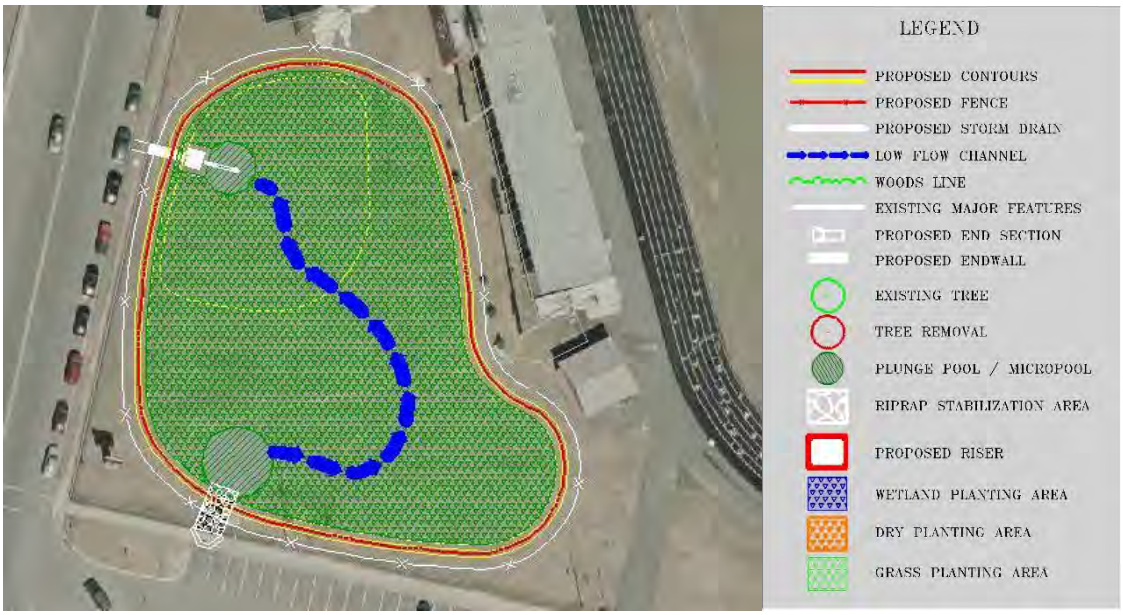
DC9100 New Stormwater Pond

Vicinity Map

Address:	8515 Old Mt Vernon Rd
Location:	Mount Vernon High School
Land Owner:	County - FCPS
PIN:	1014 01 0034
Control Type	Water Quality and Quantity
Drainage Area	22.45 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: The project proposes creation of an extended detention dry pond with a sediment forebay at Mt.Vernon High School. Runoff from the roofs and parking lots will be treated for water quantity control and water quality. The proposed pond will be implemented in open space adjacent to the track and field.



Project Area Map

Project Benefits: This facility has the potential to meet the water quality treatment requirement for the contributing drainage area via extended detention of the half inch, 48 hour storm and provide peak flow management of the 2-year and 10-year design storm. Constructing this facility would promote uptake of nutrients, removal of pollutants via suspension of floatables, and overall water quality and habitat improvements. Peak flow rates, erosive velocities, and channel sediment loads will also be reduced by this project. It is estimated that a total of 2,270 lbs of sediment, 20.0 lbs of nitrogen and 5.6 lbs of phosphorus would be reduced annually by this project. The proposed location of this facility is on the Mt. Vernon High School grounds, which will eliminate or reduce the need for land purchase or acquisition and provides an environmental education/stewardship opportunity for students and parents within the Dogue Creek community.

Project Design Considerations: The area where the facility will be located is flat. This reduces the depth potential of the pond which requires a larger surface area/footprint to meet the management requirements. A fence around the proposed facility would be necessary to ensure public safety. No environmental permitting issues are anticipated for this project. Access to the proposed facility is good. Existing utility conflicts are not anticipated. Existing storm drain characteristics may affect the potential to provide stormwater management at this location.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.84	AC	$8,500.00	$7,140
Curb Opening	1	EA	$2,000.00	$2,000
Rip Rap Stabilization	35	SY	$100.00	$3,500
New Riser	1	LS	$8,000.00	$8,000
Embedded Dewatering Pipe	1	EA	$500.00	$500
Plungepool / Micropool	2	EA	$300.00	$600
Grading and Excavation	3506	CY	$35.00	$122,710
Embankment	877	CY	$50.00	$43,850
Outflow Pipe	50	LF	$125.00	$6,250
Excavate to create low-flow channel	225	LF	$25.00	$5,625
Soil Borings	1	LS	$10,000.00	$10,000
			Initial Project Costs	**$210,175**
Plantings	1	LS	5% of Project	$10,509
Ancillary Items	1	LS	5% of Project	$10,509
Erosion and Sediment Control	1	LS	10% of Project	$21,018
			Base Construction Cost	**$252,211**
			Mobilization (5%)	$12,611
			Subtotal 1	$264,822
			Contingency (25%)	$66,206
			Subtotal 2	$331,028
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$148,963
			Estimated Project Cost	**$480,000**

DC9100_1.jpg: Location for proposed pond

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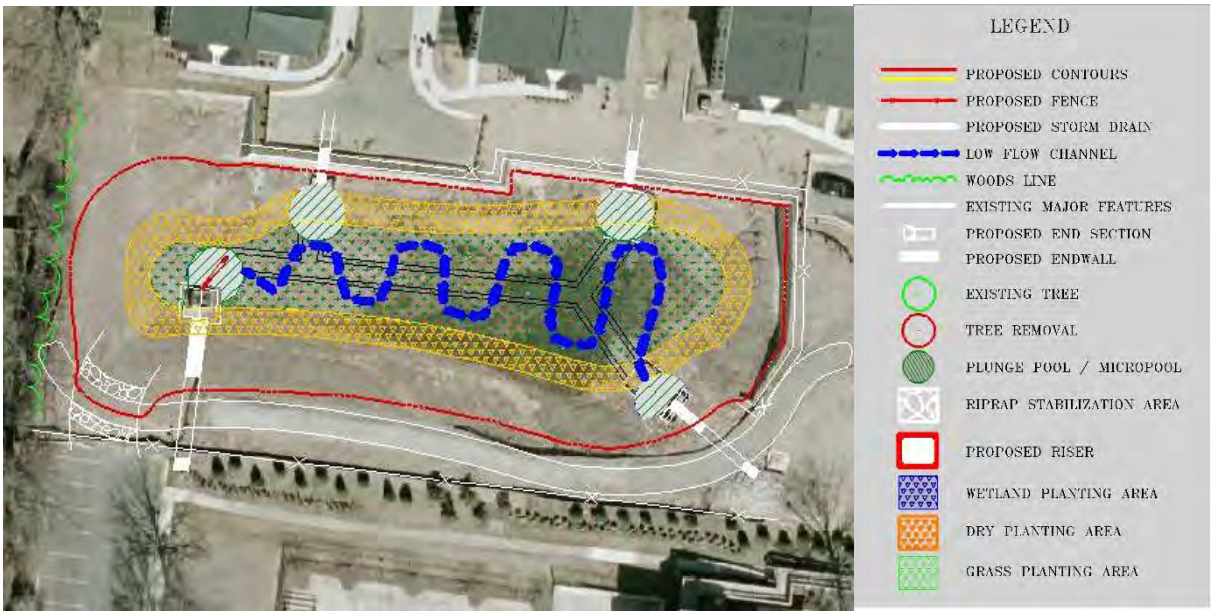
DC9106 Stormwater Pond Retrofit

Vicinity Map

Address:	Near 7147 Huntley Creek Pl
Location:	Groveton Woods Condominium
Land Owner:	Private
PIN:	
Control Type	Water Quality and Quantity
Drainage Area	11.59 acres
Receiving Waters	Unknown tributary of Barnyard Run

Description: An existing detention basin located at Groveton Woods Condominium and adjacent to Lafayette Village Apartments will be converted to a shallow wetland by removing the existing concrete low flow channels, excavating the bottom to incorporate wetland planting zones and meandering flow channels, and adjusting the dewatering orifice and riser characteristics. The pond will receive runoff from a high density residential area and provide detention along with treatment for nitrogen, phosphorus and total suspended solids.



Project Area Map

Project Benefits: This facility has potential to meet the water quality treatment requirement via extended detention of the half-inch, 48 hour storm, and manage 2-year and 10-year peak flow volumes for the contributing drainage area. Retrofits to this facility will promote the removal of suspended solids and floatables to downstream channels, help prevent future downstream channel erosion, and promote overall water quality and healthy habitat. It is estimated that a total of 2,370 lbs of sediment, 29.2 lbs of nitrogen and 5.9 lbs of phosphorus would be reduced annually by this project.

Project Design Considerations: Environmental permitting issues are not anticipated for this pond retrofit. Access to the facility is good. The community where this facility is located is gated and ownership is likely private. Minimal design and construction issues were identified at this site.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.56	AC	$8,500.00	$4,760
Paved Ditch Demolition & Haul Away	235	LF	$30.00	$7,050
Plungepool / Micropool	4	EA	$500.00	$2,000
Riser Retrofit	1	LS	$4,000.00	$4,000
Excavate to create low-flow channel	342	LF	$25.00	$8,550
Grading and Excavation	148	CY	$35.00	$5,180
Soil Borings	1	LS	$7,500.00	$7,500
			Initial Project Costs	**$39,040**
Plantings	1	LS	5% of Project	$1,952
Ancillary Items	1	LS	5% of Project	$1,952
Erosion and Sediment Control	1	LS	10% of Project	$3,904
			Base Construction Cost	**$46,848**
			Mobilization (5%)	$2,342
			Subtotal 1	$49,190
			Contingency (25%)	$12,298
			Subtotal 2	$61,488
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$27,670
			Estimated Project Cost	**$89,000**

DC9106_1.jpg: View of the existing pond

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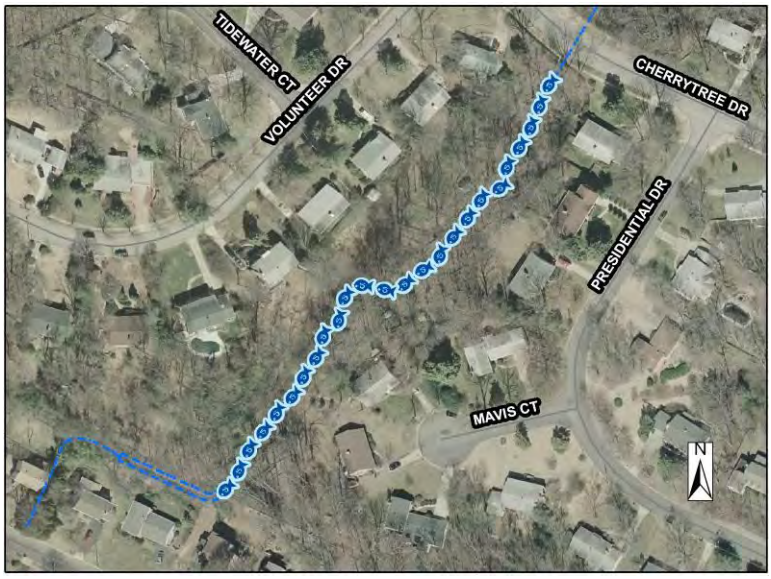
DC9201 Stream Restoration

Vicinity Map

Address:	9200 Block, Cherrytree Drive
Location:	Between Presidential Drive and Volunteer Drive
Land Owner:	Private - Residential
PIN:	1104 03 0097
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Dogue Creek

Description: This project is located between Volunteer Drive and Presidential Drive and extends from the upstream limit of DC9200 (near Robertson Boulevard) to the downstream side of a culvert under Cherrytree Drive. Currently, this natural channel is experiencing moderate to severe erosion on the outside of meander bends and where the channel parallels the valley walls. An exposed sanitary sewer concrete casing within the channel is present just downstream of the culvert under Cherrytree Drive and a headcut is also present near the middle of the proposed project limits. Restoration of this channel will include regrading and stabilizing eroded stream banks with armor-in-place techniques on outer meander bends and bioengineering techniques on straight portions to create a stable cross-section. Due to the existing headcut, the channel bed will need to be adjusted and grade controls will be needed to dissipate energy and adjust for changes in channel slope. The exposed sanitary sewer casing should be stabilized and covered as part of this restoration. Since this restoration is entirely contained within private residential property, raising the bed elevation of this channel to reconnect higher flows to the floodplain or regrading the floodplain to create a new bench is not desirable. Currently, this restoration is within forested conditions.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: New channel geometry and stabilization of existing banks will allow for reduced sediment loads to downstream channels. By reducing sedimentation within this channel and providing stable habitat along restored banks, overall instream water quality and habitat may be improved with this project. It is estimated that a total over 27,360 lbs of sediment, 22.0 lbs of total nitrogen and 8.5 lbs of total phosphorus would be reduced by this project. This project will also protect an exposed sanitary sewer casing within this channel and prevent the further upstream migration of a headcut.

Project Design Considerations: This project is entirely contained within private residential properties along Volunteer Drive, Presidential Drive, and Mavis Court and will require significant coordination with property owners for access and construction. Access to this project may need to occur off of Cherrytree Drive at the upstream end of this project or from individual property owners that grant access. This project will require environmental permitting due to construction and modifications to a perennial stream channel and floodplain. Moderate to significant tree loss can be expected with this restoration and restoration benefits may not outweigh overall construction impacts.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	1	Ac	$10,000.00	$10,000
Plantings	1	Ac	$25,000.00	$25,000
Construct New Channel	800	LF	$200.00	$160,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$295,000**
Ancillary Items	1	LS	5% of Project	$14,750
Erosion and Sediment Control	1	LS	10% of Project	$29,500
			Base Construction Cost	**$339,250**
			Mobilization (5%)	$16,963
			Subtotal 1	$356,213
			Contingency (25%)	$89,053
			Subtotal 2	$445,266
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$200,370
			Estimated Project Cost	**$646,000**

DC9201_1.jpg: Erosion on outside meander bend

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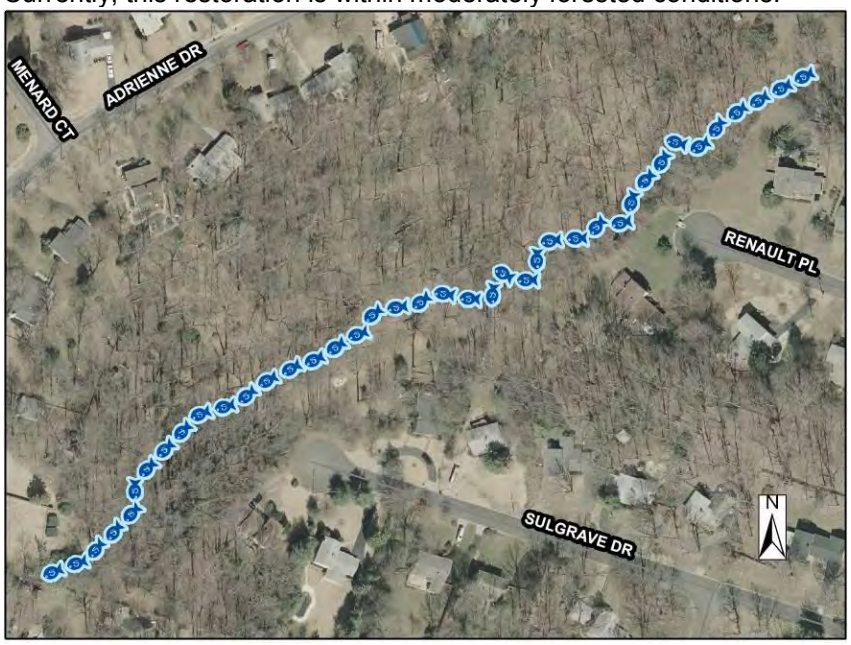
DC9202 Stream Restoration

Vicinity Map

Address:	4100 Block, Sulgrave Drive
Location:	Between Sulgrave Dr and Adrienne Dr
Land Owner:	Private - Residential
PIN:	1101 11 0083
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Dogue Creek

Description: This project is located between Adrienne Drive, Renault Place, and Sulgrave Drive and extends from a 48" storm drain outfall just north of Renault Place and extends downstream to the upstream side of the culvert under Adrienne Drive. This channel is characterized by moderate to severe erosion occurring on the outside of meanders and in the upstream portion, especially where the channel becomes very sinuous between Renault Place and Sulgrave Drive. Restoration of this channel will include regrading and stabilizing eroded stream banks with armor-in-place techniques on outer meander bends and bioengineering techniques on straight portions to create a stable cross-section. Restoration will include grade controls to dissipate energy and require some installation of stone toe protection to ensure future bank stability. Some areas within the project limits may require adjusting the bed elevation of the channel to reconnect higher flows to the floodplain and to promote stability near existing stormdrain outfalls. Currently, this restoration is within moderately forested conditions.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This restoration will be designed to withstand large, flashy flows that originate from the 48" RCP storm drain outfall. Implementation of this project will provide a reduction in sediment supply to receiving stream channels by reducing bank scour and meander bend migration while providing a floodplain to dissipate energy and encourage deposition of sediment. By reducing sedimentation within the channels and providing stable habitat along restored banks, overall instream water quality and habitat may be improved with this project. It is estimated that a total over 102,700 lbs of sediment, 82.1 lbs of total nitrogen and 31.8 lbs of total phosphorus would be reduced by this project. This project will also stabilize several storm drain outfalls and conveyances that drain to this channel.

