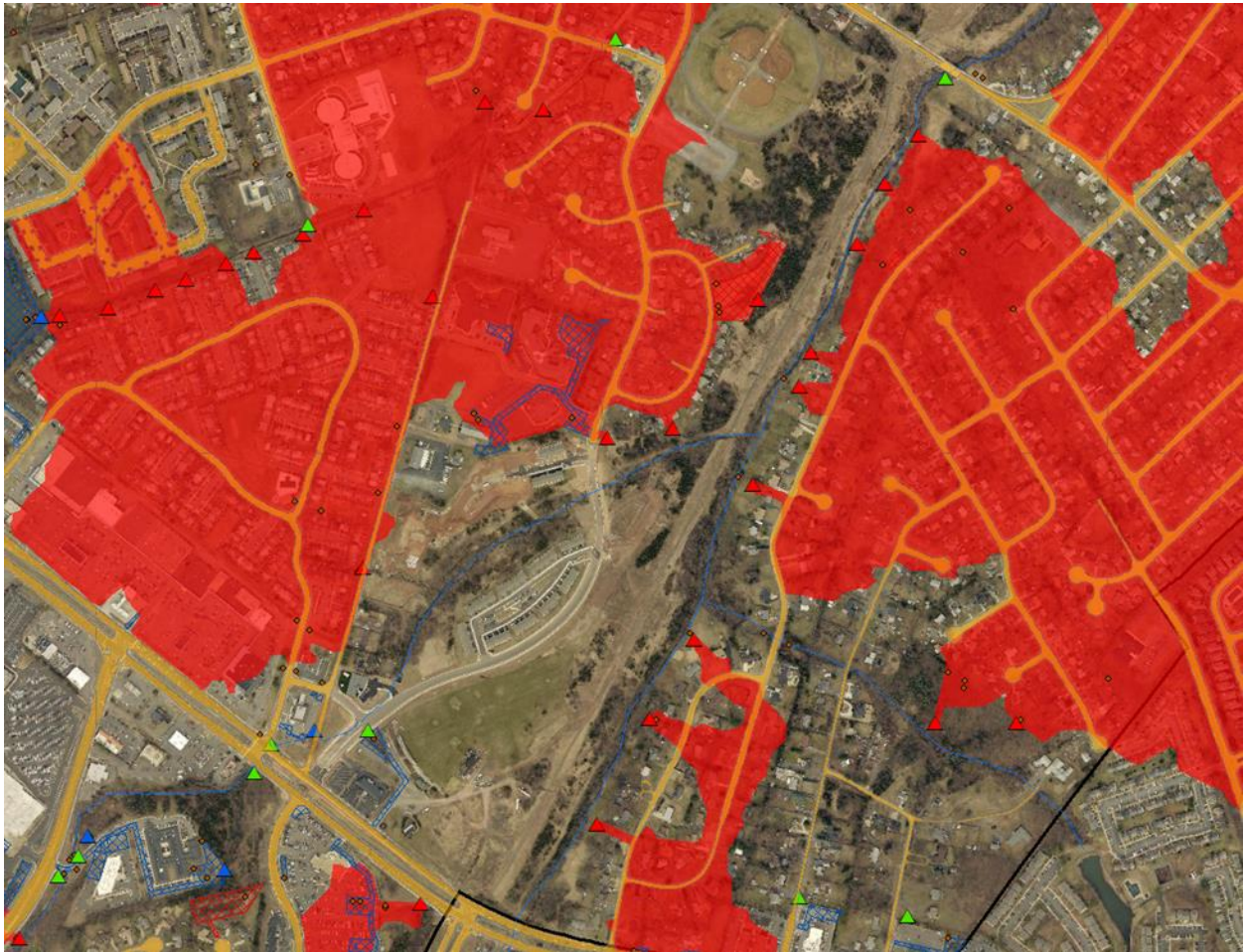
Access and feasibility: _____ []

Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 11:



Quality of upstream MS-4 outfalls: _____ []

Upstream land uses: _____ []

Opportunity to reduce floatables sources: _____ []

Access and feasibility: _____ []

Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____

Site 12:



Quality of upstream MS-4 outfalls: _____ []

Upstream land uses: _____ []

Opportunity to reduce floatables sources: _____ []

Access and feasibility: _____ []

Size of contributing drainage area(s): _____ []

Notes:

Site Score: _____



Prince William County

Floatables Monitoring Program

Permit No.
VA0088595

Prince William County Department of Public Works
Watershed Management Branch
5 County Complex Court, Suite 170
Prince William, Virginia 22192

5/1/2016

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I. Introduction

Prince William County is dedicated to Program providing its citizens with the healthiest environment possible. It is with this goal the County establishes programs aimed at reducing pollutant impacts from heavily urbanized and industrialized areas. Non-point source pollution from urban and industrial areas within the County is a great concern due to its potential to impact water quality. Pollutants are transported from these areas during rain events and often deposited untreated into nearby streams and rivers. To mitigate this issue, the Environmental Protection Agency (EPA) and Virginia Department of Environmental Quality (VA-DEQ) have instituted programs aimed at reducing the potential impact of pollutants from urban areas. Goes into

Under the Virginia Pollutant Discharge Elimination System Permit Program (VPDS) and Virginia Stormwater Management Program (VSMP) permits are issued aimed at reducing pollution runoff from industrial and urban areas containing Municipal Separate Storm Sewers Systems or MS-4s. These systems transport water from urbanized areas to streams and rivers and are a major concern of point and non-point source pollution. Discharges from MS4s are regulated under the Virginia Stormwater Management Act and Clean Water Act (CWA) through permits issued by DEQ and the EPA. Through this program, Prince William County maintains a Phase 1 VSMP MS-4 permit (Permit No. VA0088595).

Through its VSMP permit, the County is required to monitor floatables from areas suspected to be contributing excess levels of trash and refuse to its MS-4 by implementing a Floatables Monitoring Program. Unlike the Dry Weather Monitoring Program and Wet Weather Screening Program, the Floatables Monitoring Program is aimed at assessing trash loadings to streams. Using information obtained through this program, the County is to then develop strategies to reduce refuse load from these areas. The County's MS-4 permit, issued on December 17th, 2014, outlines requirements for the Floatables Monitoring Program as follows:

Floatables Solid Monitoring

For the purpose of this program, floatables are defined as any material that is not a liquid, solid, or gas, and is capable of floating on the surface of water. The program is designed to monitor floatables in the MS-4 system to determine if there is an excess loading of floatables to the MS-4 system. The program will be implemented in the MS-4 system as follows:

Monitoring shall be conducted at the following monitoring sites located at MS-4 outfalls and/or areas receiving discharges to the MS-4:

Monitoring shall be conducted once per quarter after program implementation.

The monitoring program shall include the count of floatables visually observed and length or area of floatables.

This program manual describes the methods and procedures for Prince William County's Floatables Monitoring Program. All procedures are subject to modification as program feasibility and applicability are assessed during program implementation. All program modifications will be noted as part of the County's Program Plan.

II. Site Selection

- a. Initial Locations and Site Screening
 - i. Methods and Results

Initial site locations were provided by the Prince William County Soil and Water Conservation District (PWCSWCD) from a list of sites currently monitored under its stream stewards program. These nine sites were selected as the starting point during site screening since the PWCSWCD currently visits these sites on a quarterly basis, and Floatables monitoring could straightforwardly be incorporated with the stream stewards program.

Three additional sites were identified using GIS in the need to incorporate a more diverse set of land uses in the floatables analysis, as the sites monitored by PWCSWCD were located in mostly residential areas. These sites were located by making an overall observation of the County's service area and the location of its regulated outfalls in relation to areas with diverse land uses. The first supplementary site was located off of Liberia Avenue, near the intersection of Liberia and route 294. This site includes discharge from an upstream commercial area. The second additional site is located on flat branch near the intersection of Sudley Road and Goodwin Drive. This site incorporates an area with a high degree of impervious surfaces and includes drainage from commercial and industrial land uses. Finally the third additional site is located on Cornice Place off of Old Bridge Road. This area drains from a smaller shopping center, and would be a good opportunity to see how BMPs applied in that shopping center can effect floatables numbers downstream.

- b. Selection of final sampling sites
 - i. Methods

Sites identified during initial site screening were visited and scored according to a set of metrics. These metrics were adopted in order to identify optimal locations for floatables monitoring. Metrics incorporated elements analyzing the quality of upstream conditions, land uses, safety and access of the site, size of contributing drainage systems, and opportunity to reduce floatable sources. Each metric was scored on a scale of 1-5 with a score of 5 being the most desirable, and 1 being the least. The total score for each site was calculated by averaging the scores from each metric for the site. Sites with the highest average score were the most desirable for use in the floatables monitoring program.

Within each site, a sampling area will be selected. This sampling area will outline where volunteers or staff are to assess floatables. This sampling site will be selected during the first sampling period, and will encompass the area where the most floatables are identified.

- ii. Results

All 12 sites were analyzed for use in the program. The score results from each site are located in Table 1 below.

Table 1: Site Assessment Scores

Site	Score
Site 7: Neabsco Creek, Andrew Leitch Park	3.6
Site 10: Liberia and 294	3.6
Site 3: Dawkins Branch, Victory Elementary	3.4

Site 11: Flat Branch	3.4
Site 12: Cornice Place and Old Bridge Road	3.2
Site 4: Dewey's Creek, Wayside Drive	3.2
Site 9: Powell's Creek, Monclair	3.0
Site 6: Hooe's Run, Springwood Drive	2.6
Site 5: Hooe's Run, Castile Court	2.6
Site 2: Catharpin Creek, James Long Park	2.6
Site 8: Neabsco Creek, Cloverdale Park	2.4
Site 1: Bull Run, Ben Lomond Park	0

Site scores varied from 3.6 to 0. Site 1 was disqualified due to a lack of MS-4 outfalls discharging into the stream segment. Sites that ranked the highest typically had a mix of contributing land uses and highly accessible, countable, and identifiable sources of floatables within the stream segment. Sites typically had one to three regulated outfalls discharging to the stream, and had medium to small contributing drainage areas. The top 5 sites are selected for the program, with the top 2 sites used for the pilot study. Completed site assessment sheets are available in Appendix A.

c. Site Rotation

Sites will be rotated from monitoring cycle if it is determined that the site does not perform as expected. This can occur for several reasons such as, if the site does not receive sufficient trash counts, if access to the site becomes too dangerous for staff to safely perform monitoring, or if activities occur on site that render monitoring impractical such as a stream restoration or redevelopment projects. Sites must remain in the program for at least one year before being replaced by another site, unless circumstances arise that prevent monitoring from occurring.