Project Design Considerations: This project is entirely contained within private residential properties along Adrienne Drive, Renault Place, and Sulgrave Drive and will require significant coordination with property owners for access and construction. Access to this project could occur at the end of Renault Place or Sulgrave Drive where existing stormdrain outfalls exist. Both of these access points will require moderate tree removal. This project will require environmental permitting due to construction and modifications to a perennial stream channel and moderate tree loss. Existing utility impacts are not anticipated with this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	1.5	Ac	$10,000.00	$15,000
Plantings	1.5	Ac	$25,000.00	$37,500
Construct New Channel	1350	LF	$200.00	$270,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$322,500**
Ancillary Items	1	LS	5% of Project	$21,125
Erosion and Sediment Control	1	LS	10% of Project	$42,250
			Base Construction Cost	**$485,875**
			Mobilization (5%)	$24,294
			Subtotal 1	$510,169
			Contingency (25%)	$127,542
			Subtotal 2	$637,711
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$286,970
			Estimated Project Cost	**$925,000**

DC9202_1.jpg: View of the stream section

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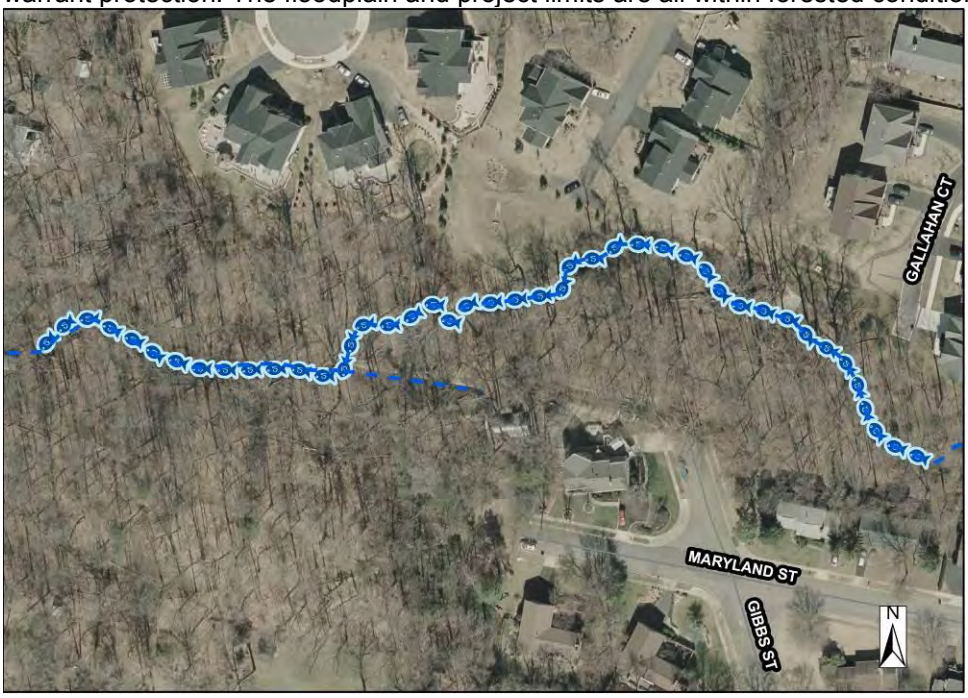
DC9203 Stream Restoration

Vicinity Map

Address:	8500 Block, Mt. Zephyr Drive
Location:	Between Mt. Zephyr Dr, Kings Hill Ct and Maryland St
Land Owner:	Private - Residential
PIN:	1014 21 A, 1014 32 A1, 1014 36 A
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Dogue Creek

Description: This project is entirely contained within HOA property and is located between Mt. Zephyr Drive, Kings Hill Court, and Maryland Street. The upstream limit of this project starts at the end of Gallahan Court and extends downstream to the upstream side of a culvert under Mt. Zephyr Drive. This channel is experiencing moderate to severe erosion on outside meanders and straight sections and is actively incising. Several stormdrain outfalls drain to this project, in which two stormdrain outfalls from Maryland Street and Nalls Road drain directly within the project limits. Restoration will include reconnecting this channel back to the original floodplain and installing grade controls to help prevent future downcutting and overwidening. Reducing the existing channel dimensions and raising the bed elevation of the channel will help to reconnect flows to the floodplain. Armor-in-place or bioengineering techniques and stone toe protection may be needed around the two stormdrain outfalls or where peak flows and channel velocities warrant protection. The floodplain and project limits are all within forested conditions.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project will reconnect the channel back to the original floodplain which will allow sediment to settle out and reduce overall stream energy during high flows. This project will reduce sediment loads to downstream channels by correcting channel downcutting, bank scour, overwidening, and meander bend migration. It is estimated that a total over 61,000 lbs of sediment, 48.8 lbs of total nitrogen and 18.9 lbs of total phosphorus would be reduced by this project. Overall, stream habitat and water quality may be improved due to stable habitat creation and reductions in available sediment supply.

Project Design Considerations: Environmental permitting and significant forest impacts are expected with this restoration due to construction and modifications to a perennial stream channel as well as obtaining access to the channel; however, restoration benefits will outweigh overall construction impacts. This project is entirely contained within several private HOA properties and will require significant coordination with property owners for access and construction. Access will most likely occur at a stormwater facility at the end of Nalls Road or at the end of Maryland Street. Utility impacts are not anticipated with this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	1	Ac	$10,000.00	$10,000
Plantings	1	Ac	$25,000.00	$25,000
Construct New Channel	1025	LF	$200.00	$205,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$340,000**
Ancillary Items	1	LS	5% of Project	$17,000
Erosion and Sediment Control	1	LS	10% of Project	$34,000
			Base Construction Cost	**$391,000**
			Mobilization (5%)	$19,550
			Subtotal 1	$410,550
			Contingency (25%)	$102,638
			Subtotal 2	$513,188
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$230,935
			Estimated Project Cost	**$744,000**

DC9203_1.jpg: View of the eroded stream section

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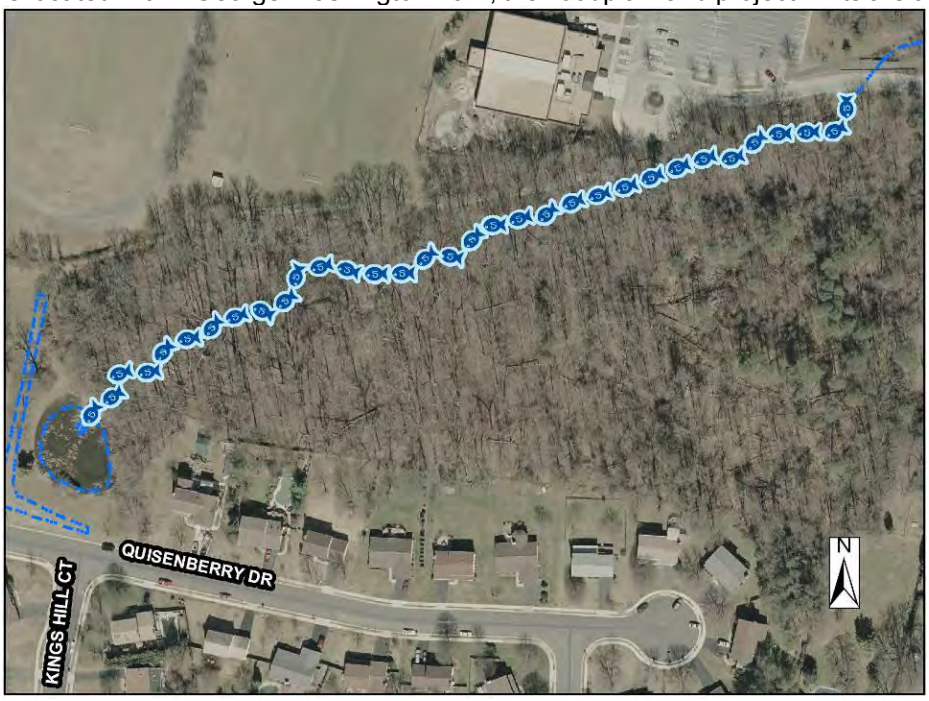
DC9204 Stream Restoration

Vicinity Map

Address:	8426 Old Mt. Vernon Rd
Location:	George Washington Park
Land Owner:	County - FCPA
PIN:	1014 01 0047A
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Dogue Creek

Description: This project is entirely contained within George Washington Park and extends from the downstream end of the culvert under George Washington Recreation Center driveway downstream to a stormwater facility located at the intersection of Quisenberry Drive and Kings Hill Court. The current channel is incised and over-widened and is actively downcutting with headcuts and moderate to severe erosion on the outside of meander bends as well as straight sections. Two stormdrain outfalls originating from the George Washington Recreation Center and the park should be stabilized with this restoration due to existing erosion. An exposed sanitary sewer utility concrete casing is also present within the channel and should be stabilized as well. Restoration efforts should focus on reconnecting this channel to the floodplain by reducing channel dimensions and raising bed elevations. Reconnection to the floodplain along with installing grade controls will help to prevent further downcutting and over-widening. Since this project is located within George Washington Park, the floodplain and project limits are all within forested conditions.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Restoration of this channel will help to reduce sediment loads that could be transported to downstream portions of this watershed. Reductions in channel downcutting, bank scour, and over-widening will allow for reduced sediment loads. Reconnecting this channel to the original floodplain will dissipate high flows that could cause erosion and can reduce downstream sediment loads by depositing suspended sediment on the floodplain. This project will stabilize storm drain outfalls and conveyances and may improve instream habitat by limiting the amount of sedimentation due to bank and bed erosion and the creation of stable habitat within the newly constructed channel. This project is completely contained within park property, which alleviates the need for land purchase or acquisition.

Project Design Considerations: Since this channel is buffered by forest, access and construction for this project could cause a significant amount of tree loss. Designs should be approached to minimize impacts to the forest outside of the stream channel itself. This project will require environmental permitting due to construction and modifications to a perennial stream channel. Overall, restoration benefits will outweigh construction impacts. Access to this channel can be gained from the George Washington Recreation Center driveway or at the stormwater facility at the downstream limit of this project. Coordination with Rec Center staff will be required to minimize impacts to park operations and infrastructure. The exposed sanitary sewer casing within this project may constrain design of the proposed channel. Other utility impacts are not anticipated with this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	1.5	Ac	$10,000.00	$15,000
Plantings	1.5	Ac	$25,000.00	$37,500
Construct New Channel	1200	LF	$200.00	$240,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$392,500**
Ancillary Items	1	LS	5% of Project	$19,625
Erosion and Sediment Control	1	LS	10% of Project	$39,250
			Base Construction Cost	**$451,375**
			Mobilization (5%)	$22,569
			Subtotal 1	$473,944
			Contingency (25%)	$118,486
			Subtotal 2	$592,430
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$266,594
			Estimated Project Cost	**$859,000**

DC9204_1.jpg: Eroded and incised channel

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DC9207 Stream Restoration

Vicinity Map

Address:	8300 Block, Frye Road
Location:	Between Frye Rd and Colony Ct
Land Owner:	Private - Residential
PIN:	1013 01 0008
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Dogue Creek

Description: This project is entirely contained within private property and extends from the downstream end of a triple cell box culvert under Madge Lane downstream to the upstream side of the culvert under Frye Road. Most of this channel is over-widened, unstable, and incised with eroded banks on straight portions. A forest buffer surrounds this channel and the upstream portion is partially confined between Frye Road and Colony Court. Restoration of this channel will focus on creating a nested channel, in which the floodplain and banks of the current channel will be regraded to allow for a new floodplain at an elevation lower than the original floodplain. Other restoration components include reducing the existing channel dimensions, installing grade controls to prevent further incision and over-widening, and increasing the sinuosity of the channel . In some areas due to constraints and high flows or velocities, the original channel may need to be stabilized with armor-in-place or bioengineering techniques to create a stable cross-section. A storm drain outfall originating from Colony Court should be incorporated into this project to provide stability.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Restoration of this channel will help to reduce sediment loads that could be transported to downstream portions of this watershed. Stabilization of existing banks and new channel geometry will allow for reduced sediment loads to these channels. Reconnecting this channel to a newly created floodplain will dissipate high flows that could cause erosion and can reduce downstream sediment loads by depositing suspended sediment on the floodplain. It is estimated that a total over 45,000 lbs of sediment, 36.0 lbs of total nitrogen and 14.0 lbs of total phosphorus would be reduced by this project. This project will also improve instream habitat by limiting the amount of sedimentation due to bank and bed erosion and the creation of stable habitat within the newly constructed channel.

Project Design Considerations: This project is entirely contained within private property and will require significant coordination with property owners for access and construction. Sanitary sewer structures and other utilities may constrain design and construction during this project. Access to this project most likely will occur off of Frye Road. This project will require environmental permitting due to construction and modifications to a perennial stream channel and floodplain. Significant tree loss is expected with this restoration; however, restoration benefits will outweigh overall construction impacts.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	1	Ac	$10,000.00	$10,000
Plantings	1	Ac	$25,000.00	$25,000
Construct New Channel	800	LF	$200.00	$160,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$295,000**
Ancillary Items	1	LS	5% of Project	$14,750
Erosion and Sediment Control	1	LS	10% of Project	$29,500
			Base Construction Cost	**$339,250**
			Mobilization (5%)	$16,963
			Subtotal 1	$356,213
			Contingency (25%)	$89,053
			Subtotal 2	$445,266
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$200,370
			Estimated Project Cost	**$646,000**

DC9207_1.jpg: View of the stream section

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DC9210 Stream Restoration

Vicinity Map

Address:	Between Parsons Ct and Stover Dr
Location:	Woodstone
Land Owner:	Private - Residential
PIN:	0924 06 E
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Barnyard Run

Description: This project is located between Parsons Court and Stover Drive and extends from Bedrock Road downstream to an existing tree line just north of the Huntley Meadows Park boundary. Currently, this channel is concrete lined and very straight with a narrow strip of mowed grass on each side of the channel. Restoration efforts should focus on removing the existing 500' of concrete channel and replacing it with a more natural channel with an improved buffer on each bank.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Removal of the concrete and development of a natural system would create instream habitat and extend the lower reach's higher quality conditions upstream. A natural channel would help to slow erosive velocities, reduce water temperatures, allow for nutrient uptake from plantings, and promote groundwater recharge. Property owners along this project might welcome the aesthetic changes of the current channel to a natural, restored channel.

Project Design Considerations: This project is entirely contained within private HOA property and will require significant coordination with property owners for access and construction. This project will require environmental permitting due to construction and modifications to a stream channel. Adequate area for construction and development of a true natural channel may be lacking at this site. Access most likely will need to occur off of Bedrock Road. Design and construction may be constrained due to the location of several utilities adjacent to the existing concrete channel including electric and cable. Minimal tree loss can be expected with this project.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Concrete channel removal	500	LF	$30.00	$15,000
Clear and Grub	1	Ac	$10,000.00	$10,000
Plantings	1	Ac	$25,000.00	$25,000
Construct New Channel	500	LF	$200.00	$100,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$250,000**
Ancillary Items	1	LS	5% of Project	$12,500
Erosion and Sediment Control	1	LS	10% of Project	$25,000
			Base Construction Cost	**$287,500**
			Mobilization (5%)	$14,375
			Subtotal 1	$301,875
			Contingency (25%)	$75,469
			Subtotal 2	$377,344
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$169,805
			Estimated Project Cost	**$547,000**

DC9210_1.jpg: View of the existing concrete channel

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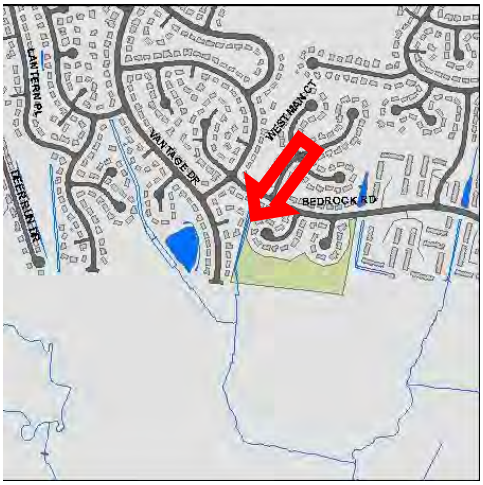
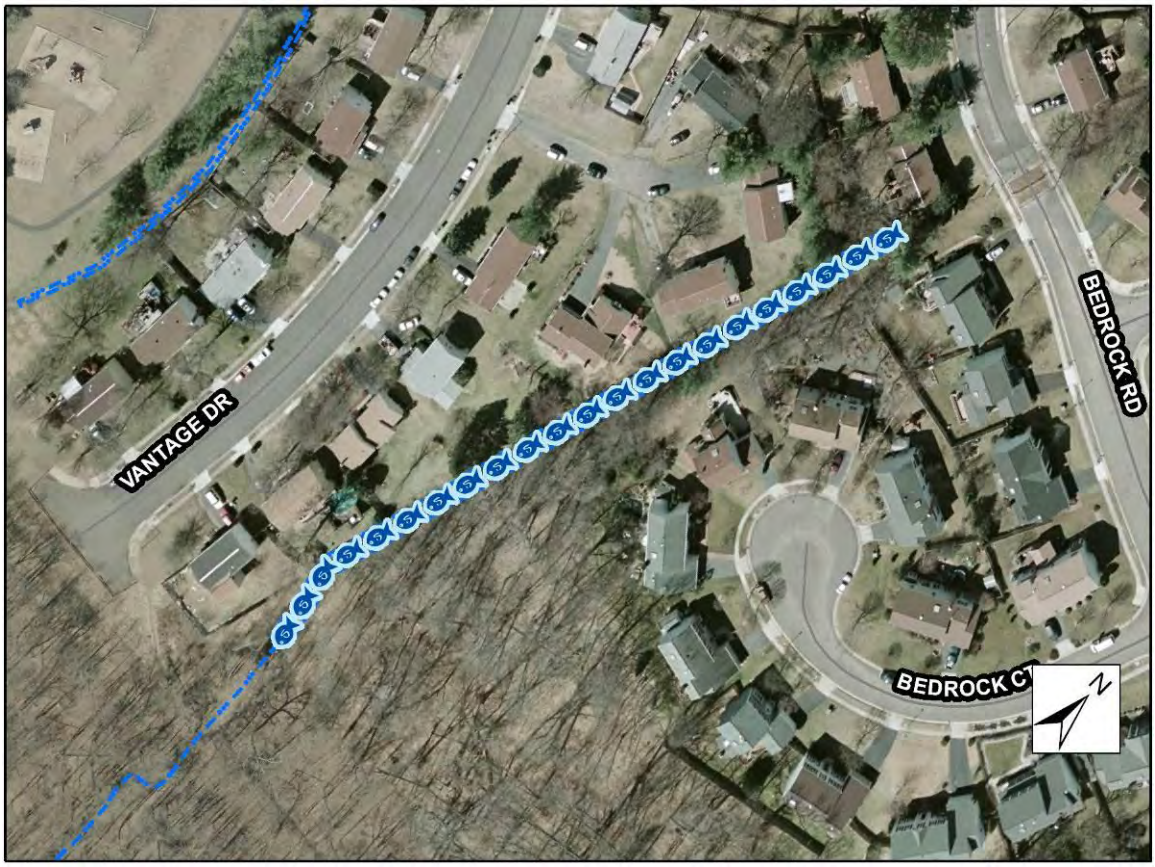
DC9211 Stream Restoration



Vicinity Map

Address:	Between Bedrock Ct and Vantage Dr
Location:	Woodstone
Land Owner:	Private – Residential
PIN:	0923 05 J
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Barnyard Run

Description: This project is located between Vantage Drive and Bedrock Court and extends from Bedrock Road downstream to just north of the Huntley Meadows Park boundary. Currently, this channel is concrete lined and very straight with a narrow strip of mowed grass on each side of the channel. The downstream portion of this channel is mostly forested especially on left bank facing downstream. Restoration efforts should focus on removing the existing 600' of concrete channel and replacing it with a more natural channel with an improved buffer on each bank. The existing forest buffer especially in the downstream portion of this project should be preserved and incorporated into the restoration design.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Removal of the concrete and development of a natural system would create instream habitat and extend the lower reach's higher quality conditions upstream. A natural channel would help to slow erosive velocities, reduce water temperatures, allow for nutrient uptake from plantings, and promote groundwater recharge. Property owners along this project might welcome the aesthetic changes of the current channel to a natural, restored channel.

Project Design Considerations: This project is entirely contained within private residential properties along Vantage Drive, Bedrock Road, and Bedrock Court as well as private HOA property and will require significant coordination with property owners for access and construction. This project will require environmental permitting due to construction and modifications to a stream channel. Access most likely will need to occur at the end of Vantage Drive. Design and construction may be constrained due to the location of several utilities adjacent to the existing concrete channel including electric and cable.

Coordination with the Park Authority will be required to address drainage issues downstream in Huntley Meadows Park and potentially include stream stabilization within the park as an additional element of the project. In addition, there is a known historic site at the entry to the park so construction access and staging should be located in order to avoid it.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Concrete channel removal	600	LF	$30.00	$18,000
Clear and Grub	0.75	Ac	$10,000.00	$7,500
Plantings	0.75	Ac	$25,000.00	$18,750
Construct New Channel	600	LF	$200.00	$120,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$264,250**
Ancillary Items	1	LS	5% of Project	$13,213
Erosion and Sediment Control	1	LS	10% of Project	$26,425
			Base Construction Cost	**$303,888**
			Mobilization (5%)	$15,194
			Subtotal 1	$319,082
			Contingency (25%)	$79,771
			Subtotal 2	$398,853
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$179,484
			Estimated Project Cost	**$578,000**

DC9211_1.jpg: View of the existing concrete channel

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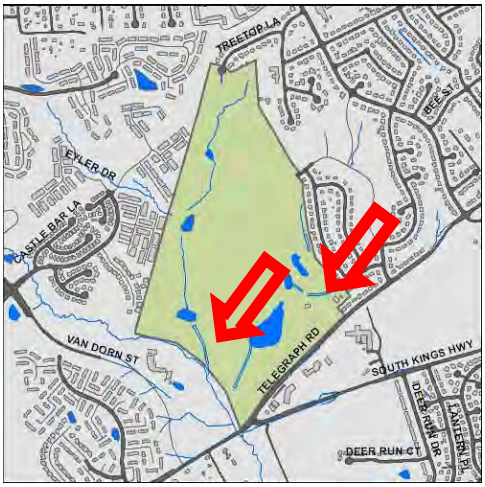
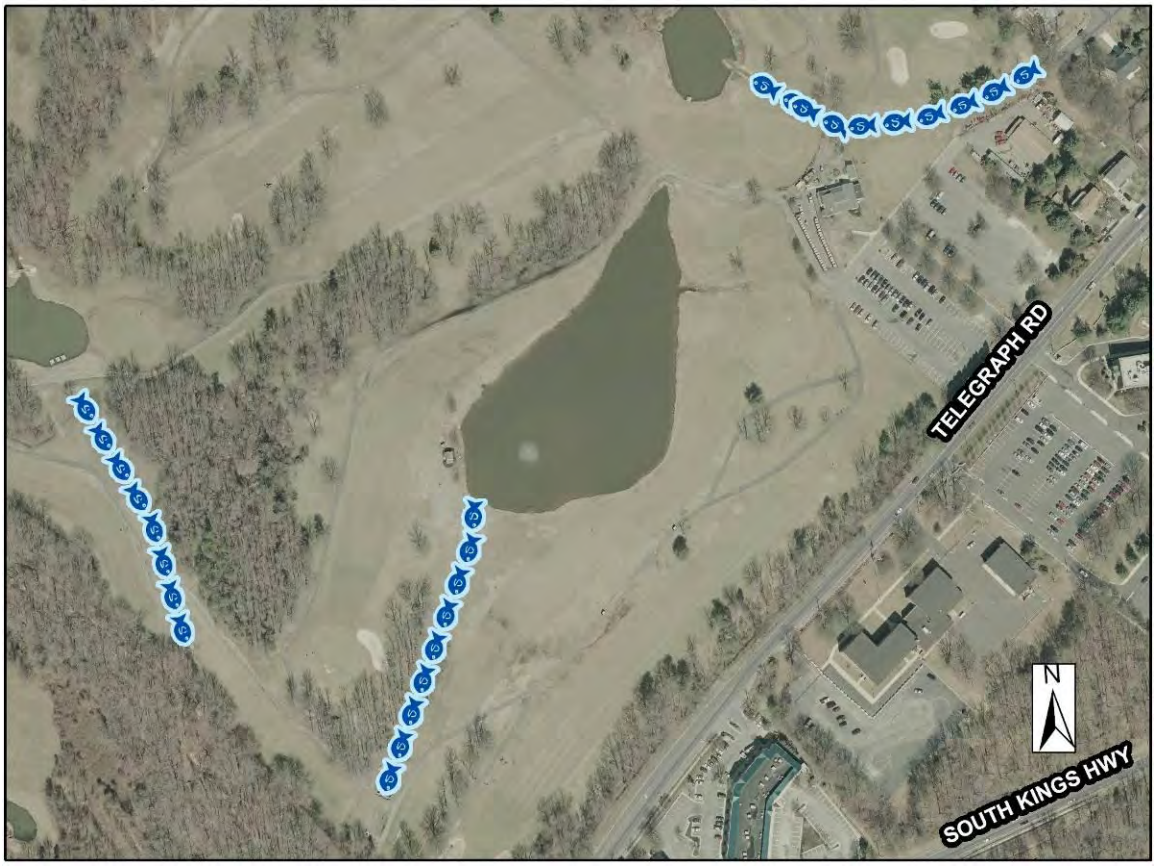
DC9213 Stream Restoration



Vicinity Map

Address:	6700 Telegraph Road
Location:	Greendale Golf Course
Land Owner:	County - FCPA
PIN:	0921 01 0001
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Dogue Creek

Description: This project is entirely contained within Greendale Golf Course and includes restoring three separate concrete lined stream channels that total 1700 feet. Currently, two of these channels are located downstream of large golf course ponds and the other receives runoff from a residential community stormdrain outfall at the end of Greendale Road. All of these channels are very open with few trees and border fairways or greens that are used by golfers. Restoration efforts should focus on removing the existing concrete channels and replacing them with a more natural channel. Development of a riparian buffer around each natural channel should be incorporated with the restoration if feasible.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Removal of the concrete channels and development of natural systems would create instream habitat, slow erosive velocities, reduce water temperatures, allow for nutrient uptake from plantings, and promote groundwater recharge. A riparian planting zone would also help to improve overall habitat and water quality at each restores channel. Local residents and visitors to the Greendale Golf Course might welcome the aesthetic changes of the current channels to natural, restored channels. This project is completely contained within County park property, which alleviates the need for land purchase or acquisition.

Project Design Considerations: This project is entirely contained within Greendale Golf Course and will require significant coordination with golf course management for access and construction. Modifications to stream channels as well as proposed buffers should be designed to minimize the impacts to the golf course. Adequate area for construction and development of true natural channels may be lacking with this project due to the existing layout of the golf course. The existing concrete channels are very accessible and will require environmental permitting due to construction and modifications to perennial stream channels. Design and construction may be constrained due to the location of several utilities including electric and irrigation. Tree loss is not expected with this project.

The project should be designed in close cooperation with Park Authority and Greendale Golf Course staff, particularly to insure that removal of the concrete channels does not lead ot increased erosion during high volume events. There is also the potential for disturbance to Civil War or Native American sites in the area, which may require archaeological testing and data recovery/avoidance measures.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Concrete channel removal	1700	LF	$30.00	$51,000
Clear and Grub	2	Ac	$10,000.00	$20,000
Plantings	2	Ac	$25,000.00	$50,000
Construct New Channel	1700	LF	$200.00	$340,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$561,000**
Ancillary Items	1	LS	5% of Project	$28,050
Erosion and Sediment Control	1	LS	10% of Project	$56,100
			Base Construction Cost	**$645,150**
			Mobilization (5%)	$32,258
			Subtotal 1	$677,408
			Contingency (25%)	$169,352
			Subtotal 2	$846,760
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$381,042
			Estimated Project Cost	**$1,228,000**

DC9213_1.jpg: Concrete channel at Greendale Golf Course

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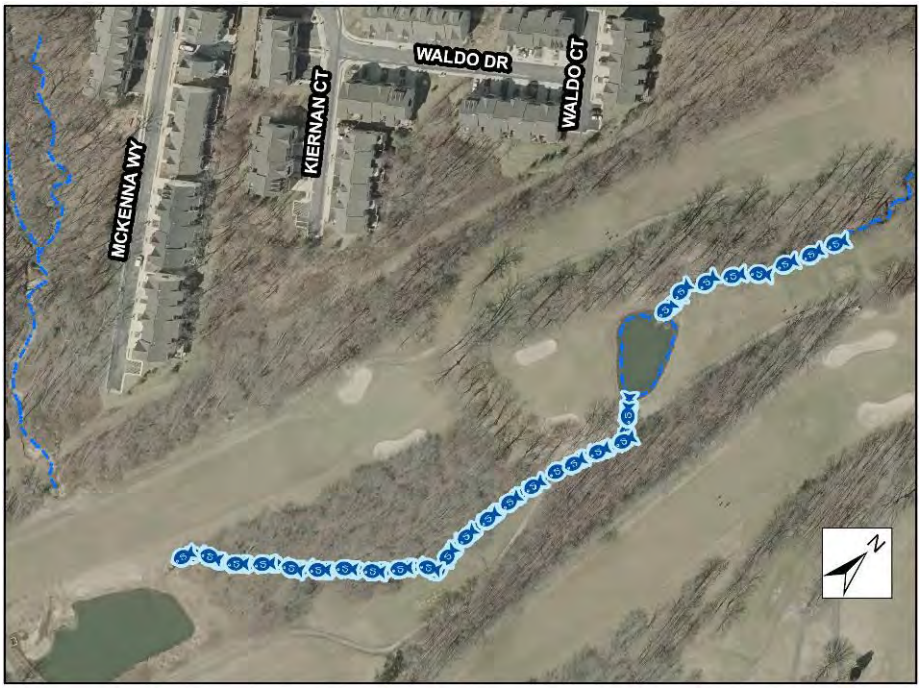
DC9214 Stream Restoration

Vicinity Map

Address:	6700 Telegraph Road
Location:	Greendale Golf Course
Land Owner:	County – FCPA
PIN:	0921 01 0001
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Dogue Creek

Description: This project is entirely contained within Greendale Golf Course and includes restoring two separate natural stream channels that total 2000 feet. Currently, these channels flow to golf course ponds and have a tree buffer on one bank and a fairway on the other bank. These channels are incised and over-widened with active erosion and downcutting. Restoration for this project will include regrading and stabilizing eroded stream banks with armor-in-place techniques on outer meander bends and bioengineering techniques on straight portions. Restoration will include grade controls to dissipate energy and require some installation of stone toe protection to ensure future bank stability. In particular, locations where these channels enter or exit the golf course ponds and on the downstream side of golf cart crossings should be stabilized as part of this project. Riparian buffers should be established as part of this restoration depending on golf course constraints. Since this restoration is entirely contained within the Greendale Golf Course, raising the bed elevation of this channel to reconnect higher flows to the floodplain or regrading the floodplain to create a new bench is not desirable. The current floodplain is a mix of trees with grass and forest.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of this project will help to stabilize golf course infrastructure and may decrease the frequency associated with pond dredging. Stabilizing these channels will reduce sediment loads to each golf course pond by preventing bank scour and channel incision. It is estimated that a total over 80,330 lbs of sediment, 64.3 lbs of total nitrogen and 25.0 lbs of total phosphorus would be reduced by this project. By reducing sedimentation within this channel and providing stable habitat along restored banks, overall instream water quality and habitat may be improved with this project. Restoring a riparian buffer along this reach will also provide future channel stability and ecological benefits.

Project Design Considerations: This project is entirely contained within Greendale Golf Course and will require significant coordination with golf course management for access and construction. Modifications to stream channels as well as proposed buffers should be designed to minimize the impacts to the golf course. The existing stream channels are very accessible and will require environmental permitting due to construction and modifications to perennial stream channels. Design and construction may be constrained due to the location of several utilities including electric and irrigation and the presence of golf cart crossings and golf course ponds. Minor tree loss can be expected with this project.