Replacement sites will be selected in the same method as described above in section b. New candidate sites will be selected from the list of sites that were not selected in the initial site selection procedure and from suggestions from County Staff.

III. Field Procedures

a. Pilot Program

i. Methods

To test and refine monitoring program procedures as well as assess staff effectiveness in monitoring efforts, the Floatables Monitoring Program will first operate under a pilot program. The pilot program will conduct monitoring at two sites for four sampling periods. In order to proceed with main sampling program in a reasonable timeframe, the pilot monitoring will take place at an accelerated schedule. Instead of sampling once per quarter, monitoring will be conducted once per month. Factors such as sampling procedures, sampling site characteristics, safety measures, and monitoring forms will be evaluated during this time. The pilot program will last a total of 4 months before the main monitoring program begins.

ii. Results

Pilot Program results will be included at the end of the pilot study for the program.

b. Training

Sampling will be performed with a mix of paid staff and volunteers. In order to maintain consistency in the program in the event that different groups of people sample different sites, or different groups of people sample from each sampling period to the next, training must take place. Staff will be responsible for reading and understanding the methods presented in this manual, and relaying that information to volunteers. Staff will be directed to either be present during all sampling events, or at the very least be present for the first sampling event a volunteer participates in. Important concepts to place emphasis on when training volunteers are bankfull depth, the location of site markers, and the layout of the sampling form. A sampling manual shall be provided to each volunteer performing monitoring and each inspection sheet will include instructions and a detailed list of site locations. Volunteers can be directed to contact PWC staff if needed.

c. Sampling Methods

Sampling will be consistent across all sites. As referenced in section II.b, a sampling area will be selected within each monitoring site. The sampling area will be identified on site with simple wooden stakes. The stakes will be labeled to indicate the direction to follow when sampling and also indicate the bankfull height of the stream. If a distinct sampling direction is not indicated, it will be assumed sampling will take place in the direction of stream flow. The distance between stakes will be approximately 100 ft. Floatables monitoring staff will walk the length of the sampling area counting the type and amount of each floatable type. Refuse will be considered a floatable eligible to be counted if it is above the water line, within the confines of the stream, and below the bankfull mark of the channel, as described in figure 1 below. Observations will be recorded on the form presented in section IV.a. Data sheets will be provided to the County at the end of each monitoring year and kept within the County's Floatables monitoring manual in Appendix B.



Figure 1. Bankfull Diagram, Credit Indiana FDH

d. Safety

Safety an important goal of the floatables monitoring program. When performing monitoring, staff should be equipped with proper footwear and clothing. This includes at a minimum closed toed shoes. Staff are recommended to also wear long sleeved shirts and pants, as well as waterproof gaiters or shoes in the event entering the stream is necessary. Staff should avoid accessing areas with high slopes and steep drop-offs.

The accessibility and safety of monitoring sites are incorporated in the site analysis used to determine sampling sites. Within sampling sites, sampling areas are identified that incorporate safe access and easy visibility for monitoring. Health and safety responsibility and accountability involves every employee. Some additional measures that should be followed or noticed includes:

- 1) Bring cell phone on all field site visits.
- 2) Exercise caution when encountering any wildlife and hazardous plants. In addition, many outfalls are located in remote areas that may be near gathering places for homeless or transient individuals. Do not enter a potentially hostile area.
- 3) Use common sense during electrical storms and/or when severe conditions (e.g., high wind, hail) develop. The safety of field staff overrides all other considerations.
- 4) Storm sewers contain a variety of water-borne bacteria and other harmful chemicals. Wash hands or use anti-bacterial wipes or hand gels liberally, especially prior to lunch breaks, etc.

i. DANGEROUS FLORA AND FAUNA

During the course of field activities, employees may come in contact with a wide range of dangerous or toxic animals and plants. Dangerous animals may include: black widow and brown recluse spiders; fire ants; mosquitoes and biting flies; bees, wasps and hornets; ticks and chiggers; microbial organisms (e.g., found in water, soil, and air and on carrier/host organisms); rabid mammals; and poisonous snakes. Dangerous plants may include: thorny plants; poison ivy, oak, and sumac; and molds, mildews, and fungi (which may cause allergic reactions). Contact with these organisms can cause effects from simple discomfort (such as from thorny bush scratches) to severe allergic reactions and possibly death. If interactions do occur, take appropriate actions related to specific interaction and individual response to interaction.

ii. WEATHER-RELATED HAZARDS

Weather-related hazards include the potential for heat or cold stress, electrical storms, treacherous weather-related working conditions, high winds, and limited visibility. These hazards correlate with the season in which site activities occur. In the event of adverse weather conditions, the Field Team Leader will determine if work can continue without endangering the health and safety of site personnel.

iii. HEAT STRESS

Heat stress is a significant potential hazard during the warmer months. Heat stress manifests itself as one of three conditions: heat cramps, heat exhaustion, or heat stroke. Heat cramps are brought about by a prolonged exposure to heat. As an individual sweats, water and salts are lost by the body, triggering painful muscle cramps.

iv. COLD STRESS

Cold stress is a danger at low temperatures and when the wind chill factor is low. Cold stress is generally described as a local cooling (frost nip, frost bite, and freezing) or a general cooling (hypothermia). Personnel working outdoors in temperatures at or below freezing may be subject to local cooling. Areas of the body that have a high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. General cooling (hypothermia) occurs when exposure to cold reduces body temperature. With prolonged exposure, the body becomes unable to maintain its proper internal temperature. Without treatment, hypothermia will lead to stupor, collapse, and death. Prevention of cold stress is a function of whole body protection. Adequate insulated clothing will be worn when the air temperature drops below 50 °F. Reduced work periods may be necessary in extreme conditions to allow adequate periods in a warm area.

IV. Documentation
a. Forms

There are two types of data acquisition forms used in the program, the site identification/evaluation form, and the field inspection form. The site identification/evaluation form is used during the site selection process to evaluate potential sampling sites. It will also be used whenever new potential sites are evaluated for inclusion into the program. This form uses a set of metrics to score and average to generate a quantitative comparison between candidate sites. An example of the Site identification form can be seen in figure 2 below:

Site #: Site Description

Site Map

Quality of upstream MS-4 outfalls: _____ []

Upstream land uses: _____ []

Opportunity to reduce floatables sources: _____ []

Access and feasibility: _____ []

Size of contributing drainage area(s): _____ []

Notes:

Site Score: ____

Figure 2: Site Identification Form

Field inspection forms are completed during each inspection. They incorporate information on the date, time, weather conditions, and site number of the inspection, Information on the person/group performing the inspection, and information on the floatables found on site. Each inspection from includes the basic sampling methods, and breaks down each floatable type typically observed in the field. An example of the field inspection form can be seen in figure 3 below:

Prince William County Floatables Monitoring Field Inspection Form

Location:	Date:	Time:
Name:		Weather Conditions:

The sampling area will be identified on site with simple wooden stakes. The stakes will be labeled to indicate the direction to follow when sampling and also indicate the bankfull height of the stream. If a distinct sampling direction is not indicated, it will be assumed sampling will take place in the direction of stream flow. The distance between stakes will be approximately 100 ft. Floatables monitoring staff will walk the length of the sampling area counting the type and amount of each floatable type observed. Refuse will be considered a floatable eligible to be counted if it is above the water line, within the confines of the stream, and below the bankfull mark of the channel.

Plastic Bags:	
Plastic Bottles:	
Snack bags or wrappers:	
Aluminum Cans:	
Oil containers:	
Cardboard:	
Styrofoam:	
Other:	

Signature: _____ Date: _____

Figure 3: Field Inspection Form

b. Documentation and trends analysis

Data gathered in the field will be organized using an excel database provided by Prince William County. This database incorporates all site characteristics and inspections and allows for the easy identification of continued trends within each sampling site.

Each site has its own sheet within the database. Each sheet contains easily identifiable areas to enter data gathered from the field. Each site is identified at the top of the sheet along with a description of the site location. This database will be the main form of data transfer between monitoring staff and PWC.

V. Future Program Goals

a. Trash Mitigation plans

As data is gathered at sampling sites, an effort to help reduce the amount of floatables entering the streams will be developed. Using data gathered on floatables entering the stream segments, a determination of their source will be made. Efforts will then be undertaken in the surrounding drainage areas to reduce the amount of the floatables identified in the stream reaches.

These mitigation plans will focus on efforts such as ensuring recycling and trash bins have lids, enhancing trash storage, enforcing and promoting current recycling standards, promoting trash pickup events, encouraging street sweeping efforts in commercial areas, and other methods. An assessment on the effectiveness of these efforts can then be made, with the possibility of expanding mitigation plans to other parts of the County.

b. Adapting to changing MS-4 Regulations

As the program continues throughout the length of the County's current MS-4 permit, the County will monitor trends related to future requirements within the MS-4 program. This could lead to changes in the floatables monitoring program. Since the permit requirements can only be changed during permit issuance, current program goals and methods will remain constant throughout each permit period (5 years). As the timeline advances towards the County receiving a new MS-4 permit, potential changes to the program will be observed and incorporated into the next monitoring period.

APPENDIX A – Site Identification Forms

Site 1: Bull Run, Ben Lomond Park



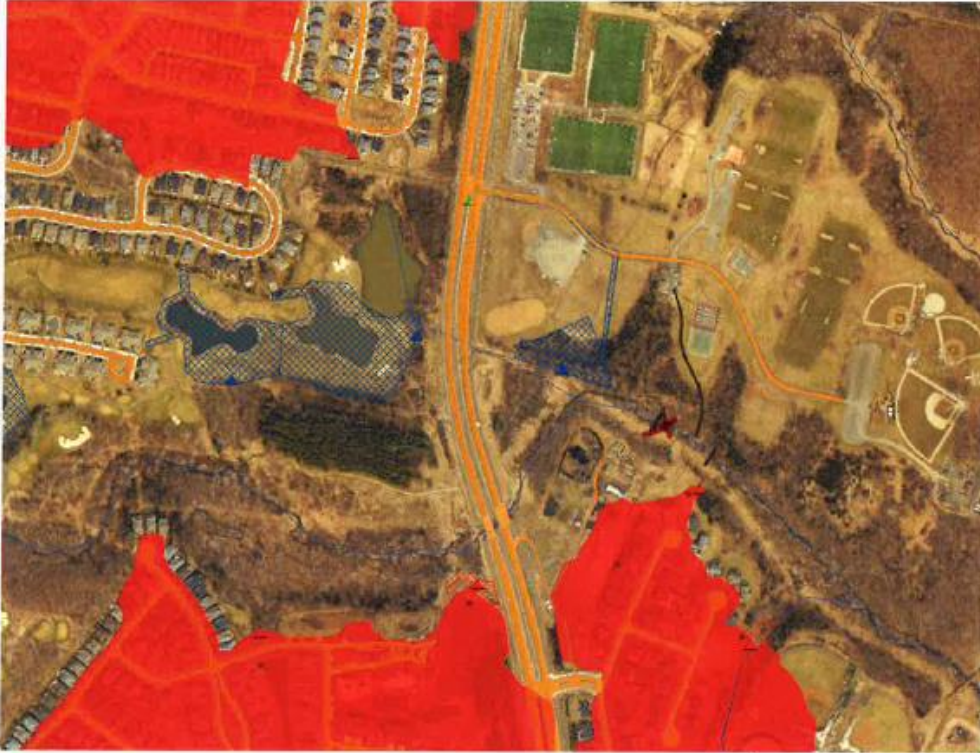
Quality of upstream MS-4 outfalls: No quality upstream outfalls [0]
Upstream land uses: Residential, some commercial [2]
Opportunity to reduce floatables sources: _____ []
Access and feasibility: _____ []
Size of contributing drainage area(s): Large >10ac [3]

Notes:

No MS-4 outfalls eliminates this site from the floatables monitoring program.