The project should be designed in close cooperation with Park Authority and Greendale Golf Course staff. High flows from the Rose Hill community north and east of the course will need to be considered in the restoration design.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	2	Ac	$10,000.00	$20,000
Plantings	2.25	Ac	$25,000.00	$56,250
Construct New Channel	2000	LF	$200.00	$400,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$576,250**
Ancillary Items	1	LS	5% of Project	$28,813
Erosion and Sediment Control	1	LS	10% of Project	$57,625
			Base Construction Cost	**$662,688**
			Mobilization (5%)	$33,134
			Subtotal 1	$695,822
			Contingency (25%)	$173,956
			Subtotal 2	$869,778
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$391,400
			Estimated Project Cost	**$1,261,000**

DC9214_1.jpg: View of stream section

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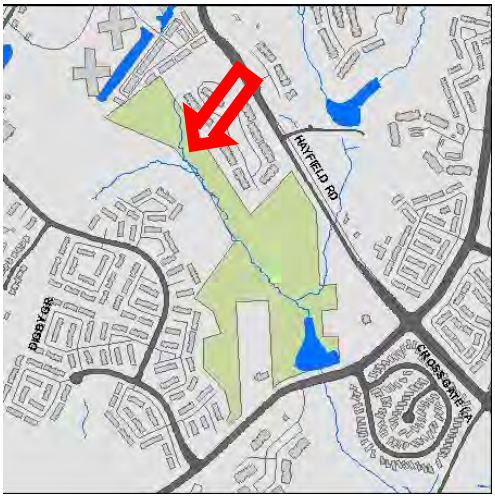
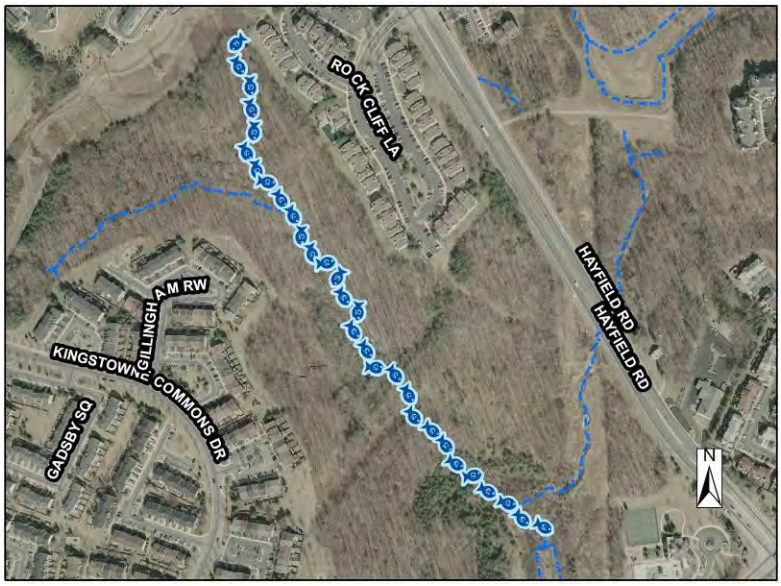
DC9215 Stream Restoration



Vicinity Map

Address:	6090 Kingstowne Village Pkwy
Location:	Behind Rockcliff La
Land Owner:	Private - Residential
PIN:	0913 01 0064B
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Piney Run

Description: The extents of this project are contained within forested HOA property. The upstream limit of the project is at Rock Cliff Lane and extends downstream to the upstream limit of stormwater facility DP0238. The upstream portion is experiencing moderate bank erosion on outside meanders and channel bed incision. The downstream portion is experiencing severe bank erosion and bed incision. Additionally, a storm drain pipe located in the middle portion of the project reach is causing severe erosion. As a result of erosion, a sanitary sewer manhole and pipe are exposed. Restoration of the channel will include reconnecting the upstream and downstream portions of the stream to the floodplain. This will be accomplished by reducing the existing channel dimensions, raising the bed elevation of the channel to correct the slope and installing grade controls to prevent future bed incision and bank erosion. Consideration will also be given to realigning the existing channel away from the sanitary sewer infrastructure.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Restoration would prevent significant future erosion throughout the project reach, stabilize and protect the exposed sanitary sewer infrastructure and reconnect the channel to the floodplain allowing sediment to settle out and reduce overall stream energy during high flows. It will reduce sediment loads to downstream channels by correcting channel downcutting, bank scour, over-widening, and meander bend migration. It is estimated that a total over 88,730 lbs of sediment, 71.0 lbs of total nitrogen and 27.5 lbs of total phosphorus would be reduced by this project. Overall, stream habitat and water quality may be improved due to stable habitat creation and reductions in available sediment supply.

Project Design Considerations: Environmental permitting and significant forest impacts are expected with this restoration. Impacts to forested areas will be caused by channel access and construction. Long-term benefits will outweigh construction impacts. This project is entirely contained within private HOA property and will require significant coordination with property owners for access and construction. Access may need to occur from several locations due to the length of the restoration. Potential access points are Rock Cliff Lane, Kingstowne Commons Drive and an existing embankment in the middle of the restoration reach. The exposed sanitary sewer casing and manhole may constrain the overall design of the proposed channel. Other utility impacts are not anticipated. There is also the potential for disturbance to a Native American sites directly to the east of the project site, which should be avoided during construction staging or access.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	2.75	Ac	$10,000.00	$27,500
Plantings	2.75	Ac	$25,000.00	$68,750
Construct New Channel	2400	LF	$200.00	$480,000
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$676,250**
Ancillary Items	1	LS	5% of Project	$33,813
Erosion and Sediment Control	1	LS	10% of Project	$67,625
			Base Construction Cost	**$777,688**
			Mobilization (5%)	$33,884
			Subtotal 1	$816,572
			Contingency (25%)	$204,143
			Subtotal 2	$1,020,715
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$459,322
			Estimated Project Cost	**$1,480,000**

DC9215_1.jpg: View of stream section

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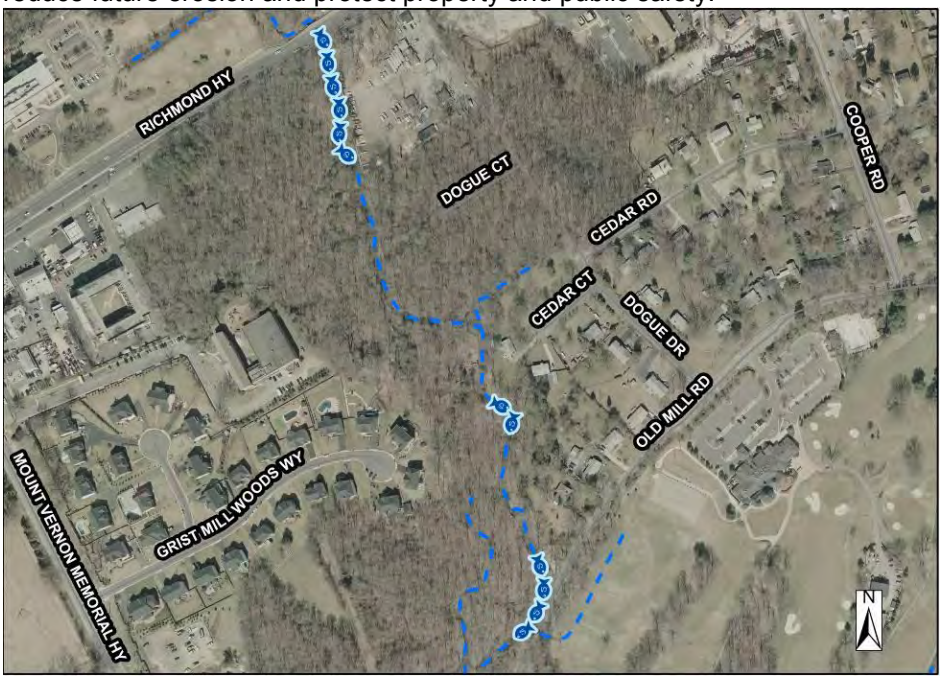
DC9217 Stream Restoration

Vicinity Map

Address:	8801 Richmond Hwy
Location:	Between Old Mill Rd and Richmond Hwy
Land Owner:	Private
PIN:	1092 02 0010, 1092 02 0009, 1092 02 0018A, 1092 03E 0018, 1092 03E 0017, 1092 03E 0016, 1092 08 A
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Dogue Creek

Description: This project is comprised of three sections on the Dogue Creek mainstem. The northern section limits extend from the Richmond Highway bridge over Dogue Creek downstream approximately 400 ft along the mainstem channel. Currently, this section of the mainstem on the left bank facing downstream has little to no buffer with moderate to severe erosion. In isolated areas rock has been placed along the bank. The right bank facing downstream is eroded and undercut within this section near the bridge over Dogue Creek due to a mid channel obstruction directing flow toward the banks. The middle section limits extend from Cedar Court downstream approximately 177 ft along the mainstem channel. The left bank facing downstream is experiencing severe erosion and is threatening private property. The southern section is located adjacent to Old Mill Road where the existing mainstem channel left bank flows along the road shoulder. Since the mainstem of Dogue Creek flows along this road, several small areas of erosion and undercutting are occurring along the hardened shoulder of Old Mill Road. Restoration of these three sections will involve regrading of banks and placement of rigid and soft stabilization practices to reduce future erosion and protect property and public safety.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Restoration of these sections would prevent future erosion and reduce sediment loads to the downstream Dogue Creek tidal area by correcting bank scour, over-widening and meander bend migration. It is estimated that a total over 28,180 lbs of sediment, 22.5 lbs of total nitrogen and 8.7 lbs of total phosphorus would be reduced by this project.Overall, stream habitat and water quality improvements will be minor due to stabilizing as opposed to restoring the channel. Stabilizing the severely eroded banks and road embankment will help to prevent adverse impacts to private property and human safety.

Project Design Considerations: Environmental permitting and minor to moderate forest impacts are expected with this restoration due to construction and modifications to a perennial stream channel as well as obtaining access to the channel; however, stabilization benefits will outweigh overall construction impacts. This channel has numerous private property owners along the banks and will require significant coordination for access and construction. Access will need to occur from several locations due to the three sections being isolated from each other. The northern section can be accessed from Richmond Highway. The middle section can be accessed from either Cedar Court or Grist Mill Woods Way. The southern section can be accessed from Old Mill Road. Utility impacts are not anticipated with this restoration.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	1.5	Ac	$10,000.00	$15,000
Plantings	1.5	Ac	$25,000.00	$37,500
Construct New Channel	852	LF	$200.00	$170,400
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$322,900**
Ancillary Items	1	LS	5% of Project	$16,145
Erosion and Sediment Control	1	LS	10% of Project	$32,290
			Base Construction Cost	**$371,335**
			Mobilization (5%)	$18,567
			Subtotal 1	$389,902
			Contingency (25%)	$97,476
			Subtotal 2	$487,378
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$219,320
			Estimated Project Cost	**$707,000**

DC9217_1.jpg: Eroded stream banks

DC9217_2.jpg: Area to be stabilized along Old Mill Road

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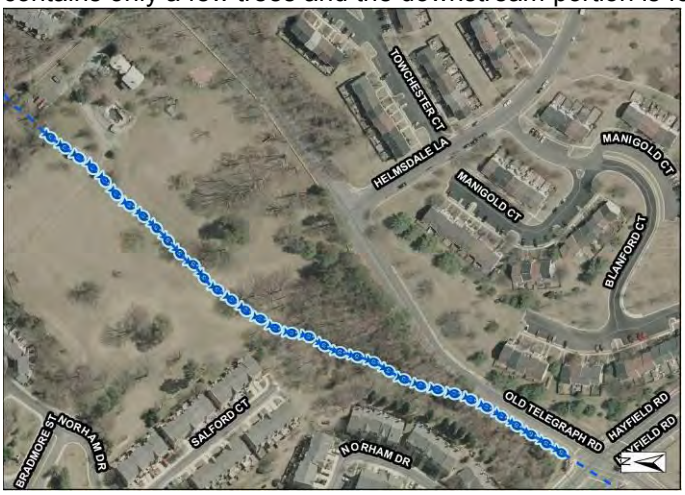
DC9218 Stream Restoration

Vicinity Map

Address:	7400 Old Telegraph Road
Location:	Banks Property
Land Owner:	County - FCPA
PIN:	0914 01 0023, 0914 01 0024, 0914 0922 A
Control Type	Water Quality
Drainage Area	NA
Receiving Waters	Unknown tributary of Piney Run

Description: This project extends from County-owned Banks property boundary to the upstream side of a culvert off of Old Telegraph Road near Hayfield Road. The downstream portion of the project reach is on HOA property. The stream channel within the Banks property is currently piped for several hundred feet. Areas not piped have been lined with rip rap and concrete. The pipes and crossings are in disrepair or are blocked causing high flows to overtop the structures. The downstream portion of this project, which is entirely contained within HOA property, is currently eroding, headcutting upstream to a culvert at the Banks property boundary and exposing a sanitary sewer pipe. The channel near the intersection of Old Telegraph Road and Hayfield Road is currently lined with concrete. Restoration in the upstream portion will involve removing the pipe, rip rap and concrete lined sections of the existing channel and restoring the stream to a more natural state with a healthy riparian buffer. Restoration in the downstream portion will include removing the concrete lined section of channel, reconnecting the channel to the original floodplain and installing grade controls to help prevent future incision and erosion. The upstream portion of this project contains only a few trees and the downstream portion is forested.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Removing the pipe, rip rap and concrete lining the channel and creating a natural channel with a sinuous design would attenuate stormflows, allow the stream to access its floodplain and improve downstream water quality and instream habitat. This project would also reduce future erosion in the downstream and upstream portions of this project, protect exposed sanitary sewer infrastructure and reconnect the channel to the floodplain which will allow sediment to settle out during high flows. Sediment loads to downstream channels may be reduced by correcting channel downcutting and bank scour in the downstream portion. It is estimated that a total over 10,910 lbs of sediment, 8.7 lbs of total nitrogen and 3.4 lbs of total phosphorus would be reduced by this project. Most of this project is contained within park property and could provide an educational opportunity for residents using the park.

Project Design Considerations: Most of this project is located on a historic property and consideration should be made to the integrity of the park and existing trees. The project should be developed in close cooperation with the Park Authority, and park amenities such as foot paths, bridges, and plantings will need to be incorporated into the overall design.

The downstream portion is contained within private HOA property and will require significant coordination with property owners for access and construction. Access to this project is good from the historic horse farm property and will only minimally impact trees within the park. The downstream portion will have moderate tree impacts due to access and construction. Environmental permitting is expected due to construction and modifications to a perennial stream channel. An exposed sanitary sewer pipe and utility are located within and near the current channel in the upstream and downstream portions of this project and may constrain design of the proposed channel. An access road within the horse farm park may constrain design of the proposed channel as well. Other utility impacts are not anticipated.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Concrete channel removal	210	LF	$30.00	$6,300
Pipe Removal	350	LF	$20.00	$7,000
Clear and Grub	0.75	Ac	$10,000.00	$7,500
Plantings	0.75	Ac	$25,000.00	$18,750
Construct New Channel	1294	LF	$200.00	$258,800
Additional Cost, First 500 LF	500	LF	$200.00	$100,000
			Initial Project Costs	**$398.350**
Ancillary Items	1	LS	5% of Project	$19,918
Erosion and Sediment Control	1	LS	10% of Project	$39,835
			Base Construction Cost	**$458,103**
			Mobilization (5%)	$22,905
			Subtotal 1	$481,008
			Contingency (25%)	$120,252
			Subtotal 2	$601,260
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$270,567
			Estimated Project Cost	**$872,000**

DC9218_1.jpg: Stream to be daylighted

DC9218_2.jpg: Downstream eroded channel

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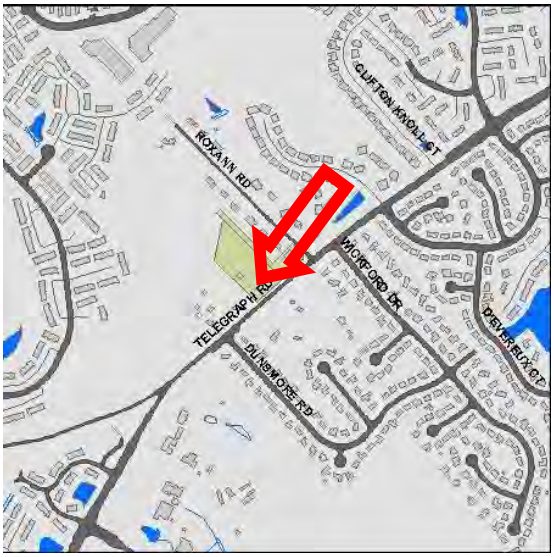
DC9400 Culvert Retrofit



Vicinity Map

Address:	7150 Telegraph Road
Location:	North side, Telegraph Road
Land Owner:	Private - Residential
PIN:	0914 01 0013
Control Type	Water Quality
Drainage Area	42.48 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: The project consists of providing an impoundment structure such as a weir wall across the existing stream channel on the upstream side of a culvert under Telegraph Road to provide stormwater management. The project will treat runoff from upstream low and high-density residential areas.