Site Score: 0

Site 2: Catharpin Creek, James Long Park



Quality of upstream MS-4 outfalls: Mostly Nonpoint, one MS-4 outfall (1)

Upstream land uses: Residential, Large lot, Sports Complex (2)

Opportunity to reduce floatables sources: Not much trash present (1)

Access and feasibility: Very easy access, ~~little~~ easy mobility (along road #5)

Size of contributing drainage area(s): Small-Med (4)

Notes:

Access easily available from library parking lot. Site is deranked by
lack of floatable input, Not many MS-4 outfalls nearby, Little Nonpoint
Sources. Site good for monitoring, Bad for trend analysis

Site Score: 2.6

Site 3: Dawkins Branch, Victory Elementary School



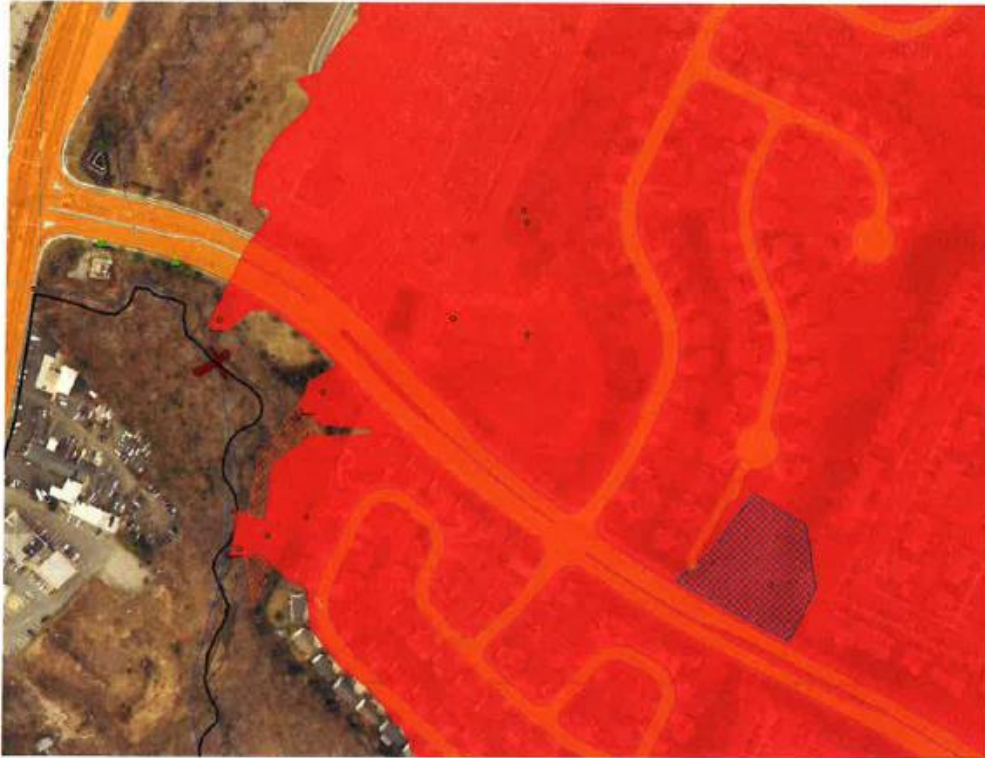
Quality of upstream MS-4 outfalls:	<u>2 quality outfalls</u>	<u>[3]</u>
Upstream land uses:	<u>Residential, Schools, Roadway</u>	<u>[3]</u>
Opportunity to reduce floatables sources:	<u>Some floatables, limited But excessive sources</u>	<u>[4]</u>
Access and feasibility:	<u>Path allows easy access, Lotwork access good</u>	<u>[5]</u>
Size of contributing drainage area(s):	<u>Med. large</u>	<u>[3]</u>

Notes:

Good open area for monitoring. Outreach can be isolated to single residential area. Not many floatables present when site inspection occurred

Site Score: 3.4

Site 4: Dewey's Creek, Wayside Drive



Quality of upstream MS-4 outfalls: One gravity outfall, [3]

Upstream land uses: Residential, Commercial, Roadway [4]

Opportunity to reduce floatables sources: Large amount of trash [3]

Trash Source from Streambank

Access and feasibility: Available parking, easy access [3]

Size of contributing drainage area(s): Large [3]

Notes:

Stream will undergo Restoration project in coming years. May Complicate Monitoring efforts [fall 2016]. Could be good pilot site

Site Score: ~~4.0~~ 3.2

Site 5: Hoes Run, Castile Court



Quality of upstream MS-4 outfalls:	<u>2-3 quality outfalls</u>	[3]
Upstream land uses:	<u>Residential,</u>	[2]
Opportunity to reduce floatables sources:	<u>good amount of trash identifiable sources</u>	[4]
Access and feasibility:	<u>Neighborhood w/ little parking, hill difficult</u>	[2]
Size of contributing drainage area(s):	<u>Medium</u>	[2]

Notes:

good opportunity to reduce floatables, Access may be difficult, Steep Slope Down to Stream, and Stream has high steep banks.

Site Score: 2.6

Site 6: Hooes Run, Springwood Drive



- Quality of upstream MS-4 outfalls: 3 quality outfalls [3]
Upstream land uses: Residential [2]
Opportunity to reduce floatables sources: little to no trash [2]
Access and feasibility: hilly area to descend, path helps access [3]
Size of contributing drainage area(s): med-large [3]

Notes:

larger stream, access good, but roads may vary according to
where along reach sampling occurs. very little trash in stream.

Site Score: 7.6

Site 7: Neabsco Creek, Andrew Leitch Park



Quality of upstream MS-4 outfalls: 2 quality outfalls [2]
Upstream land uses: Residential small lot [3]
Opportunity to reduce floatables sources: Low numbers of floatables [4]
Access and feasibility: good access, too few inputs good isolated inputs [10] [5]
Size of contributing drainage area(s): Small - mid [4]

Notes:

Many potential sampling sites, but must first find in stream access is good. Stream size is good. fairly simple area to reduce floatables.

Site Score: 3.6

Site 8: Neabsco Creek, Cloverdale Park



Quality of upstream MS-4 outfalls: 2-3 quality [3]
Upstream land uses: Residential [2]
Opportunity to reduce floatables sources: would be difficult to ID sources, little amount of trash [2]
Access and feasibility: long way from parking, wide deep channel [2]
Size of contributing drainage area(s): Med-Large [3]

Notes:

wide stream makes it difficult for monitoring efforts.

Site Score: 2.4

Site 9: Powells Creek, Monclair



Quality of upstream MS-4 outfalls: 1-2 quality outfalls [2]
 Upstream land uses: Residential [2]
 Opportunity to reduce floatables sources: ~~Some trash, difficult to determine~~ [2] *Identifiably sources*
 Access and feasibility: ~~large distance from parking, access through lots~~ *Some trash (3) easy access*
 Size of contributing drainage area(s): Small - med [4]

Notes:

Trash present as part of Prior Stream Restoration project which must be removed from analysis. wide but shallow stream that receives high flows.

Site Score: 3.0

Site 10:



- Quality of upstream MS-4 outfalls: Many upstream outfalls [4]
- Upstream land uses: Commercial/residential [4]
- Opportunity to reduce floatables sources: Some [3]
- Access and feasibility: Fence impedes Access, Litter - before stream [3]
- Size of contributing drainage area(s): Small-med [4]

Notes:

No current sampling site. Inaccessible through private property
Mostly residential, need access to BML, but site can be located before fenced off area
leaves identifiable input drainage areas. floatables are few, but have potential for more.

Site Score: 3.6

Site 11: Flat Branch

2



Quality of upstream MS-4 outfalls:	<u>Many</u>	[4]
Upstream land uses:	<u>Commercial/Residential</u>	[4]
Opportunity to reduce floatables sources:	<u>Sufficient floatables</u>	[4]
Access and feasibility:	<u>Ingress/Egress through private property</u>	[3] Lateral access good
Size of contributing drainage area(s):	<u>Large</u>	[2]

Notes:

No current sampling site. Ingress/Egress through private property. Sufficient floatables exist, but may not be attributed to MS-4 outfalls. Transported from upstream

Site Score: 3.4

Site 12:



- Quality of upstream MS-4 outfalls: Many [4]
Upstream land uses: Commercial / Residential [4]
Opportunity to reduce floatables sources: Good amount of floatables [4]
Access and feasibility: Small stream, easy access from Roadway [3]
Size of contributing drainage area(s): Very Large [1]

Notes:

No current sampling site. Small stream with good floatable #'s. easy access
May be able to discern source of floatables for Res/Com sources

Site Score: 3.2

APPENDIX B – Field Inspection Forms

Forms will be added to this section upon completion

Prince William County Floatables Monitoring Field Inspection Form

Location:	Date:	Time:
Name:		Weather Conditions:

The sampling area will be identified on site with simple wooden stakes. The stakes will be labeled to indicate the direction to follow when sampling and also indicate the bankfull height of the stream. If a distinct sampling direction is not indicated, it will be assumed sampling will take place in the direction of stream flow. The distance between stakes will be approximately 100 ft. Floatables monitoring staff will walk the length of the sampling area counting the type and amount of each floatable type observed. Refuse will be considered a floatable eligible to be counted if it is above the water line, within the confines of the stream, and below the bankfull mark of the channel.