Project Area Map: Conceptual plan showing potential location of culvert retrofit

Project Benefits: A control structure installed on the upstream side of the existing cross culvert under Telegraph Road has potential to attenuate peak runoff volumes for a variety of design storm conditions. Reducing runoff volumes and slowing discharge velocities during storm events will promote settling of suspended particles and floatables, preserve future channel conditions, reduce erosion and promote habitat health downstream of the culvert. It is estimated that a total of 8,850 lbs of sediment, 108.0 lbs of nitrogen and 21.0 lbs of phosphorus would be reduced annually by this project

Project Design Considerations: During a storm event, the control structure will cause water levels on the upstream side of the cross culvert to elevate rapidly. This is a safety concern both for community residents and property. The base flow component of the control structure will require constant monitoring to prevent clogging. All components of the existing roadway and stream channel should be analyzed to ensure that the integrity of the culvert/stream is not compromised as a result of change in hydraulic characteristics at the crossing. Changes to the 100-year floodplain in this area due to a culvert retrofit must adhere to FEMA regulations.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
New Control Structure	1	LS	$12,000.00	$12,000.00
			Initial Project Costs	**$12,000**
Plantings	1	LS	5% of Project	$600
Ancillary Items	1	LS	5% of Project	$600
Erosion and Sediment Control	1	LS	10% of Project	$1,200
			Base Construction Cost	**$14,400**
			Mobilization (5%)	$720
			Subtotal 1	$15,120
			Contingency (25%)	$3,780
			Subtotal 2	$18,900
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$8,505
			Estimated Project Cost	**$27,000**

DC9400_1.jpg: Location of proposed project

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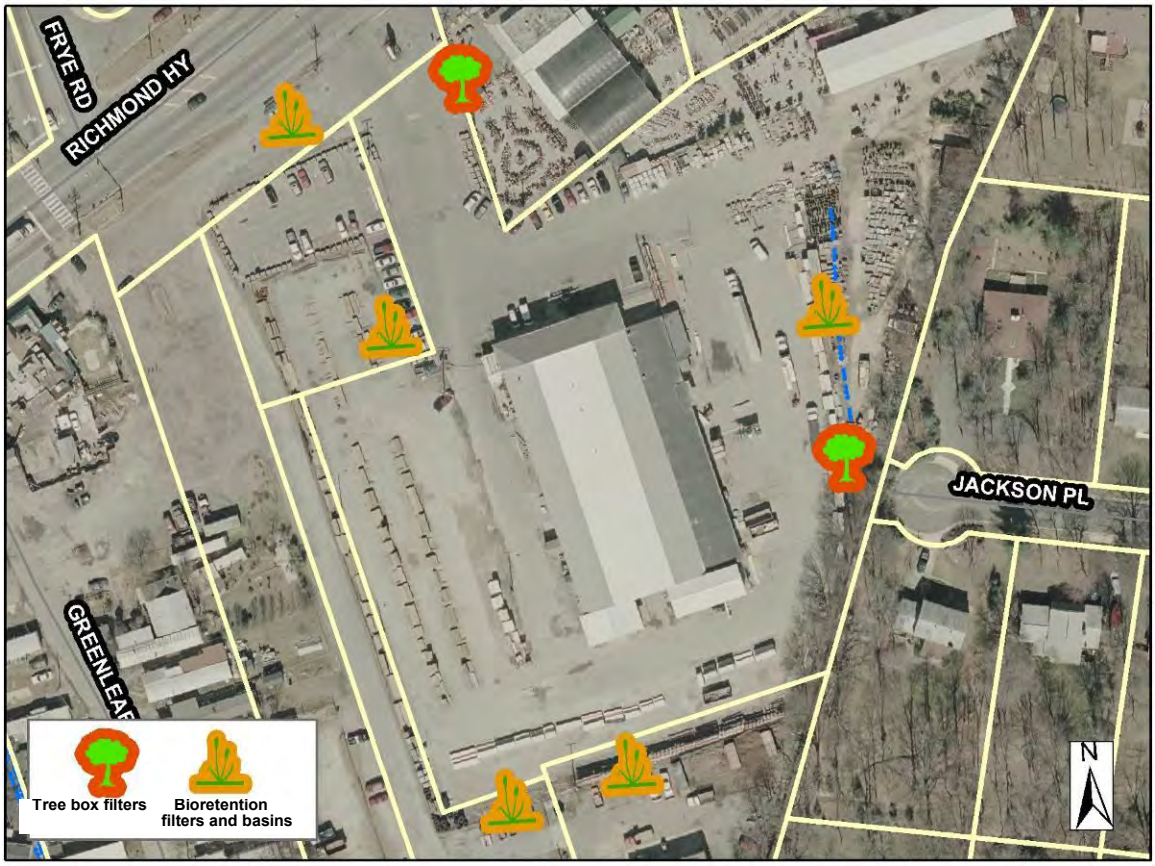
DC9500 BMP/LID

Vicinity Map

Address:	8453 Richmond Hwy
Location:	Smittys Building Supply
Land Owner:	Private - Commercial
PIN:	1013 01 0030
Control Type	Water Quality
Drainage Area	5.11 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Installation of bioretention filters and basins and tree box filters are proposed to treat runoff from the parking lot surrounding Smitty's Building Supply and adjacent areas along Richmond Highway. Two existing inlets will be retrofitted with tree box filters and unsed portions of the parking lot will be removed and graded to implement bioretention areas. The runoff will be treated to improve water quality.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of tree box filters and bioretention filters and basins will provide water quality treatment for this commercial/industrial area during storm events. These facilities remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total of 1.480 lbs of sediment, 20.0 lbs of nitrogen and 3.1 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. No tree removal is required for these sites. Access to the proposed sites is excellent from the parking lot around Smitty's Building Supply. Property ownership is private and coordination with the owner/management will be necessary for these sites.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	2	EA	$10,000.00	$20,000
Bioretention Filters & Basin	632	SY	$150.00	$94,800
			Initial Project Cost	**$114,800**
Plantings	1	LS	5% of project (excluding pervious pavement)	$5,740
Ancillary Items	1	LS	5% of project	$5,740
Erosion and Sediment Control	1	LS	10% of project	$11,480
			Base Construction Cost	**$137,760**
			Mobilization (5%)	$6,888
			Subtotal 1	**$144,648**
			Contingency (25%)	$36,162
			Subtotal 2	**$180,810**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$81,365
			Estimated Project Cost	**$262,000**

DC9500_1.jpg: View of parking lot

DC9500_2.jpg: View of existing inlet

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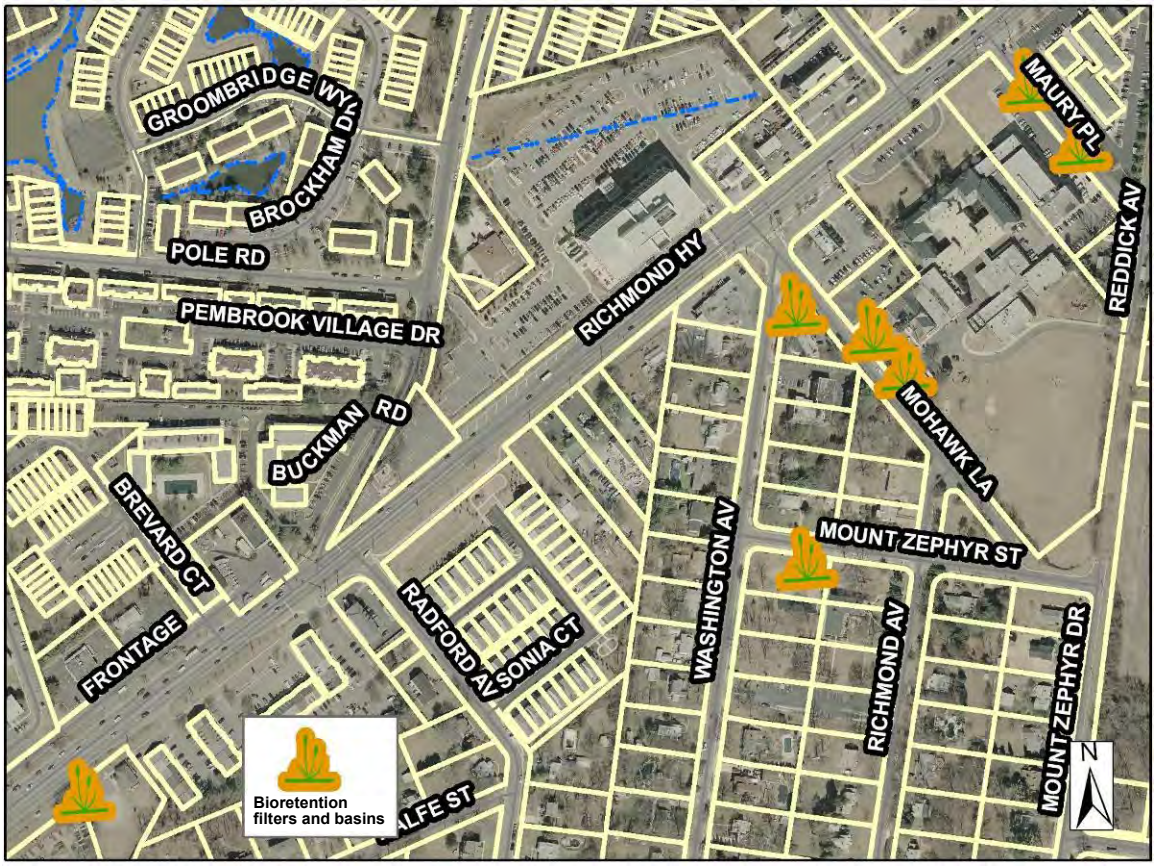
DC9501 BMP/LID

Vicinity Map

Address:	SE of 8300 Block of Richmond Hwy
Location:	Various
Land Owner:	County and Private
PIN:	1014 01 0005A
Control Type	Water Quality
Drainage Area	2.99 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Bioretention filters and basins are proposed for construction at low points of the parking lots in this area to capture and treat the runoff. The sites at Maury Place located between the street and the lot would require construction of a depressed berm. Removal of either play area or parking and curb cuts might be required for the site at the foot of Mohawk Lane. The sites at the church on Mt. Zephyr Street and Wesley Pre-school on Mohawk Lane may be a good volunteer opportunities.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Bioretention filters and basins can remove oil and grease, heavy metals, nutrients including phosphorus and nitrogen, and suspended solids from storm water runoff. It is estimated that a total of 70 lbs of sediment, 4.0 lbs of nitrogen and 0.6 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since a number of these sites are located on publicly-owned land or institutional properties, implementation is likely to be easier. It will also provide an environmental education/stewardship opportunity for residents in the community.

Project Design Considerations: Because of the intensity of existing development, no environmental constraints or permitting issues are anticipated. In the publicly-owned and cultural sites, signs promoting environmental education/stewardship could be used to educate residents. No tree removal is required for the proposed sites. Access is excellent.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Bioretention Filters & Basin	202	SY	$150.00	$30,300
			Initial Project Cost	**$30,300**
Plantings	1	LS	5% of project (excluding pervious pavement)	$1,515
Ancillary Items	1	LS	5% of project	$1,515
Erosion and Sediment Control	1	LS	10% of project	$3,030
			Base Construction Cost	**$36,360**
			Mobilization (5%)	$1,818
			Subtotal 1	**$38,178**
			Contingency (25%)	$9,545
			Subtotal 2	**$47,723**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$21,475
			Estimated Project Cost	**$69,000**

DC9501_1.jpg: Parking lot at Wesley PreSchool

DC9501_2.jpg: Parking lot along Mohawk Lane

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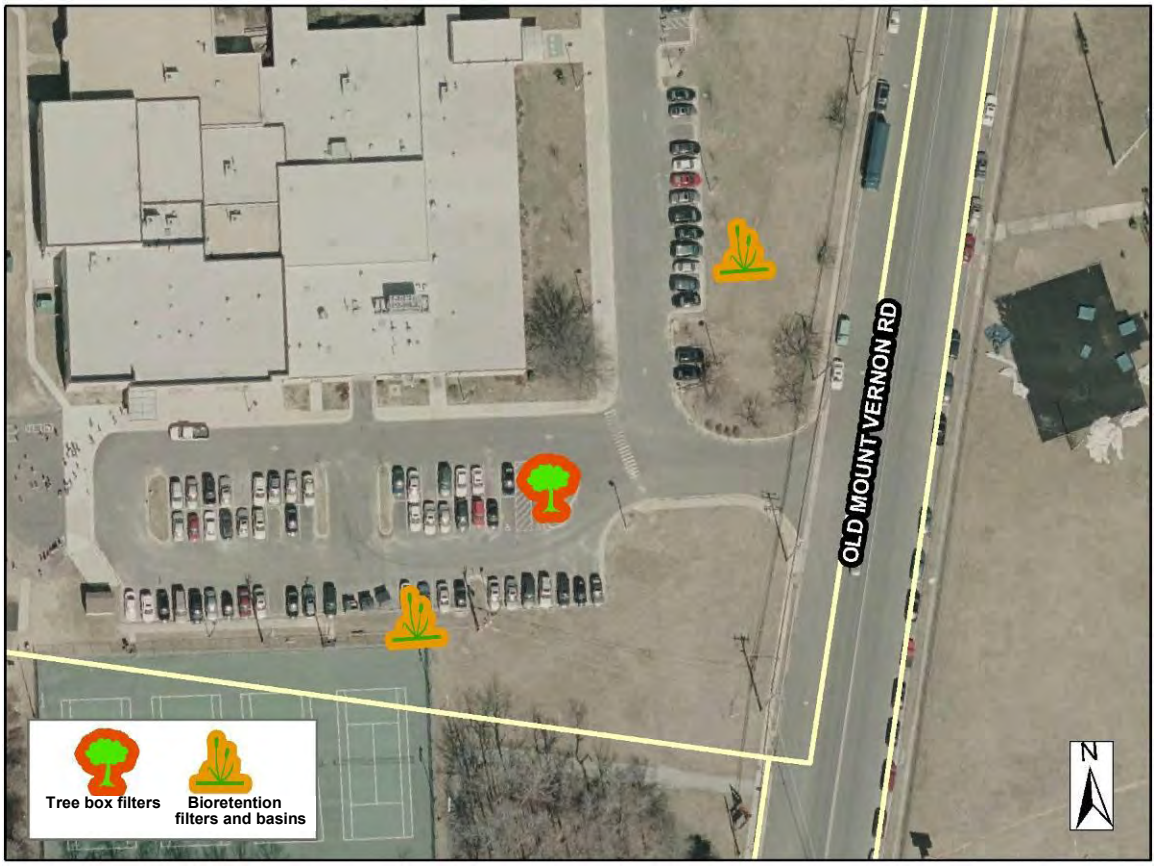
DC9503 BMP/LID

Vicinity Map

Address:	8410 Old Mt Vernon Rd
Location:	Riverside Elementary School
Land Owner:	County - FCPS
PIN:	1014 06 0011
Control Type	Water Quality
Drainage Area	2.03 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: This project would treat runoff from the parking lots at Riverside Elementary School and George Washington Recreational area by implementing bioretention filters and basins and tree box filters in the medians and in adjacent grassy areas in the parking lots. One tree box filter will be added to the existing inlet in the south parking lot. The bioretention areas will be created by grading the open space adjacent to the parking lots. The primary indicators are pollutants nitrogen, phosphorus and total suspended solids.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Tree box filters and bioretention filters and basins remove oil and grease, heavy metals, nutrients including phosphorus and nitrogen, and suspended solids from storm water runoff. It is estimated that a total of 246 lbs of sediment, 3.0 lbs of nitrogen and 0.7 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since this site is located on school grounds, the need for land purchase or acquisition is eliminated while providing an environmental education/stewardship opportunity for students and parents within the community.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate students and parents in the community. Access to the proposed sites is excellent from the school parking lots.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	1	EA	$10,000.00	$10,000
Bioretention Filters & Basin	150	SY	$150.00	$22,500
			Initial Project Cost	**$32,500**
Plantings	1	LS	5% of project (excluding pervious pavement)	$1,625
Ancillary Items	1	LS	5% of project	$1,625
Erosion and Sediment Control	1	LS	10% of project	$3,250
			Base Construction Cost	**$39,000**
			Mobilization (5%)	$1,950
			Subtotal 1	**$40,950**
			Contingency (25%)	$10,238
			Subtotal 2	**$51,188**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$23,035
			Estimated Project Cost	**$74,000**