Plastic Bags:	
Plastic Bottles:	
Snack bags or wrappers:	
Aluminum Cans:	
Oil containers:	
Cardboard:	
Styrofoam:	
Other:	

Signature: _____

Date: _____

PWC Floatable Survey Results and Analysis - 2018 Fiscal Year

Figure 1. Floatable Monitoring from July – December 2017

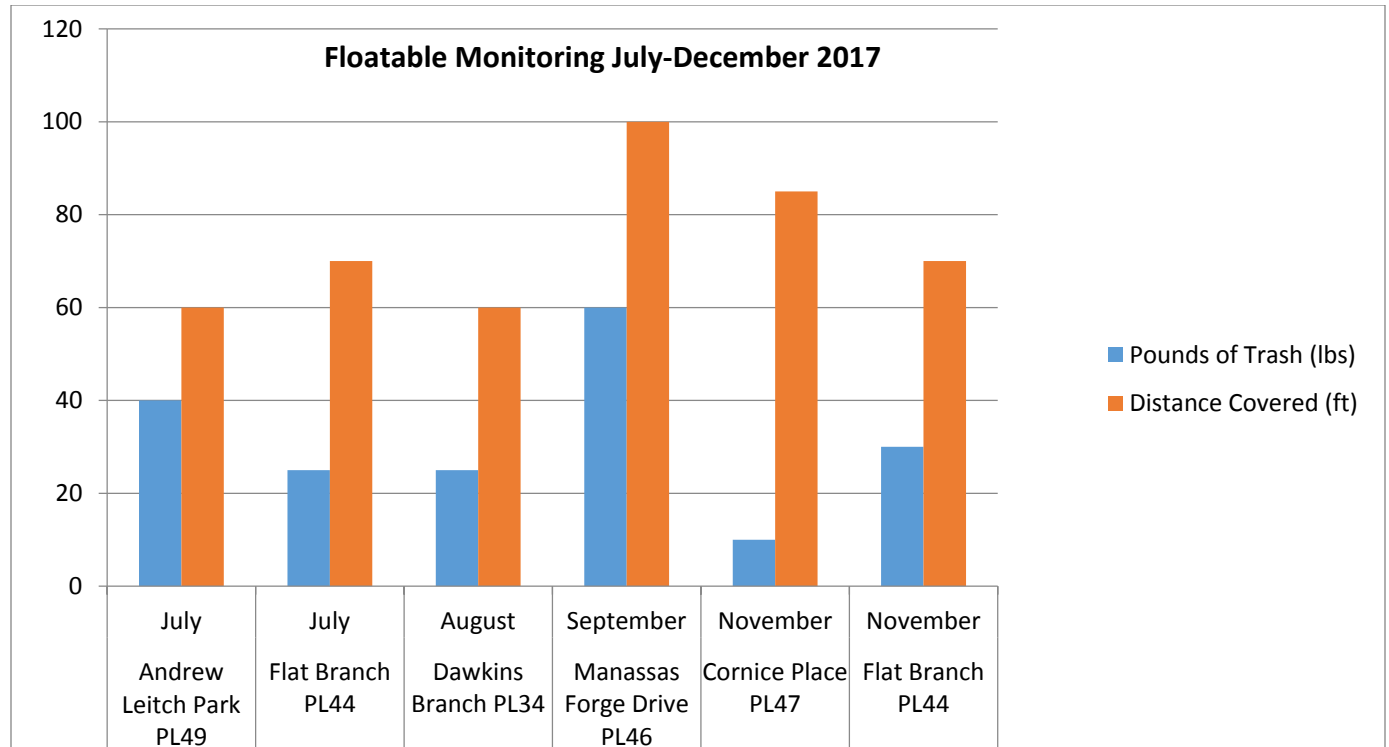


Figure 2. Floatable Monitoring from January – March 2018

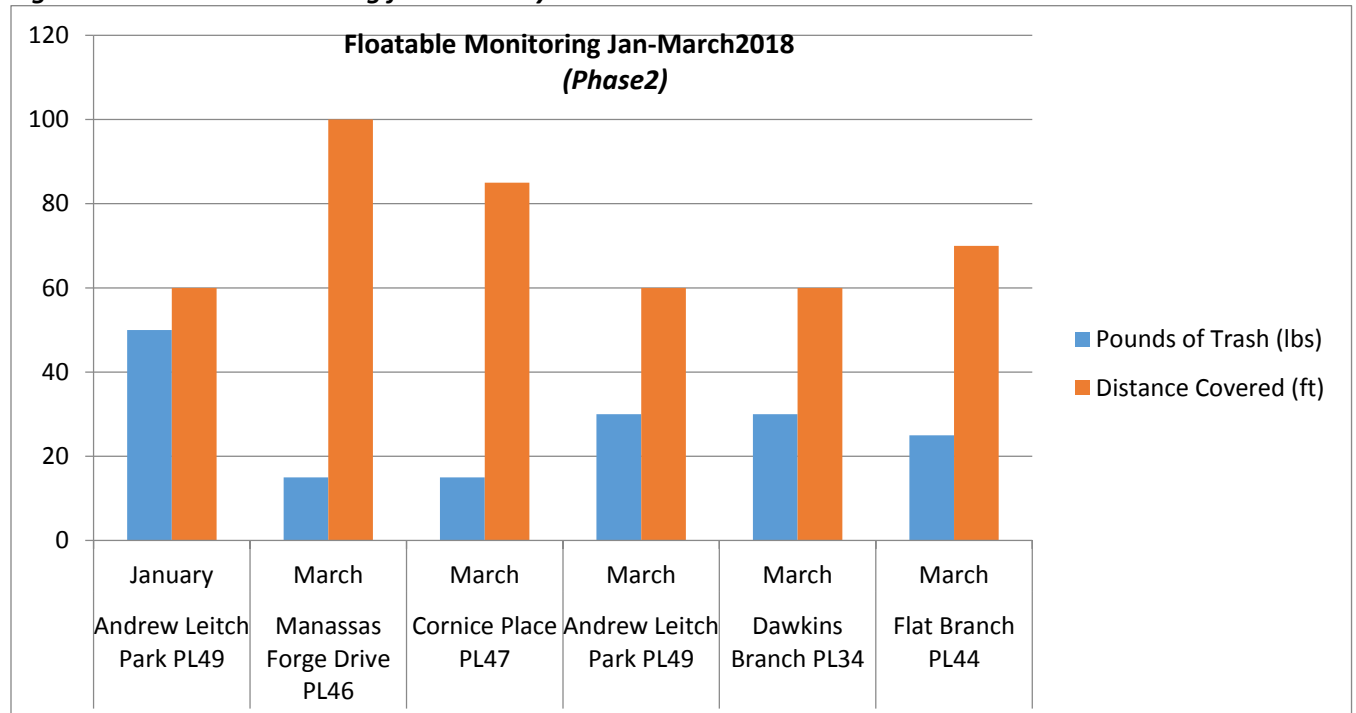


Figure 3. Floatable Monitoring April – June 2018

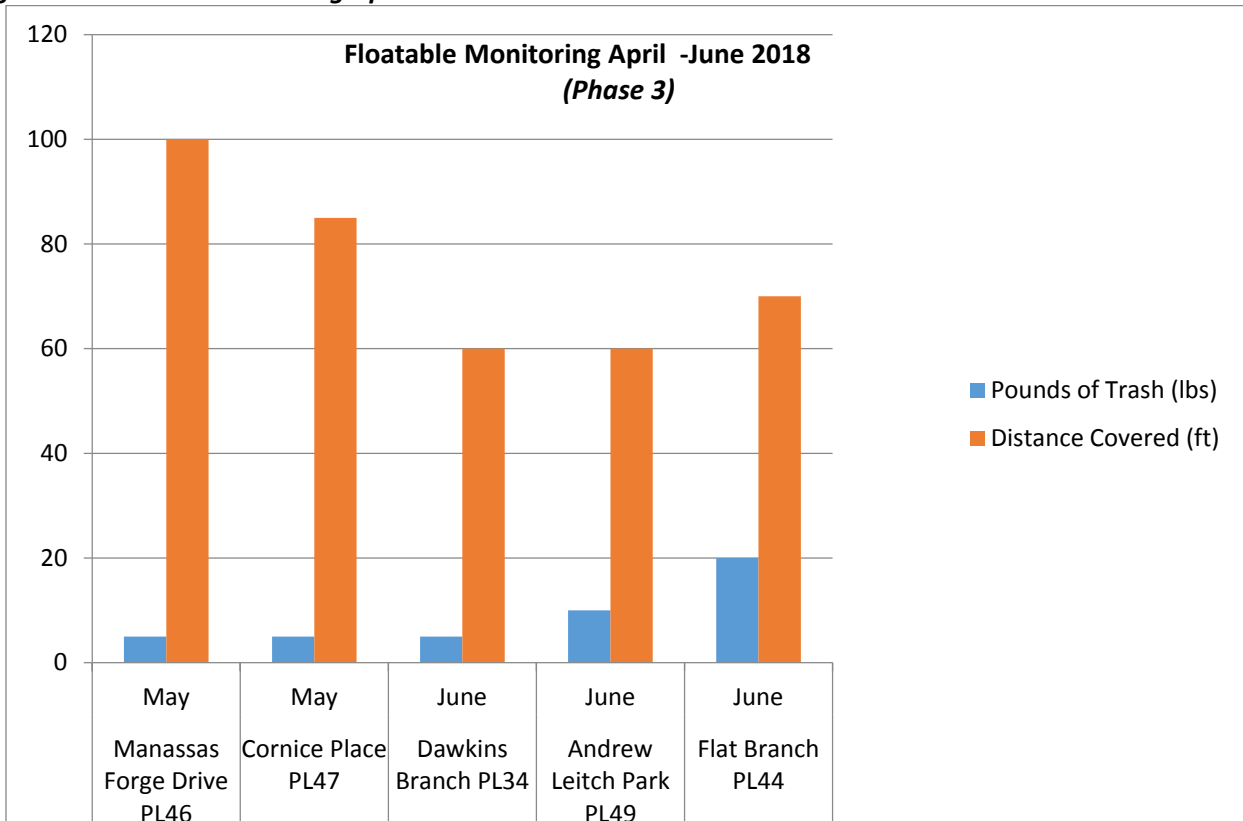


Figure 4. Percentage of Trash Load Relative to Site- Phase 1

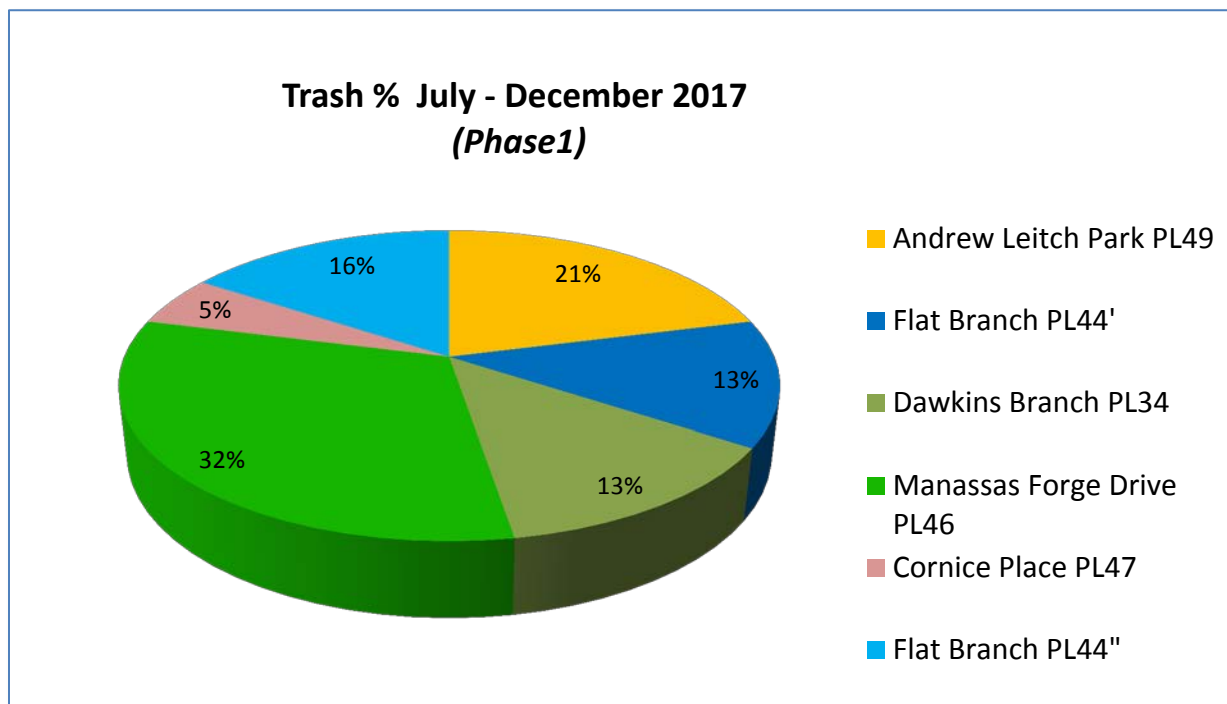


Figure 5. Percentage of Trash Load Relative to Site- Phase 2

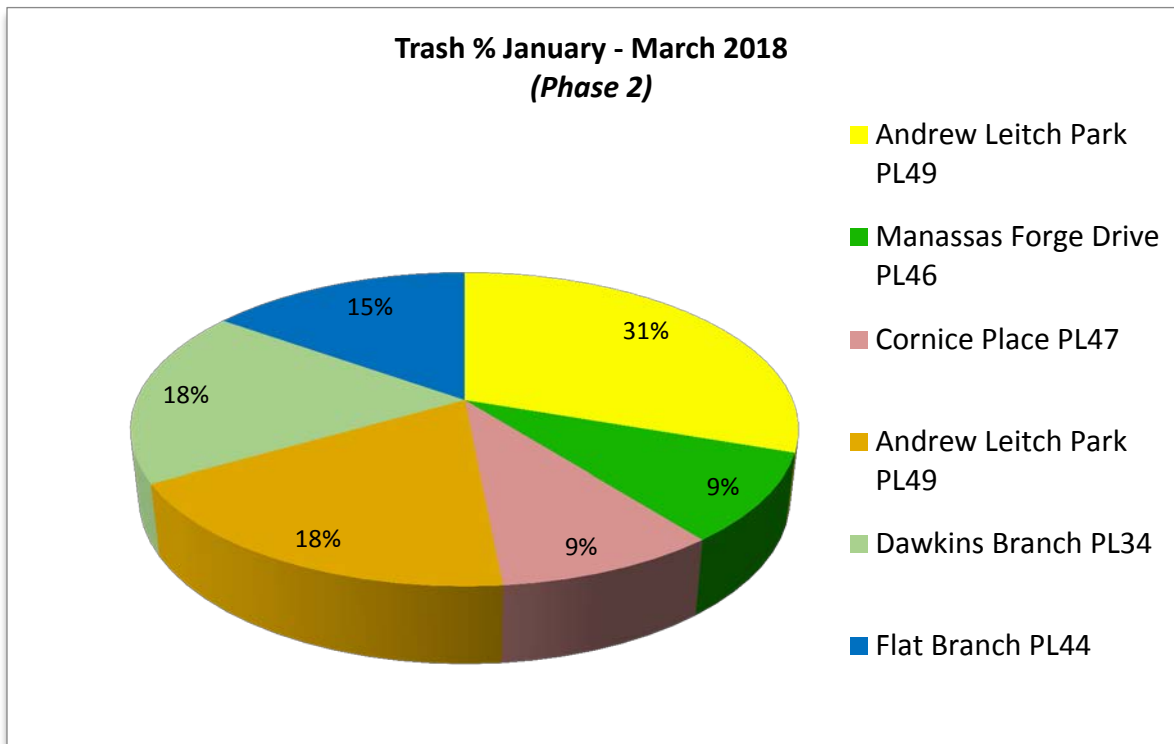
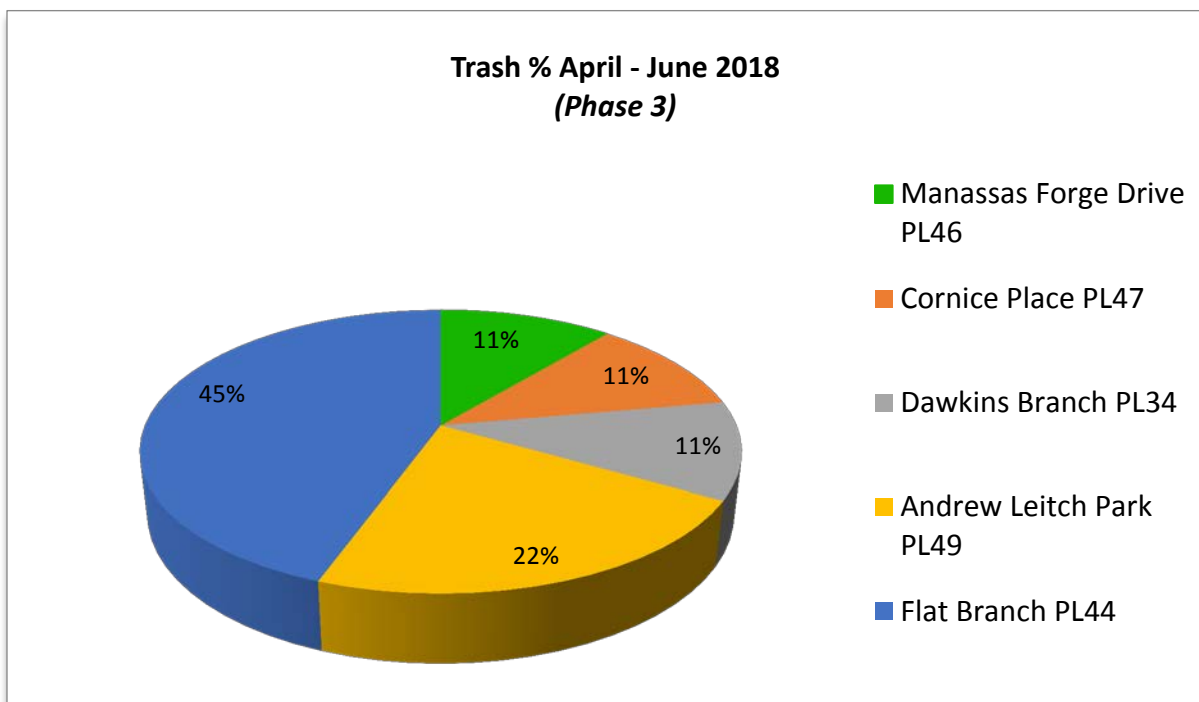


Figure 6. Percentage of Trash Load Relative to Site- Phase 3



Phase 1

Compared to Phase 1- 2016, the Phase – 1, 2017 maintained a high trash level at Andrew Leitch, Manassas Forge and Flat Branch. Plastic wraps, plastic bottles and plastic bags were the dominate items collected from all the sites. While items of different brand names were identified, the brand names of plastic bags brand have been a major parameter. For example, the brand name 7-11 was dominant at most of the sites- be it cups or plastic bags. 7-11 plastic bags showed significant reoccurrences at Cornice Place and Flat Branch while Walmart bags came seconded in the trend especially at Flat Branch. At Cornice Place, a constant present of oil sheen has also been noticed. Ziploc bags and dog poop bags with the brand name “Duty Calls Poop Bags” have also been dominant at the Dawkin’s Branch site.

Phase 2 and Phase 3

Phase 2 and Phase 3 2017 showed a decrease in trash load from all sites but leaving Andrew Leitch, Flat Branch and Dawkin’s Branch with high trash counts compared to the other sites. Cornice Place and Manassas Forge maintained a low trash load.

Areas of attention for follow-up:

- Examine the relationship of more 7-11 products at the Cornice Place site
- Examine the possible sources of the oil sheen at Cornice Place site
- Examine state of trash bins in County schools and the level of environmental education especially on plastics and water pollutions in County Schools. Resulting from the dominant Ziploc bags recorded at Dawkin’s Branch
- Intensify pet waste management education among residents as with the case with dog poop bags at Dawkin’s Branch

Conclusion

With the Floatable monitoring program in its second year of monitoring, other factors that directly or indirectly related to trash load at the different monitoring sites still needs to be identified. For example, a close examination of the relation of periods/seasons of the year and trash load at particular sites. Getting Prince William County residents and schools; especially students, in a general trash awareness campaign will also be a significant step in reducing environmental pollution and debris in Prince William County waterways.