DC9503_1.jpg: Parking lot at Riverside Elementary School

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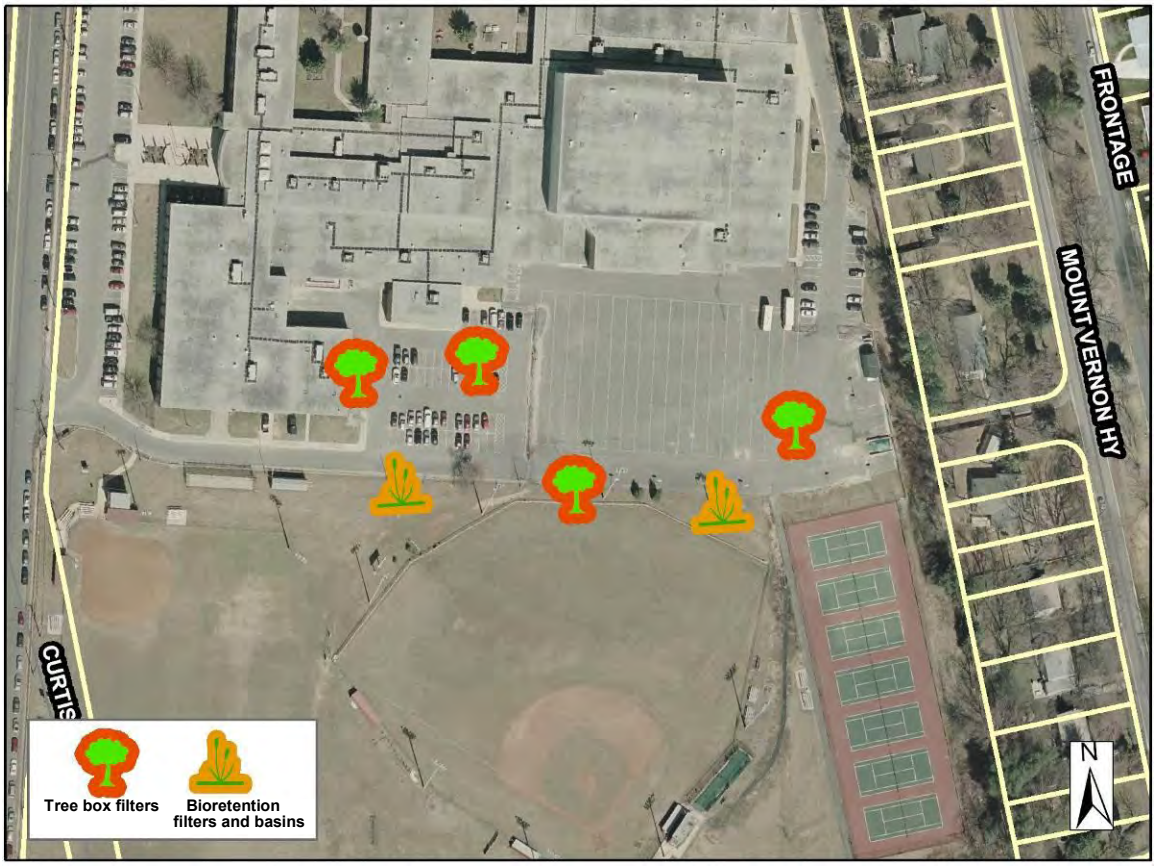
DC9504 BMP/LID

Vicinity Map

Address:	8515 Old Mt Vernon Rd
Location:	Mount Vernon High School
Land Owner:	County - FCPS
PIN:	1014 10010016
Control Type	Water Quality
Drainage Area	2.80 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Mount Vernon High School parking lot runoff would be treated by installing bioretention filters and basins and tree box filters in and along the edges of the parking lot. Tree box filters will be added to the four existing inlets in the parking lot and bioretention filters will be created by grading the open area along the southern edge of the parking lot.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Bioretention filters and basins and tree box filters remove oil and grease, heavy metals, nutrients including phosphorus and nitrogen, and suspended solids from storm water runoff. It is estimated that a total of 210 lbs of sediment, 7.4 lbs of total nitrogen and 0.3 lbs of total phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since this site is located on school grounds, the need for land purchase or acquisition is eliminated while providing an environmental education/stewardship opportunity for students and parents within the community.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate students and parents in the community. Access to the proposed sites is excellent from the school parking lots. A temporary or permanent loss of parking spaces may occur with these sites.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	4	EA	$10,000.00	$40,000
Bioretention Filters & Basin	284	SY	$150.00	$42,600
			Initial Project Cost	**$82,600**
Plantings	1	LS	5% of project (excluding pervious pavement)	$4,130
Ancillary Items	1	LS	5% of project	$4,130
Erosion and Sediment Control	1	LS	10% of project	$8,260
			Base Construction Cost	**$99,120**
			Mobilization (5%)	$4,956
			Subtotal 1	**$104,076**
			Contingency (25%)	$26,019
			Subtotal 2	**$130,095**
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	$58,543
			Estimated Project Cost	**$189,000**

DC9504_1.jpg: Parking lot at Mount Vernon High School

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DC9505 BMP/LID

Vicinity Map

Address:	8515 Old Mt Vernon Rd
Location:	Mount Vernon High School
Land Owner:	County - FCPS
PIN:	1014 01 0034
Control Type	Water Quality
Drainage Area	4.883 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Mount Vernon High School parking lot runoff would be treated by installing bioretention filters and basins and tree box filters in and along the edges of the parking lot. All but one of these sites are located just upstream of a proposed stormwater project (DC9100) and could be designed as a system to maximize pre-treatment, water quality benefits, and water quantity storage.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Bioretention filters and basins and tree box filters remove oil and grease, heavy metals, nutrients, and suspended solids from storm water runoff. It is estimated that a total of 525 lbs of sediment, 6.7 lbs of nitrogen and 1.5 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since this site is located on school grounds, the need for land purchase or acquisition is eliminated while providing an environmental education/stewardship opportunity for students and parents within the community.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate students and parents in the community. Access to the proposed sites is excellent from the school parking lots. Modifications to the existing storm drain system may be necessary to drain these sites. A temporary or permanent loss of parking spaces may occur with these sites.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	2	EA	$10,000.00	$20,000
Bioretention Filters & Basin	478	SY	$150.00	$71,700
			Initial Project Cost	**$91,700**
Plantings	1	LS	5% of project (excluding pervious pavement)	$4,585
Ancillary Items	1	LS	5% of project	$4,585
Erosion and Sediment Control	1	LS	10% of project	$9,170
			Base Construction Cost	**$110,040**
			Mobilization (5%)	$5,502
			Subtotal 1	**$115,542**
			Contingency (25%)	$28,886
			Subtotal 2	**$144,428**
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	$64,993
			Estimated Project Cost	**$209,000**

DC9505_1.jpg: Parking lot at Mount Vernon High School

DC9505_2.jpg: Parking lot at Mount Vernon High School

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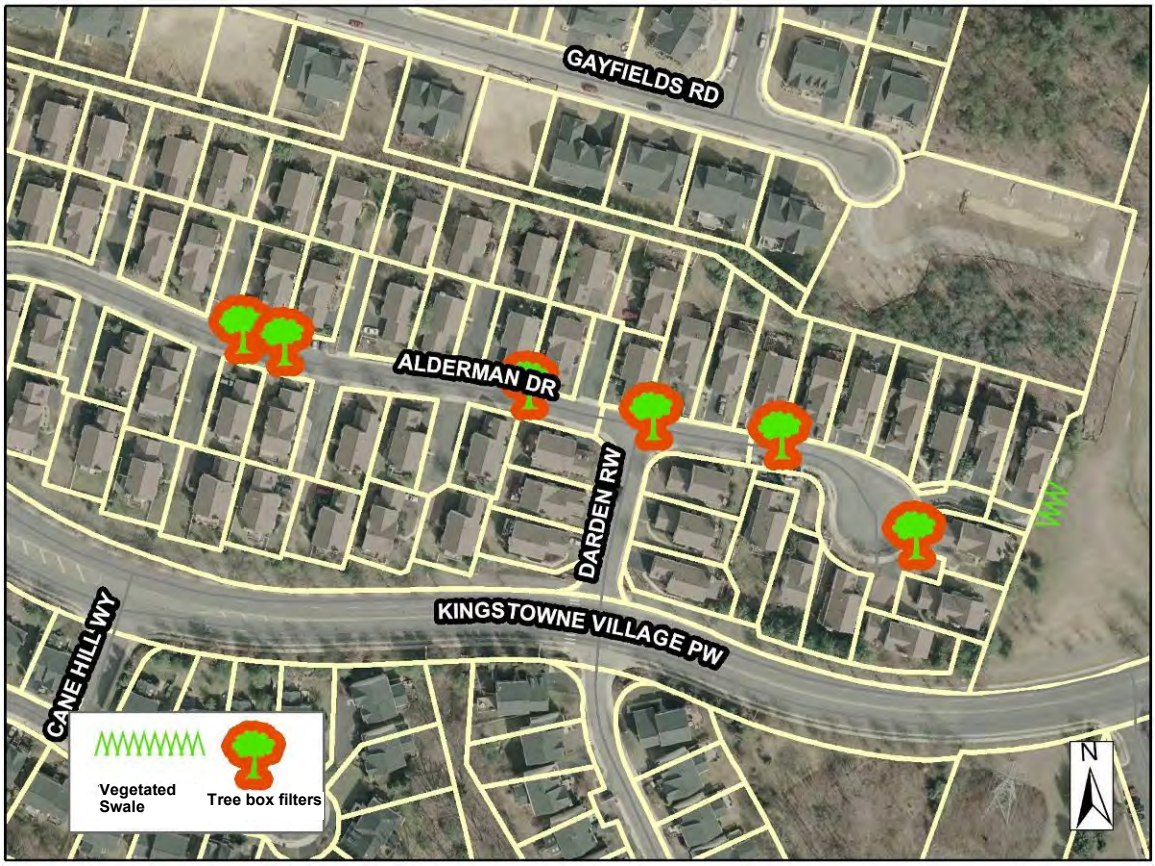
DC9506 BMP/LID

Vicinity Map

Address:	6300 Block, Alderman Drive
Location:	Alderman Drive
Land Owner:	State - VDOT
PIN:	0913 01 0064W
Control Type	Water Quality
Drainage Area	0.51 acres
Receiving Waters	Unknown tributary of Piney Run

Description: This proposed project includes installation of tree box filters and the implementation of a vegetated swale. Six tree box filters will be installed at the existing inlets and a vegetated swale will be implemented in the open area behind Alderman Dr. The proposed project will treat the rooftop and driveway runoff from the residential area.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of the proposed improvements will provide water quality treatment for residential runoff during storm events. Both the tree box filters and the vegetated swale will trap suspended solids, reduce trace metals, and uptake nutrients including phosphorus and nitrogen from storm water runoff. It is estimated that a total of 315 lbs of sediment, 3.5 lbs of nitrogen and 0.7 lbs of phosphorus would be reduced annually by this project. They also promote infiltration and can reduce the flow velocity of storm water runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Minimal tree removal is required for this site. Access to the proposed site is good from Alderman Drive; however, private driveways will need to be accessed to reach the proposed site. Property ownership is private and coordination with the homeowners/landowners will be necessary.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	6	EA	$10,000.00	$60,000
Vegetated Swale	73	SY	$50.00	$3,650
			Initial Project Cost	**$63,650**
Plantings	1	LS	5% of project (excluding pervious pavement)	$3,183
Ancillary Items	1	LS	5% of project	$3,183
Erosion and Sediment Control	1	LS	10% of project	$6,365
			Base Construction Cost	**$76,381**
			Mobilization (5%)	$3,819
			Subtotal 1	**$80,200**
			Contingency (25%)	$20,050
			Subtotal 2	**$100,250**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$45,113
			Estimated Project Cost	**$145,000**

DC9506_1.jpg: View open area behind Alderman Drive

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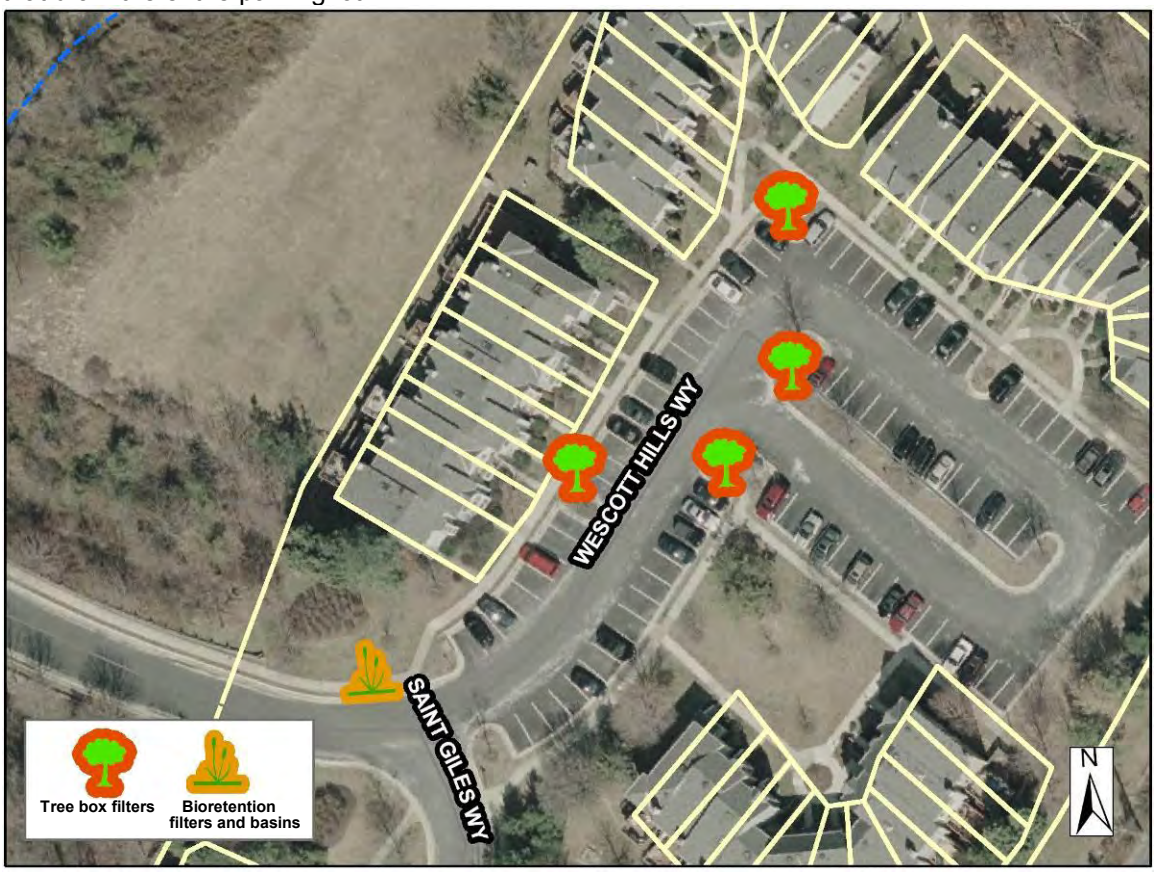
DC9507 BMP/LID

Vicinity Map

Address:	5800 Block, Wescott Hills Way
Location:	Parking lots along Wescott Way
Land Owner:	Private - Residential
PIN:	0914 0926 C
Control Type	Water Quality
Drainage Area	1.07 acres
Receiving Waters	Unknown tributary of Piney Run

Description: Installation of bioretention filters and basins and tree box filters are proposed to treat runoff from the residential parking lots along Wescott Hills Way. This project includes retrofitting four existing inlets that drain the entire parking lot.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Tree box filters and bioretention filters and basins remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total of 463 lbs of sediment, 5.0 lbs of nitrogen and 1.0 lb of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent in the parking lot; however, property ownership is private and coordination with the owners/management will be necessary. Modifications to the existing storm drain system may be necessary to drain the proposed sites. A temporary or permanent loss of parking spaces can be expected.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	4	EA	$10,000.00	$40,000
Bioretention Filters & Basin	88	SY	$150.00	$13,200
			Initial Project Cost	**$53,200**
Plantings	1	LS	5% of project (excluding pervious pavement)	$2,660
Ancillary Items	1	LS	5% of project	$2,660
Erosion and Sediment Control	1	LS	10% of project	$5,320
			Base Construction Cost	**$63,840**
			Mobilization (5%)	$3,192
			Subtotal 1	**$67,032**
			Contingency (25%)	$16,758
			Subtotal 2	**$83,790**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$37,706
			Estimated Project Cost	**$121,000**

DC9507_1.jpg: View of existing inlets at end of Wescott Hills Way

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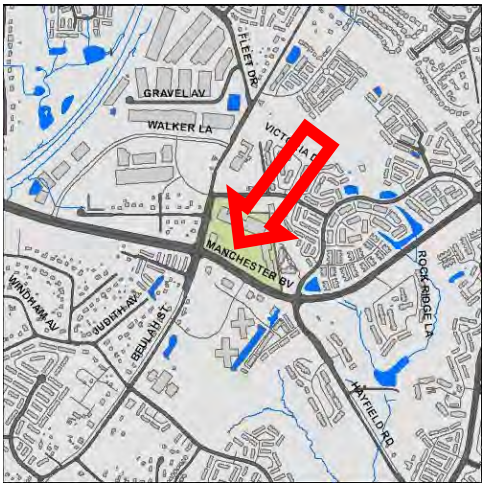
DC9508 BMP/LID



Vicinity Map

Address:	7000 Block, Manchester Blvd
Location:	Shoppers' parking lot
Land Owner:	Private - Commercial
PIN:	0911 12 N
Control Type	Water Quality
Drainage Area	5.83 acres
Receiving Waters	Unknown tributary of Piney Run

Description: Bioretention filters and basins are proposed in the medians of the Shoppers' parking lot to treat the runoff. Most of this parking lot drains to single inlets along medians. The medians will be graded to create bioretention areas that will treat the runoff for pollutants like nitrogen, phosphorus and total suspended solids.