Appendix 4 – Structural and Source Controls

Appendix III – Administrative and Programmatic

FY18 Report - SWM Retrofits: Stormwater Facility Retrofits Beginning July 1, 2009

WMB Number	Project Name	Status	Installation FY	Latitude	Longitude	BMP Practice	Area Treated (Ac)	Impervious Area (Ac)	Pervious Area (Ac)	Forested Area (Ac)	Calculation Method	Estimated Total Pollutant Reduction (lbs/yr)			Precent Unregulated Area	Baseline Adjustment for Unregulated Area (lbs/yr)			Total Pollutant Reduction Achieved after Baseline Adjustment (lbs/yr)		
												TN	TP	TSS		TN	TP	TSS	TN	TP	TSS
Completed Projects																					
1	SWM Facility #257	Completed	2010	38.70846	-77.42804	Extended Detention	4.28	1.09	1.91	1.28	CBP Established Efficiency, Incremental	7.33	0.35	223.44	13.52%	0.53	0.06	52.90	6.80	0.29	170.54
21	Pond 51 - Hammill Mill Park SWMF	Completed	2011	38.66706	-77.26875	Extended Detention	7.13	2.10	2.76	2.27	CBP Established Efficiency, Incremental	12.41	0.63	406.44	3.06%	0.21	0.03	21.60	12.20	0.60	384.84
23	SWM Facility #154 - Dawson Ridge	Completed	2011	38.64959	-77.26743	Extended Detention	6.48	2.44	2.89	1.15	CBP Established Efficiency, Incremental	12.60	0.69	449.74	9.17%	0.61	0.08	69.64	11.99	0.61	380.09
24	SWM Facility #157 - Dawson Ridge	Completed	2011	38.64802	-77.26509	Extended Detention	4.86	1.56	1.46	1.83	CBP Established Efficiency, Incremental	8.38	0.44	290.67	7.23%	0.36	0.05	40.57	8.03	0.39	250.11
83	SWM Facility #363	Completed	2013	38.73062	-77.41825	Extended Detention	35.42	8.54	14.34	12.53	CBP Established Efficiency, Incremental	58.53	2.77	1,758.43	0.52%	0.18	0.02	19.30	58.35	2.75	1,739.13
129	SWM Facility #318	Completed	2013	38.56811	-77.30660	Extended Detention	17.48	3.27	9.46	4.75	CBP Established Efficiency, Incremental	28.95	1.27	763.03	0.00%	0.00	0.00	0.00	28.95	1.27	763.03
145	SWM Facility #494	Completed	2013	38.78569	-77.53199	Constructed Wetland	38.27	15.26	22.13	0.88	CBP Retrofits Expert Panel, ST, Incremental	99.20	14.00	5,442.51	5.70%	2.20	0.29	244.38	97.00	13.72	5,198.13
69	SWM Facility #77	Completed	2014	38.74038	-77.42235	Extended Detention	54.12	6.38	22.48	25.26	CBP Established Efficiency, Incremental	77.15	2.97	1,747.72	14.09%	5.89	0.55	424.59	71.26	2.42	1,323.13
85	SWM Facility #505	Completed	2014	38.56390	-77.30522	Extended Detention	16.26	4.28	7.77	4.22	CBP Established Efficiency, Incremental	28.49	1.39	872.77	3.07%	0.35	0.03	19.68	28.14	1.36	853.09
59	SWM Facility #99	Completed	2015	38.78563	-77.51022	Constructed Wetland	8.89	5.14	3.74	0.00	CBP Retrofits Expert Panel, ST, Incremental	40.20	4.84	4,319.55	81.51%	7.90	1.10	955.15	32.31	3.74	3,364.40
80	SWM Facility #98	Completed	2015	38.62455	-77.27419	Extended Detention	7.70	2.70	2.51	2.50	CBP Established Efficiency, Incremental	13.86	0.74	494.46	0.41%	0.03	0.00	3.52	13.83	0.74	490.94
169	SWM Facility #28	Completed	2017	38.68411	-77.27122	Wet Pond, L1	74.97	21.10	34.63	19.24	CBP Retrofits Expert Panel, ST, Incremental	67.40	5.81	5,409.80	8.34%	5.74	0.68	566.70	61.65	5.13	4,843.10
16	SWM Facility #147	Completed	2018	38.61010	-77.31428	Constructed Wetland, L1	45.24	15.28	24.02	5.93	CBP Retrofits Expert Panel, ST, Incremental	68.18	6.61	5,808.09	10.44%	4.17	0.47	388.79	64.01	6.14	5,419.30
173	SWM Facility #489	Completed	2018	38.68457	-77.29579	Extended Detention	82.12	32.67	36.52	12.92	CBP Established Efficiency, Incremental	162.85	9.05	5,943.86	15.04%	11.28	1.33	1,105.74	151.57	7.72	4,838.12
190	SWM Facility #109	Completed	2018	38.72093	-77.41199	Wet Pond, L1	72.52	9.79	21.94	40.78	CBP Retrofits Expert Panel, ST, Incremental	167.29	12.72	10,334.53	11.36%	7.00	0.75	611.50	160.29	11.97	9,723.03
Planned Projects																					
191	SWM Facility #424	Design	2019	38.57761	-77.30891	Constructed Wetland	92.01	39.01	41.88	11.11	CBP Retrofits Expert Panel, ST, Incremental	239.05	37.64	28,053.69	19.75%	21.34	3.14	2,763.32	217.71	34.49	25,290.37
60	SWM Facility #91	Further Study	2019	38.79483	-77.50565	Constructed Wetland	25.48	14.02	11.26	0.19	CBP Retrofits Expert Panel, ST, Incremental	73.68	12.59	9,579.11	0.84%	0.27	0.04	37.52	73.41	12.54	9,541.59

FY18 Report-Stream Restoration: Stream Restoration Projects Beginning July 1, 2009

WMB Number	Project Name	Status	Installation FY	Latitude	Longitude	Total Drainage Area (Ac)	Impervious Area (Ac)	Pervious Area (Ac)	Forested Area (Ac)	Length	Pollutant Removal Rate	Physiographic Province	Estimated Total Pollutant Reduction (lbs/yr)			Percent Unregulated Area	Baseline Adjustment for Unregulated Areas (lbs/yr)			Total Pollutant Reduction Achieved After Baseline Adjustment (lbs/yr)		
													TN	TP	TSS		TN	TP	TSS	TN	TP	TSS
Completed Projects																						
76	Cow Branch Phase I	Completed	2011	38.62637	-77.27779	1,505.15	656.53	489.60	359.02	1,600	Interim Approved	Coastal Plain	120	108.8	24208	36%	613.55	88.90	77,864.74	77.38	70.16	15,609.85
78	Cow Branch Phase II	Completed	2012	38.63309	-77.27754	1,261.74	555.46	392.21	314.07	1,086	Interim Approved	Coastal Plain	81.45	73.848	16431.18	37%	533.87	77.39	67,792.77	51.44	46.64	10,377.70
81	Lower Cabin Run	Completed	2012	38.55637	-77.31275	250.53	52.09	111.39	87.04	1,073	Interim Approved	Coastal Plain	80.475	72.964	16234.49	3%	5.42	0.57	463.86	78.40	72.39	15,815.83
11	Northgate	Completed	2013	38.60703	-77.32944	7,543.75	1,153.02	2,847.75	3,542.98	300	Interim Approved	Piedmont	22.5	20.4	13464	19%	1,084.44	100.84	77,953.88	18.31	16.60	10,954.81
82	Deerfield Estates	Completed	2013	38.72890	-77.41942	62.22	12.67	23.93	25.61	225	Interim Approved	Piedmont	16.875	15.3	10098	5%	2.40	0.25	204.70	16.10	15.05	9,893.30
79	Cow Branch III	Completed	2015	38.63026	-77.27800	1,351.40	603.27	419.49	328.64	1,000	Interim Approved	Coastal Plain	75	68	15130	39%	604.15	87.75	76,896.67	45.88	41.60	9,255.93
268	Oak Street	Completed	2015	38.78353	-77.43967	359.56	76.60	232.65	50.31	200	Interim Approved	Piedmont	15	13.6	8976	80%	232.74	23.42	18,609.81	3.02	2.74	1,806.18
43	Hylbrook Park	Completed	2016	38.65086	-77.26413	263.59	82.49	114.41	66.69	1,268	Interim Approved	Coastal Plain	95.1	86.224	19184.84	27%	67.25	8.06	6,752.78	68.99	78.16	13,918.49
49	East Longview - Route 1 Restoration	Completed	2017	38.64522	-77.26070	144.73	55.33	65.38	24.02	925	Interim Approved	Coastal Plain	69.375	62.9	13995.25	68%	95.00	11.94	10,119.16	22.52	50.96	4,543.39
100	Dewey's Creek Reach 4	Completed	2017	38.56467	-77.31045	1,322.85	341.10	532.60	449.15	400	Interim Approved	Coastal Plain	30	27.2	6052	29%	342.39	38.66	31,845.39	21.20	19.22	4,276.94
158	Reach 5	Completed	2017	38.68478	-77.29637	86.76	36.57	37.65	12.54	2,100	Interim Approved	Piedmont	157.5	142.8	94248	12%	10.24	1.25	1,056.83	147.26	141.55	93,191.17
102	Dewey's Creek Reach 1	Completed	2018	38.57572	-77.31094	1,066.73	293.06	398.77	374.91	1,270	Interim Approved	Coastal Plain	95.25	86.36	19215.1	28%	277.11	32.85	27,422.95	68.35	61.97	13,788.21
Planned Projects																						
99	Dewey's Creek Reach 2	Construction	2019	38.56572	-77.30986	1,298.15	339.07	520.41	438.68	4,865	Interim Approved	Coastal Plain	364.875	330.82	73607.45	29%	334.00	38.01	31,377.59	259.17	292.81	52,283.42
194	Powells 725 Phase 1 - Northgate to Timid Creek Court	Design	2019	38.60268	-77.32370	7,587.64	1,160.30	2,870.83	3,556.51	3,100	Interim Approved	Piedmont	232.5	210.8	139128	19%	1,090.80	101.39	78,367.50	189.16	171.50	113,192.38

FY18 Report - Reforestation: Reforestation Projects (LUC) Beginning July 1, 2009

WMB Number	Project Name	Status	Installation FY	Latitude	Longitude	BMP Type	Existing Land Use	New Land Use	Area (Ac)	Total Pollutant Reduction (lbs/yr)		
										TN	TP	TSS
Completed Projects												
229	Innovation - Area 1D	Completed	2011	38.74008	-77.53709	Land Use Change	Pervious	Forest	0.22	1.58	0.08	29.25
233	Ben Lomond Park Area A	Completed	2012	38.79833	-77.47860	Land Use Change	Pervious	Forest	0.15	1.07	0.06	19.94
234	Ben Lomond Park Area B	Completed	2013	38.79833	-77.47860	Land Use Change	Pervious	Forest	3.81	27.28	1.45	506.58
235	Ben Lomond Park Area C	Completed	2013	38.79833	-77.47860	Land Use Change	Pervious	Forest	0.23	1.65	0.09	30.58
73	Sudley Place Reforestation	Completed	2014	38.79188	-77.50187	Land Use Change	Pervious	Forest	3.17	22.70	1.20	421.48
236	Ben Lomond Park Area D	Completed	2015	38.79833	-77.47860	Land Use Change	Pervious	Forest	0.12	0.86	0.05	15.96
5	Hope Hill Crossing	Completed	2015	38.61801	-77.37752	Land Use Change	Pervious	Forest	5.09	36.44	1.93	676.77
237	Garner Drive	Completed	2016	38.78738	-77.50875	Land Use Change	Pervious	Forest	0.40	2.86	0.15	53.18
258	Hunter Ridge Estates Area A	Completed	2016	38.63727	-77.38444	Land Use Change	Pervious	Forest	5.65	40.45	2.15	751.22
269	Hunter Ridge Estates Area B	Completed	2017	38.63427	-77.38747	Land Use Change	Pervious	Forest	4.75	34.01	1.81	631.56
231	Bristoe Station Battlefield Phase 1	Completed	2017	38.72238	-77.54464	Land Use Change	Pervious	Forest	13.99	100.17	5.32	1,860.11
270	Bristoe Station Battlefield Phase 2	Completed	2018	38.72238	-77.54464	Land Use Change	Pervious	Forest	4.50	32.22	1.71	598.32
Planned Projects												

Reduction Calculation Summary
October 30, 2017

SWM Facility #147 Constructed Wetland -L1

1 Determine existing published efficiency

BMP Type	Source	TN	TP	TSS
Dry Detention Pond	CBP	5%	10%	10%

2 Apply downward modification to BMP Efficiency

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #147	Dry Detention Pond	38.6101	-77.31428	No sediment forebay	-10%
				Short Circuiting	-10%
				No micropool	-10%
				Total	-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5%	10%	10%
Efficiency Modification	Step 2	-30%	-30%	-30%
Modified Efficiency		4%	7%	7%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Retrofit Equations	Constructed Wetland -L1	16.34%	25.69%	32.70%

Runoff storage (acre-feet) 0.32 (Final Design)
 Impervious acres 15.29
 Runoff depth 0.25

Retrofit Equation Results
 TN 16.34%
 TP 25.69%
 TSS 32.70%

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Constructed Wetland -L1	16.34%	25.69%	32.70%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	4%	7%	7%	
Incremental Removal Rate		12.84%	18.69%	25.70%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	10.19	19.50	0.89	30.57
Other Regulated Land	3.65	1.25	0.00	4.90
Unregulated Land	1.44	3.28	5.04	9.77
	15.28	24.02	5.93	45.24

6b Account for Total Baseline Reductions on Unregulated Land

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	1.44	2.19
Unregulated Pervious	TN	0.03021000	0.60420000	3.28	1.98
Unregulated Impervious	TP	0.01296000	0.25920000	1.44	0.37
Unregulated Pervious	TP	0.00148625	0.02972500	3.28	0.10
Unregulated Impervious	TSS	11.71320000	234.26400000	1.44	338.33
Unregulated Pervious	TSS	0.76912500	15.38250000	3.28	50.46

6c Calculate Total Load Reduction

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	15.28	257.68	13%	33.09	2.19	30.89	
Urban Pervious	Nitrogen	10.07	24.02	241.92	13%	31.06	1.98	29.08	64.01
Forest	Nitrogen	5.29	5.93	31.39	13%	4.03	0.00	4.03	
Urban Impervious	Phosphorus	1.62	15.28	24.76	19%	4.63	0.37	4.25	
Urban Pervious	Phosphorus	0.41	24.02	9.85	19%	1.84	0.10	1.74	6.14
Forest	Phosphorus	0.13	5.93	0.77	19%	0.14	0.00	0.14	
Urban Impervious	Total Suspended Solids	1,171.32	15.28	17,902.07	26%	4,600.83	338.33	4,262.50	
Urban Pervious	Total Suspended Solids	175.80	24.02	4,223.37	26%	1,085.41	50.46	1,034.95	5,419.30
Forest	Total Suspended Solids	79.91	5.93	474.13	26%	121.85	0.00	121.85	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #147	Constructed Wetland -L1	38.6101	-77.31428	64.01	6.14	5,419.30

Reduction Calculation Summary
August 30, 2017

SWM Facility #489 Extended Detention

1 Determine existing published efficiency

BMP Type	Source	TN	TP	TSS
Dry Detention Pond	CBP	5%	10%	10%

2 Apply downward modification to BMP Efficiency

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #489	Dry Detention Pond	38.68457	-77.29579	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Extended Detention	20.00%	20.00%	20.00%

Runoff storage (acre-feet)	0.00
Impervious acres	0
Runoff depth	#DIV/0!

Retrofit Equation Results

TN	#DIV/0!
TP	#DIV/0!
TSS	#DIV/0!

5 Calculate Incremental Removal Rate

		TN	TP	TSS
Removal Rate	Extended Detention	20.00%	20.00%	20.00%
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%
Incremental Removal Rate		16.50%	13.00%	13.00%

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	18.46	21.62	2.44	42.52
Other Regulated Land	10.03	6.73	0.81	17.57
Unregulated Land	4.18	8.17	9.67	22.03
	32.67	36.52	12.92	82.12

6b Account for Total Baseline Reductions on Unregulated Land

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	4.18	6.35
Unregulated Pervious	TN	0.03021000	0.60420000	8.17	4.94
Unregulated Impervious	TP	0.01296000	0.25920000	4.18	1.08
Unregulated Pervious	TP	0.00148625	0.02972500	8.17	0.24
Unregulated Impervious	TSS	11.71320000	234.26400000	4.18	980.08
Unregulated Pervious	TSS	0.76912500	15.38250000	8.17	125.66

6c Calculate Total Load Reduction

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	32.67	550.84	16.50%	90.89	6.35	84.54	
Urban Pervious	Nitrogen	10.07	36.52	367.80	16.50%	60.69	4.94	55.75	151.57
Forest	Nitrogen	5.29	12.92	68.35	16.50%	11.28	0.00	11.28	
Urban Impervious	Phosphorus	1.62	32.67	52.93	13.00%	6.88	1.08	5.80	
Urban Pervious	Phosphorus	0.41	36.52	14.97	13.00%	1.95	0.24	1.70	7.72
Forest	Phosphorus	0.13	12.92	1.68	13.00%	0.22	0.00	0.22	
Urban Impervious	Total Suspended Solids	1,171.32	32.67	38,268.56	13.00%	4,974.91	980.08	3,994.84	
Urban Pervious	Total Suspended Solids	175.80	36.52	6,420.90	13.00%	834.72	125.66	709.05	4,838.12
Forest	Total Suspended Solids	79.91	12.92	1,032.52	13.00%	134.23	0.00	134.23	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #489	Extended Detention	38.68457	-77.29579	151.57	7.72	4,838.12

**Reduction Calculation Summary
June 30, 2018**

SWM Facility #109 Wet Pond-L1

1 Determine existing published efficiency

BMP Type	Source	TN	TP	TSS
Dry Detention Pond	CBP	5%	10%	10%

2 Apply downward modification to BMP Efficiency

Facility Name	BMP Type	Lat	Long	Modification Type	Downward Modification Applied
SWM Facility #109	Dry Detention Pond	38.72093	-77.41199	No sediment forebay	-10%
				No micropool	-10%
				Short circuiting	-10%
Total					-30%

3 Calculate modified existing efficiency

		TN	TP	TSS
Published Efficiency	Step 1	5.00%	10.00%	10.00%
Efficiency Modification	Step 2	-30.00%	-30.00%	-30.00%
Modified Efficiency		3.50%	7.00%	7.00%

4 Determine efficiency of proposed BMP Type

Source	BMP Type	TN	TP	TSS
Bay Program Efficiencies (Table A5)	Wet Pond-L1	31.30%	49.19%	62.61%

Runoff storage (acre-feet)	0.59 (Final Design)
Impervious acres	9.78
Runoff depth	0.72

Retrofit Equation Results

TN	31.30%
TP	49.19%
TSS	62.61%

5 Calculate Incremental Removal Rate

		TN	TP	TSS	
Removal Rate	Wet Pond-L1	31.30%	49.19%	62.61%	Bay Program Retrofit Equations
Modified existing efficiency	Step 3	3.50%	7.00%	7.00%	
Incremental Removal Rate		27.80%	42.19%	55.61%	

6 Calculate Load Reduction

6a Characterize the Drainage Area

	Urban Impervious Acres	Pervious Acres	Forested Acres	Total
PWC Regulated Land	4.33	12.95	22.73	40.00
Other Regulated Land	3.25	2.97	0.01	6.23
Unregulated Land	2.21	6.03	18.05	26.29
	9.79	21.94	40.78	72.52

6b Account for Total Baseline Reductions on Unregulated Land

	POC	Required 5% Load Reductions	Baseline Loading Rate (*20)	Acres	Baseline Reduction
Unregulated Impervious	TN	0.07587000	1.51740000	2.21	3.36
Unregulated Pervious	TN	0.03021000	0.60420000	6.03	3.64
Unregulated Impervious	TP	0.01296000	0.25920000	2.21	0.57
Unregulated Pervious	TP	0.00148625	0.02972500	6.03	0.18
Unregulated Impervious	TSS	11.71320000	234.26400000	2.21	518.79
Unregulated Pervious	TSS	0.76912500	15.38250000	6.03	92.71

6c Calculate Total Load Reduction

Land Use	Pollutant	2009 EOS Loading Rate (lbs/acre/yr)	DA	Load	Efficiency	Initial Reduction	Baseline	Total Reduction	Sub-total/POC
Urban Impervious	Nitrogen	16.86	9.79	165.06	27.80%	45.89	3.36	42.53	
Urban Pervious	Nitrogen	10.07	21.94	220.97	27.80%	61.44	3.64	57.79	160.30
Forest	Nitrogen	5.29	40.78	215.74	27.80%	59.98	0.00	59.98	
Urban Impervious	Phosphorus	1.62	9.79	15.86	42.19%	6.69	0.57	6.12	
Urban Pervious	Phosphorus	0.41	21.94	9.00	42.19%	3.80	0.18	3.62	11.97
Forest	Phosphorus	0.13	40.78	5.30	42.19%	2.24	0.00	2.24	
Urban Impervious	Total Suspended Solids	1,171.32	9.79	11,467.33	55.61%	6,376.78	518.79	5,857.99	
Urban Pervious	Total Suspended Solids	175.80	21.94	3,857.72	55.61%	2,145.21	92.71	2,052.50	9,722.70
Forest	Total Suspended Solids	79.91	40.78	3,258.89	55.61%	1,812.21	0.00	1,812.21	