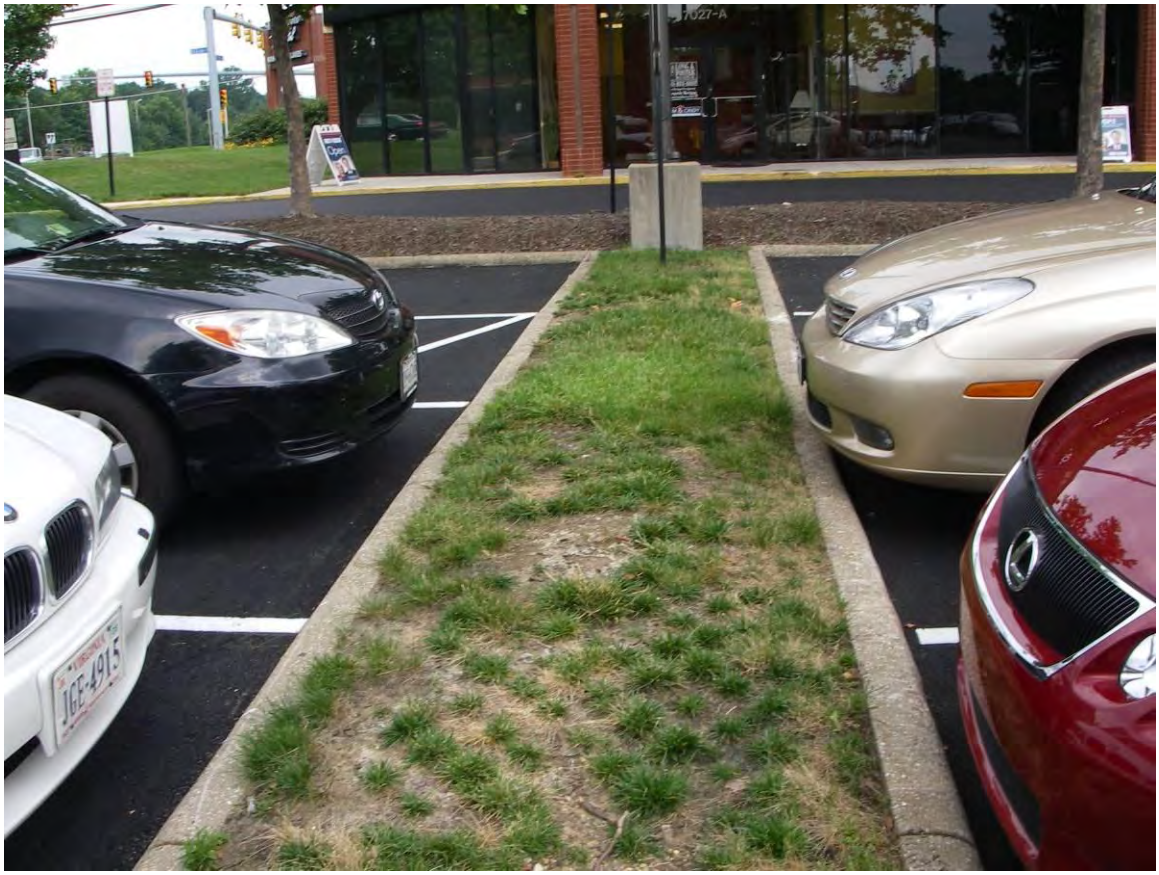
Project Area Map: Conceptual plan showing potential locations

Project Benefits: Implementation of bioretention filters and basins will provide water quality treatment for the Shoppers commercial parking lot runoff during storm events. These facilities can remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, and oil and grease from storm water runoff. It is estimated that a total of 2,040 lbs of sediment, 22.0 lbs of nitrogen and 4.1 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from roads and the Shoppers commercial parking lot. Property ownership is most likely private and coordination with the shopping center owner/management will be necessary for these sites. A temporary or permanent loss of parking spaces can be expected with these sites.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Bioretention Filters & Basin	700	SY	$150.00	$105,000
			Initial Project Cost	**$105,000**
Plantings	1	LS	5% of project (excluding pervious pavement)	$5,250
Ancillary Items	1	LS	5% of project	$5,250
Erosion and Sediment Control	1	LS	10% of project	$10,500
			Base Construction Cost	**$126,000**
			Mobilization (5%)	$6,300
			Subtotal 1	**$132,300**
			Contingency (25%)	$33,075
			Subtotal 2	**$165,375**
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	$74,419
			Estimated Project Cost	**$240,000**



DC9508_1.jpg: View of existing medians in parking lot.

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DC9510 BMP/LID

Vicinity Map

Address:	7630 Telegraph Road
Location:	Hayfield Secondary School
Land Owner:	County - FCPS
PIN:	0914 01 0028
Control Type	Water Quality
Drainage Area	8.58 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Hayfield Secondary School parking lot runoff would be treated by installing bioretention filters and basins in the medians and adjacent grassy areas. The facilities would be installed by grading the low open area downstream side of each parking lot which will treat the runoff for pollutants like nitrogen, phosphorus and total suspended solids.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Bioretention filters and basins remove oil and grease, heavy metals, nutrients including phosphorus and nitrogen, and suspended solids from storm water runoff. It is estimated that a total of 720 lbs of sediment, 3.8 lbs of nitrogen and 1.6 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since this site is located on school grounds, the need for land purchase or acquisition is eliminated while providing an environmental education/stewardship opportunity for students and parents within the community.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate students and parents in the community. Access to the proposed sites is excellent from the school parking lots.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Bioretention Filters & Basin	650	SY	$150.00	$97,500
			Initial Project Cost	**$97,500**
Plantings	1	LS	5% of project (excluding pervious pavement)	$4,875
Ancillary Items	1	LS	5% of project	$4,875
Erosion and Sediment Control	1	LS	10% of project	$9,750
			Base Construction Cost	**$117,000**
			Mobilization (5%)	$5,850
			Subtotal 1	**$122,850**
			Contingency (25%)	$30,713
			Subtotal 2	**$153,563**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$69,103
			Estimated Project Cost	**$223,000**

DC9510_1.jpg: Parking lot area at Hayfield Secondary School

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DC9511 BMP/LID

Vicinity Map

Address:	Hayfield Rd and Telegraph Rd
Location:	Hayfield Plaza parking lot
Land Owner:	Private - Commercial
PIN:	0914 01 0031
Control Type	Water Quality
Drainage Area	5.22 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: The project proposes implementation of bioretention areas to receive parking lot runoff at Hayfield Plaza. The southern grassy area of the parking lot can be graded to create bioretention areas. The runoff from the parking lot will primarily be treated to reduce nitrogen, phosphorus and total suspended solids.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Implementation of bioretention filters and basins will provide water quality treatment for this parking lot during storm events. It is estimated that a total of 1,000 lbs of sediment, 12.8 lbs of nitrogen and 2.0 lbs of phosphorus would be reduced annually by this project. These facilities remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from roads and the commercial parking lot. Property ownership is most likely private and coordination with the shopping center owner/management will be necessary for these sites. A temporary or permanent loss of parking spaces can be expected with these sites.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Bioretention Filters & Basin	666	SY	$150.00	$99,900
			Initial Project Cost	**$99,900**
Plantings	1	LS	5% of project (excluding pervious pavement)	$4,995
Ancillary Items	1	LS	5% of project	$4,995
Erosion and Sediment Control	1	LS	10% of project	$9,990
			Base Construction Cost	**$119,880**
			Mobilization (5%)	$5,994
			Subtotal 1	**$125,874**
			Contingency (25%)	$31,469
			Subtotal 2	**$157,343**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$70,804
			Estimated Project Cost	**$228,000**

DC9511_1.jpg: Parking lot area at Hayfield Plaza

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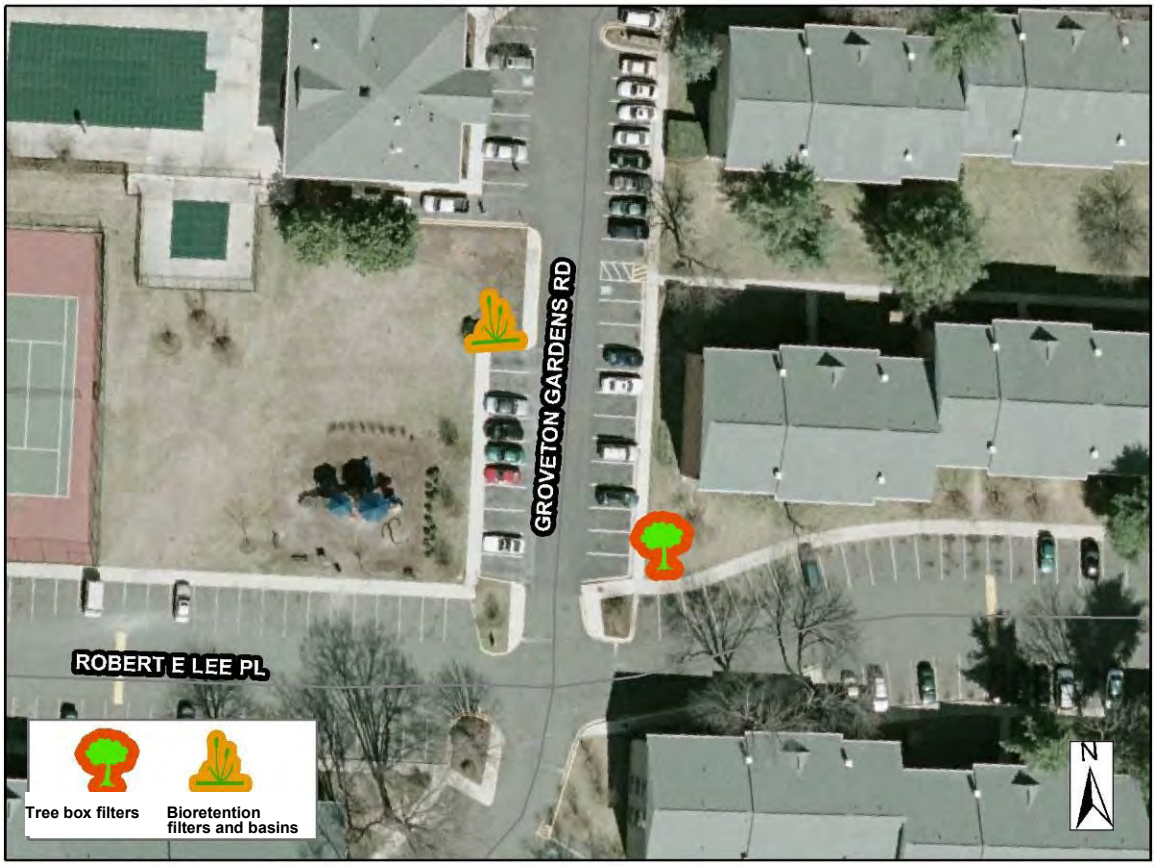
DC9512 BMP/LID

Vicinity Map

Address:	7140 Block, Groveton Gardens Rd
Location:	Parking lots
Land Owner:	Private
PIN:	0924 01 0013
Control Type	Water Quality
Drainage Area	0.43 acres
Receiving Waters	Unknown tributary of Barnyard Run

Description: This project proposes installation of tree box filters and creation of bioretention areas to receive the runoff from parking lots at Groveton Gardens. One existing storm drain inlet will be retrofitted with a filter and low open area adjacent to the parking lot will be graded to create a bioretention area. The runoff from the parking lot will be treated to reduce nitrogen, phosphorus and total suspended solids..



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Tree box filters and bioretention filters and basins remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total of 223 lbs of sediment, 2.6 lbs of nitrogen and 0.5 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent in the residential parking lots; however, property ownership is private and coordination with the owners/management will be necessary. A temporary or permanent loss of parking spaces can be expected with these sites.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	1	EA	$10,000.00	$10,000
Bioretention Filters & Basin	32	SY	$150.00	$4,800
			Initial Project Cost	**$14,800**
Plantings	1	LS	5% of project (excluding pervious pavement)	$740
Ancillary Items	1	LS	5% of project	$740
Erosion and Sediment Control	1	LS	10% of project	$1,480
			Base Construction Cost	**$17,760**
			Mobilization (5%)	$888
			Subtotal 1	**$18,648**
			Contingency (25%)	$4,662
			Subtotal 2	**$23,310**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$10,490
			Estimated Project Cost	**$34,000**

DC9512_1.jpg: View of the parking lot

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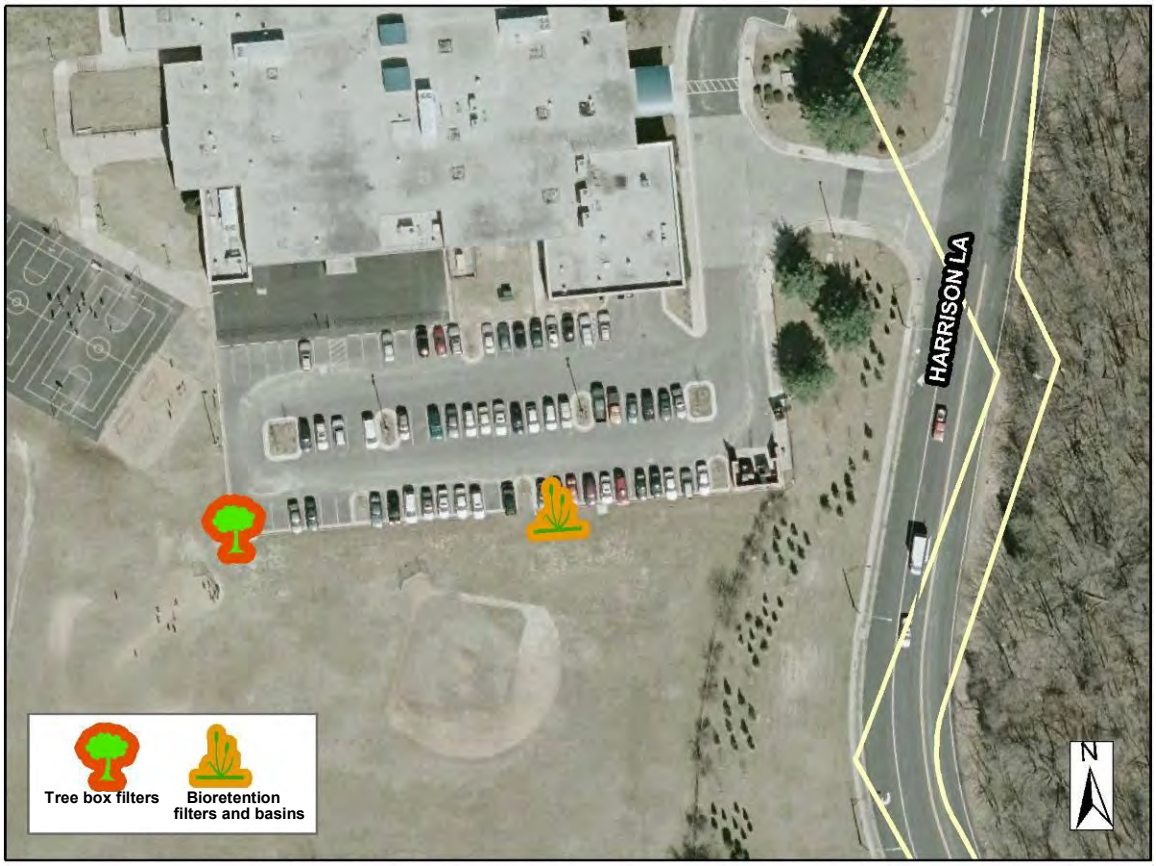
DC9513 BMP/LID

Vicinity Map

Address:	6900 Harrison Lane
Location:	Groveton Elementary School
Land Owner:	County - FCPS
PIN:	0922 01 0008
Control Type	Water Quality
Drainage Area	0.65 acres
Receiving Waters	Unknown tributary of Barnyard Run

Description: A tree box filter and bioretention filters and basins are proposed in the Groveton Elementary School parking lot to treat stormwater runoff. Field assessment showed that this parking lot was currently treated for quantity control. A bioretention area will be created in the open space south of the parking lot and one tree box filter will be installed at the existing inlet for quality control. The runoff from the parking lot will be treated to reduce nitrogen, phosphorus and total suspended solids.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Tree box filters and bioretention filters and basins remove oil and grease, heavy metals, nutrients including phosphorus and nitrogen, and suspended solids from storm water runoff. It is estimated that a total of 368 lbs of sediment, 6.5 lbs of nitrogen and 1.2 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since this site is located on school grounds, the need for land purchase or acquisition is eliminated while providing an environmental education/stewardship opportunity for students and parents within the Dogue Creek Watershed community.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate students and parents in the community. Access to the proposed sites is excellent from the school parking lot.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	1	EA	$10,000.00	$10,000
Bioretention Filters & Basin	65	SY	$150.00	$9,750
			Initial Project Cost	**$19,750**
Plantings	1	LS	5% of project (excluding pervious pavement)	$988
Ancillary Items	1	LS	5% of project	$988
Erosion and Sediment Control	1	LS	10% of project	$1,975
			Base Construction Cost	**$23,701**
			Mobilization (5%)	$1,185
			Subtotal 1	**$24,886**
			Contingency (25%)	$6,222
			Subtotal 2	**$31,108**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$13,999
			Estimated Project Cost	**$45,000**