7 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
SWM Facility #109	Wet Pond-L1	38.72093	-77.41199	160.30	11.97	9,722.70

Bay TMDL Reduction Calculation
July 16, 2018

Dewey's Creek Reach 1 Stream Restoration Status: Completed
 1,270

1 Calculate POC Reductions

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Interim Removal Rates (lbs/lf)	0.075	0.068	15.13
Restoration Length (lf)	1,270	1,270	1,270
Initial POC Reductions	95.25	86.36	19,215.10

2 Characterize the Drainage Area

	Urban Impervious Acres	Urban Pervious Acres	Forested Acres	Total Urban Acres	Total Acres
PW Regulated Land	93.18	147.74	32.99	240.92	273.91
Other Regulated Land	95.76	53.87	18.51	149.63	168.14
Total Regulated Land	188.94	201.60	51.50	390.55	442.04
Total Unregulated Land	104.11	197.16	323.41	301.28	624.69
	293.06	398.77	374.91	691.82	1,066.73

3 Compute Ratios and Calculate Proportional Reductions by Land Use

	Regulated Area	Unregulated Area	Forested Acres	Total Credit	Total Check 100.00%
Ratio	36.61%	28.24%	35.15%		
TN (lbs) Reduction	34.87	26.90	33.48	95.25	
TP (lbs) Reduction	31.62	24.39	30.35	86.36	
TSS (lbs) Reduction	7,034.94	5,426.89	6,753.27	19,215.10	

4 Account for Total Baseline Reductions on Unregulated Land

Urban Land Use	POC	Required 5% Load Reductions (lbs/acre/yr)	Baseline Loading Rate (*20)	Acres	Baseline Reduction (lbs/yr)
Impervious	TN	0.07587000	1.51740000	104.11	157.98
Pervious	TN	0.03021000	0.60420000	197.16	119.13
Impervious	TP	0.01296000	0.25920000	104.11	26.99
Pervious	TP	0.00148625	0.02972500	197.16	5.86
Impervious	TSS	11.71320000	234.26400000	104.11	24,390.11
Pervious	TSS	0.76912500	15.38250000	197.16	3,032.84

5 Calculate Total Reductions Minus Required Baseline

	Nitrogen (lbs/yr)	Phosphorous (lbs/yr)	TSS (lbs/yr) - Coastal
Credit for Unregulated Areas	26.90	24.39	5,426.89
Minus Unregulated Impervious Baseline	157.98	26.99	24,390.11
Minus Unregulated Pervious Baseline	119.13	5.86	3,032.84
Credit for Unregulated Areas	0.00	0.00	0.00
Credit for Regulated Areas	34.87	31.62	7,034.94
Credit for Forested Areas	33.48	30.35	6,753.27
Total Reductions Claimed	68.35	61.97	13,788.21

6 Reduction Summary Table

Project Name	BMP Type	Lat	Long	TN (lbs/yr)	TP (lbs/yr)	TSS (lbs/yr)
Dewey's Creek Reach 1	Stream Restoration	38.57572	-77.31094	68.35	61.97	13,788.21



COUNTY OF PRINCE WILLIAM

5 County Complex Ct., Suite 260
Prince William, Virginia 22192-5308
(703) 792-6820 Fax: (703) 792-6828

Thomas Bruun
Director

Department of
Public Works



A Nationally Accredited
Public Works Agency

June 29, 2018

Department of Environmental Quality
Northern Regional Office
ATTN: Anna Tuthill
13901 Crown Court
Woodbridge, VA 22193

RE: Prince William County MS4 Permit No. VA0088595 Review of Local TMDL
Action Plans (Bacteria, Sediment, PCBs) – Response to Comments

Dear Ms. Tuthill,

Prince William County (PWC) is submitting the following information in response to your comments on PWC's Local TMDL Action Plans, received May 4th, 2018. Please refer to our comment responses below as well as the revised Action Plans attached to this letter.

- 1) There are currently three streams in Prince William County (PWC) associated with Bacteria TMDLs (Powells Creek, Quantico Creek, and the North Branch of Chopawamsic Creek). PWC, Prince William County Public Schools, and the VDOT MS4s share aggregated E.coli loads for Powells Creek and Quantico Creek. PWC has been assigned the entire E.coli load for the North Branch of Chopawamsic Creek. However, it appears that the entire North Branch of Chopawamsic Creek watershed may be within the Quantico Marine Corps Base and the boundaries of their permitted MS4 area (VAR040069). Based upon this information, staff will continue to review the TMDL to identify responsibility for the WLA developed for the North Branch of Chopawamsic Creek and will provide updated comments to the County should this review draw a different conclusion than that identified above.*

To clarify, there are eight streams associated with the four bacteria TMDLs assigned to Prince William County as listed in Table 2.A in our Action Plan. There are the three streams identified in the bacteria TMDL for tributaries to the Potomac river (Powells Creek, Quantico Creek, and the North Branch of Chopawamsic Creek). We concur with County's limited role within the Chopawamsic Creek watershed and will address any updated comments received from DEQ.

- 2) *Street sweeping is addressed in the PWC MS4 Program Plan under Housekeeping, and pet waste stations are present throughout the County, particularly in the dog parks. Staff recommends these practices be discussed and incorporated into the Bacteria TMDL Action Plan.*

The county is currently developing SOPs related to street sweeping. However, the sweeping will not be used for BMP credit and therefore will not be included in the Action Plan.

There are privately maintained pet waste stations and dog parks located throughout the County. The County does not currently maintain any dog parks or pet waste stations. As stated in the revised attached Action Plan, we will perform an initial assessment of waste deposits to determine the need to install signage or pet waste station(s).

The County continues to distribute brochures on proper collection and disposal of pet wastes to the sites listed in Table 2.F as part of a public outreach event.

- 3) *Clarify the procedure for the review of waste deposits on county-owned or operated properties. Please state the method in which the measure of effectiveness of a property being a significant source of bacteria is determined.*

Clarification on this procedure has been updated in the Bacteria TMDL Action Plan under Section 2.5, and is summarized below. In addition, the County will distribute pet waste brochures to the private facilities found in Table 2.F.

- The County will assess portions of the trail system operated by the Department of Parks and Recreation. This assessment will include evaluating their proximity to residential neighborhoods, performing a field survey for prevalent waste deposit problems, and use staff knowledge of trail systems. If the County believes a waste deposit problem area has been discovered, installing signage will be considered to remind pet owners of the County's pet waste clean-up laws and penalties associated with non-compliance. If the County finds the installed signage to be ineffective, pet waste stations will be considered for installation. Continued monitoring will reoccur on an as needed basis to determine effectiveness of installed preventative measures.

- 4) *Establish a monitoring plan and/or use existing DEQ bacteria monitoring data to determine if measurable bacteria load reduction goals are being met.*

The County will review DEQ's bacteria monitoring data and trend analysis to determine if load reduction goals are being met.

- 5) *To assist with the implementation of this TMDL (Sediment), public education efforts that specifically target controlling discharge of sediments to local waterways should be enhanced.*

Section 2.5 of the Benthic TMDL Action Plan identifies the existing public education and outreach programs. These programs include components that specifically target controlling the discharge of sediments into the local waterways. Section 2.7 has been updated with a list of topics that specifically target controlling discharge of sediments to local waterways. They include:

- Urban nutrient management
- Homeowner stormwater and soil BMPs (use of native plants, mulching, rooftop disconnection, bio-retention etc.)
- Management of effective riparian buffers
- Citizen reporting of illicit discharges
- Citizen reporting of erosion and sediment runoff
- Preservation of Resource Protection Areas
- Storm drain labelling to promote awareness of stormwater discharges
- Erosion and sediment control as well as stormwater management information associated with Site Development

- 6) *To assist with the implementation of this TMDL (PCB), a standard operating procedure for disposal of materials from renovation of structures constructed prior to 1979 should be developed.*

The County will prepare an SOP that addresses the required controls to be implemented during the demolition of county-facilities that minimize the exposure of potential PCB materials to stormwater runoff. The SOP shall apply to any structure with at least 10,000 square feet of floor space and built or renovated prior to January 1, 1980. Section 2.5.2 and 2.8 of the PCB TMDL Action Plan has been revised to include the development of this SOP.

If you have any questions, please contact the MS-4 Coordinator of the Watershed Management Branch, Mr. David Ungar at (703) 792-7104 or email DUngar@pwcgov.org.

Sincerely,

Marc T. Aveni
Environmental Services Division Chief



COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
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Molly Joseph Ward
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
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June 28, 2017

Christopher E. Martino
County Executive
County of Prince William
1 Complex Court
Prince William, VA 22192

Transmitted electronically to (CEmartino@pwcgov.org)

RE: Virginia Pollutant Discharge Elimination System (VPDES) MS4 Permit
VA0088595, County of Prince William, Chesapeake Bay TMDL Action Plan
Approval

Dear Mr. Martino:

The Department of Environmental Quality (DEQ) has reviewed the Chesapeake Bay TMDL Action Plan for received on February 21, 2017 in accordance Part I.D.1 of the MS4 Permit. Additional information was received March 13, 2017, March 14, 2017 and May 16, 2017.

As submitted, the action plan will result in the following annual reduction of pollutants of concern:

Pollutant of Concern	Annual Load Reduction (lb/yr)	Percentage of L2 Reduction Achieved After Implementation
Total Nitrogen	6706.58	33.5%
Total Phosphorus	1370.40	62.0%
Total Suspended Solids	893286.63	49.4%

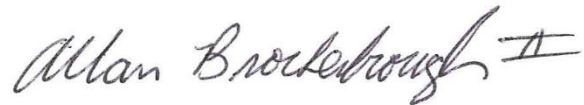
The Chesapeake Bay TMDL Action Plan is hereby approved and is an enforceable part of the MS4 Program Plan.

Please note any modifications to the Chesapeake Bay TMDL Action Plan shall be made in accordance with Part I.A.7 of the MS4 Permit.

As provided by Rule 2A:2 of the Supreme Court of Virginia, you have thirty (30) days from the date you received this decision within which to appeal this decision by filing a notice of appeal in accordance with the Rules of the Supreme Court of Virginia with the Director, Virginia Department of Environmental Quality.

Please contact Jeff Selengut at (804) 698-4265 or at Jeffrey.selengut@deq.virginia.gov if you have any questions.

Sincerely,

A handwritten signature in cursive script that reads "Allan Brockenbrough II". The signature is written in black ink and includes a stylized flourish at the end.

Allan Brockenbrough II, P.E.
Manager, Office of VPDES Permits

Copies: File
Mark Aveni, Prince William County (maveni@pwcgov.org)