DC9513_1.jpg: View of the parking lot

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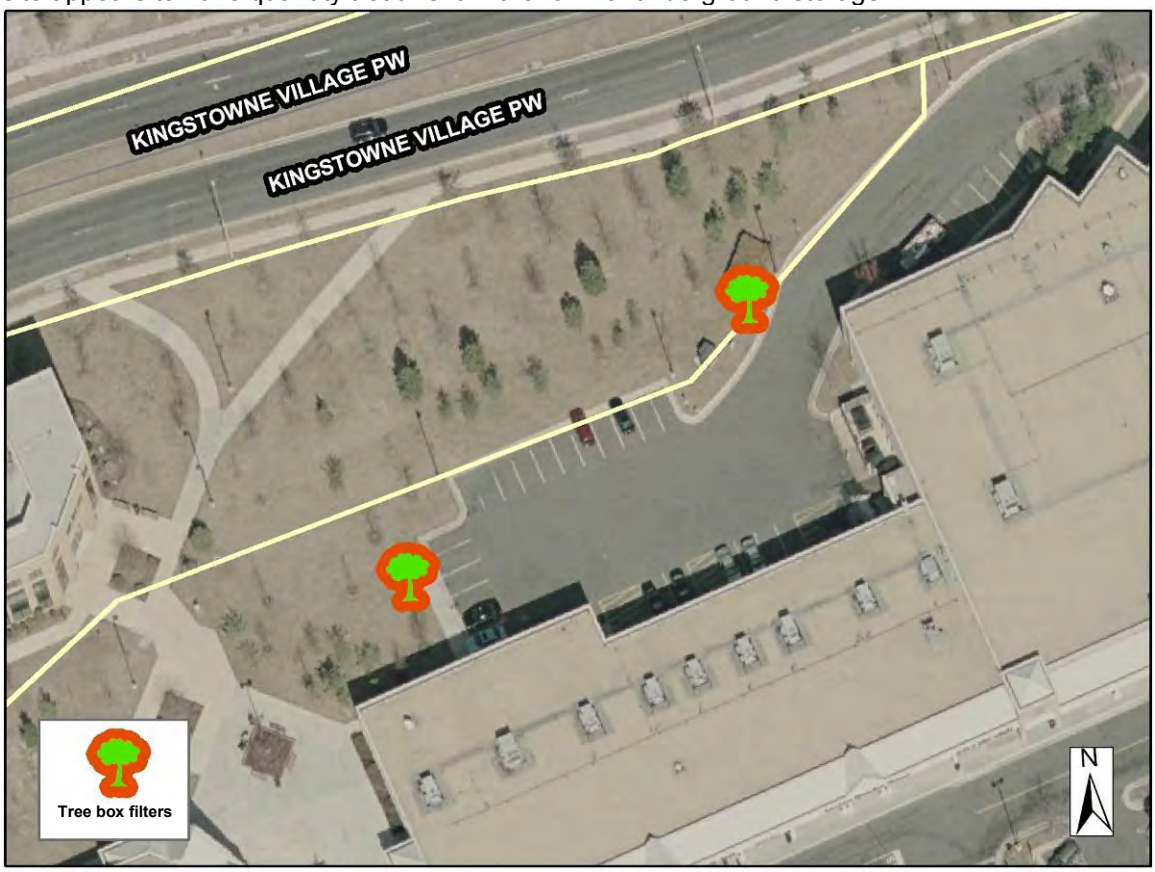
DC9518 BMP/LID

Vicinity Map

Address:	580 Block, Kingstowne Center
Location:	Kingstowne Village
Land Owner:	Private - Commercial
PIN:	0912 01 0032A
Control Type	Water Quality
Drainage Area	0.58 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Installation of tree box filters are proposed to provide water quality treatement for runoff from the parking lot behind the commercial strip mall located along Kingstowne Village Parkway. Currently, the site appears to have quantity treatment in the form of underground storage.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Tree box filters remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total of 572 lbs of sediment, 3.3 lbs of nitrogen and 0.8 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from the parking lot; however, the property ownership is private and coordination with the owners/management will be necessary. Modifications to the existing storm drain system may be necessary to drain these proposed sites.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	2	EA	$10,000.00	$20,000
			Initial Project Cost	**$20,000**
Plantings	1	LS	5% of project (excluding pervious pavement)	$1,000
Ancillary Items	1	LS	5% of project	$1,000
Erosion and Sediment Control	1	LS	10% of project	$2,000
			Base Construction Cost	**$24,000**
			Mobilization (5%)	$1,200
			Subtotal 1	**$25,200**
			Contingency (25%)	$6,300
			Subtotal 2	**$31,500**
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	$14,175
			Estimated Project Cost	**$46,000**

DC9518_1.jpg: Parking lot area at Kingstowne Village

DC9518_2.jpg: Existing inlet in parking lot

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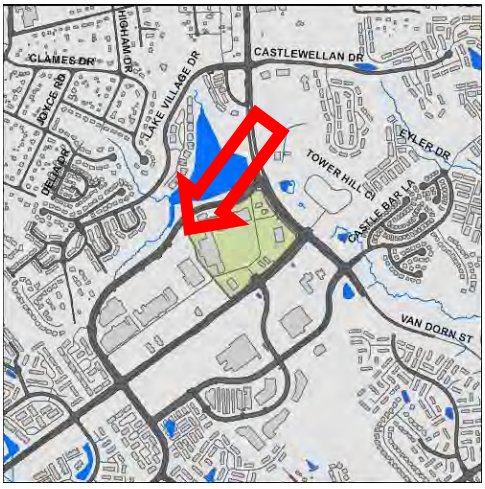
DC9519 BMP/LID



Vicinity Map

Address:	580 Block, Kingstowne Center
Location:	Kingstowne Village
Land Owner:	Private - Commercial
PIN:	0912 01 0032A
Control Type	Water Quality
Drainage Area	1.44 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Installation of bioretention filters and basins and tree box filters are proposed to treat runoff from the driveways and parking lots behind the commercial strip mall located between Kingstowne Boulevard and Kingstowne Village Parkway. The open area between the parking lots will be used for bioretention and one existing inlet will be retrofitted with a tree box filter.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Tree box filters and bioretention filters and basins remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total of 1,160 lbs of sediment, 4.8 lbs of nitrogen and 1.3 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Access to the proposed sites is excellent from driveways and parking lots; however, the property ownership is private and coordination with the owners/management will be necessary.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	1	EA	$10,000.00	$10,000
Bioretention Filters & Basin	104	SY	$150.00	$15,600
			Initial Project Cost	**$25,600**
Plantings	1	LS	5% of project (excluding pervious pavement)	$1,280
Ancillary Items	1	LS	5% of project	$1,280
Erosion and Sediment Control	1	LS	10% of project	$2,560
			Base Construction Cost	**$30,720**
			Mobilization (5%)	$1,536
			Subtotal 1	**$32,256**
			Contingency (25%)	$8,064
			Subtotal 2	**$40,320**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$18,144
			Estimated Project Cost	**$58,000**

DC9519_1.jpg: View of parking lot

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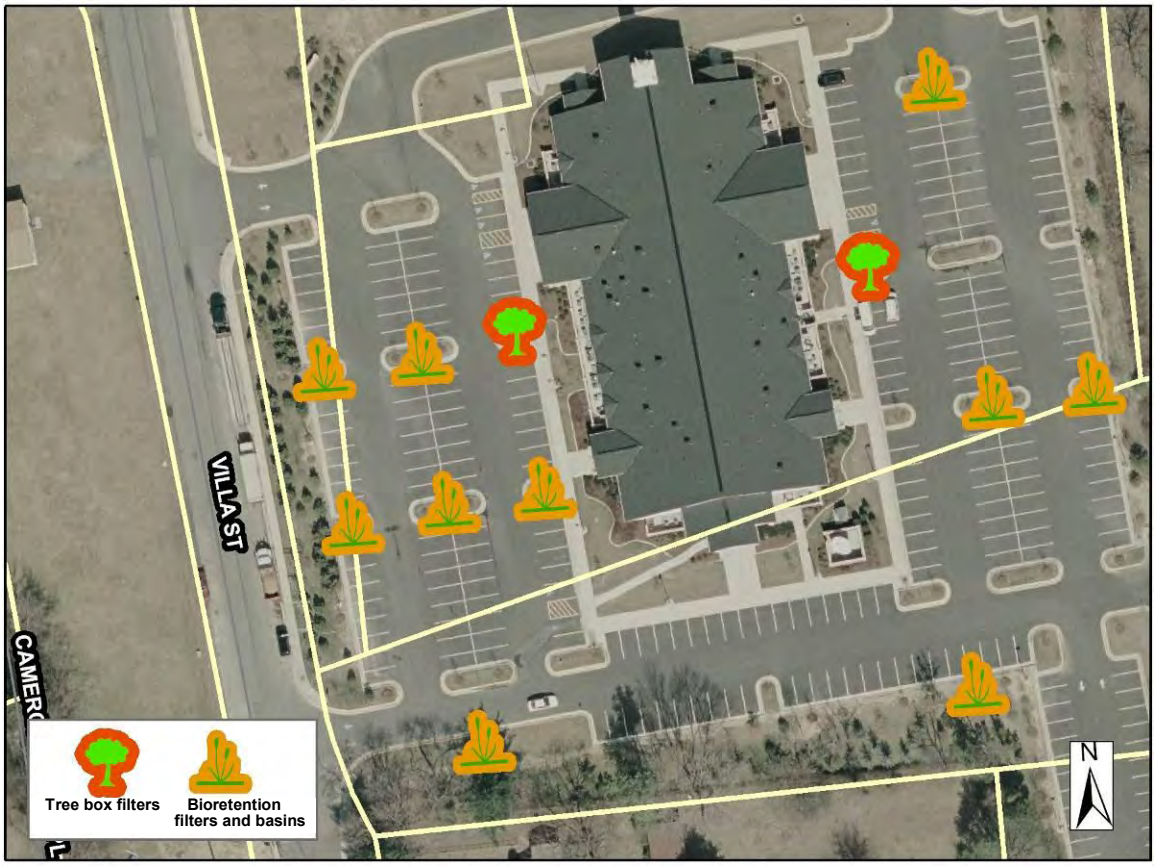
DC9520 BMP/LID

Vicinity Map

Address:	5900 Block, Franconia Road
Location:	Church of Jesus Christ of Latter Day Saints
Land Owner:	Private - Church
PIN:	0814 03 0006A
Control Type	Water Quality
Drainage Area	4.21 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Installation of bioretention filters and basins and tree box filters are proposed to treat runoff from the parking lot surrounding the church along Villa Street. Tree box filters can be added near the church building. Parking lot islands as well as adjacent grassy areas could be modified for bioretention filters and basins. The primary indicators are pollutants nitrogen, phosphorus and total suspended solids.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Bioretention filters and basins and tree box filters remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total of 556 lbs of sediment, 6.9 lbs of nitrogen and 1.4 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since this site is located on church grounds, an environmental education/stewardship opportunity for residents within the community exists.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate residents in the community. Minimal tree removal may be required for the proposed island sites. Access to the proposed sites is excellent from the church parking lot; however, the property ownership is private and coordination with the church will be necessary. Modifications to the existing storm drain system may be necessary to drain these proposed sites. A temporary or permanent loss of parking spaces may occur.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Tree Box Filters	2	EA	$10,000.00	$20,000
Bioretention Filters & Basin	343	SY	$150.00	$51,450
			Initial Project Cost	**$71,450**
Plantings	1	LS	5% of project (excluding pervious pavement)	$3,573
Ancillary Items	1	LS	5% of project	$3,573
Erosion and Sediment Control	1	LS	10% of project	$7,145
			Base Construction Cost	**$85,741**
			Mobilization (5%)	$4,287
			Subtotal 1	**$90,028**
			Contingency (25%)	$22,507
			Subtotal 2	**$112,535**
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	$50,641
			Estimated Project Cost	**$163,000**

DC9520_1.jpg: View of parking lot

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DC9522 BMP/LID

Vicinity Map

Address:	6000 Block, Clames Drive
Location:	Clames Drive
Land Owner:	State – VDOT
PIN:	NA
Control Type	Water Quality
Drainage Area	0.72 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Installation of vegetated swales is proposed to treat road and residential runoff along Clames Drive and Higham Drive. The right-of-way along Clames Drive appears to have enough room for placement of the proposed projects. Coordination with existing driveway culverts and property owners will be needed.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: These vegetated swales will trap suspended solids, reduce trace metals and uptake nutrients including phosphorus and nitrogen from storm water runoff. It is estimated that a total of 327 lbs of sediment, 4.0 lbs of nitrogen and 0.8 lbs of phosphorus would be reduced annually by this project. Vegetated swales also promote infiltration and can reduce the flow velocity of storm water runoff.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. No tree removal is required for this site. Access to the proposed site is good from Clames Drive; however, private driveways and landowners will need to be coordinated with. Current driveway culverts may impact the design of these swales.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Vegetated Swale	180	SY	$50.00	$9,000
			Initial Project Cost	**$9,000**
Plantings	1	LS	5% of project (excluding pervious pavement)	$450
Ancillary Items	1	LS	5% of project	$450
Erosion and Sediment Control	1	LS	10% of project	$900
			Base Construction Cost	**$10,800**
			Mobilization (5%)	$540
			Subtotal 1	**$11,340**
			Contingency (25%)	$2,835
			Subtotal 2	**$14,175**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$6,379
			Estimated Project Cost	**$21,000**

DC9522_1.jpg: View of proposed project location

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DC9523 BMP/LID

Vicinity Map

Address:	6021 Franconia Road
Location:	Virginia Presbyterian Church
Land Owner:	Private - Church
PIN:	0814 02 0005A
Control Type	Water Quality
Drainage Area	1.24 acres
Receiving Waters	Unknown tributary of Dogue Creek

Description: Bioretention filters and basins and rooftop disconnection are proposed to treat Virginia Presbyterian Church runoff before the runoff enters an existing dry pond located on the east side of the property. In particular, the drains located on the west side of the church could be disconnected and allowed to drain onto open area for filtration and bioretention filters and basins could be placed at the edge of the parking lot to treat water before entering the dry pond.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: Bioretention filters and basins remove suspended solids, heavy metals, nutrients including phosphorus and nitrogen, oil and grease from storm water runoff. It is estimated that a total of 327 lbs of sediment, 3.5 lbs of nitrogen and 0.7 lbs of phosphorus would be reduced annually by this project. They also prevent trash and debris from entering the storm drain system and have the ability to cool down warm runoff. Since this site is located on church grounds, an environmental education/stewardship opportunity for residents within the community exists.

Project Design Considerations: No environmental constraints or permitting issues are anticipated. Signs promoting environmental education/stewardship could be used at this site to educate residents in the community. No tree removal is required. Access to the proposed sites is excellent from the church parking lot; however, the property ownership is private and coordination with the church will be necessary.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Bioretention Filters & Basin	140	SY	$150.00	$21,000
			Initial Project Cost	**$21,000**
Plantings	1	LS	5% of project (excluding pervious pavement)	$1,050
Ancillary Items	1	LS	5% of project	$1,050
Erosion and Sediment Control	1	LS	10% of project	$2,100
			Base Construction Cost	**$25,200**
			Mobilization (5%)	$1,260
			Subtotal 1	**$26,460**
			Contingency (25%)	$6,615
			Subtotal 2	**$33,075**
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$14,884
			Estimated Project Cost	**$48,000**

DC9523_1.jpg: View of proposed bioretention site

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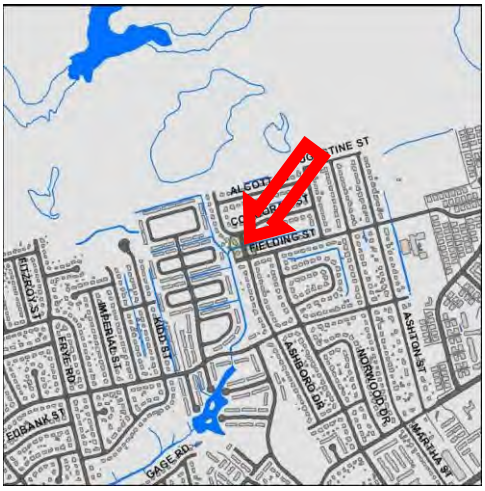
DC9600 Flood Protection/Mitigation



Vicinity Map

Address:	7918 to 7921 Ashboro Drive
Location:	Culvert under Ashboro Drive
Land Owner:	State - VDOT
PIN:	
Control Type	Peak flow control
Drainage Area	
Receiving Waters	Unknown Tributary of Dogue Creek

Description: The crossing at Ashboro Drive overtops and several upstream buildings are within the modeled 100-year flood limit. Reconstruction of the culvert to allow 100-yr event flows will reduce the backwater effects. The primary indicators are number of flooded buildings and the magnitude of the road hazard.

Project Area Map: Conceptual plan showing potential project location

Project Benefits: The reconstruction of the structure under Ashboro Dr. will be able to convey the 100-year storm reducing the modeled overtopping at this location.

Project Design Considerations: The concrete channel under the crossing needs maintenance as the banks are overgrowing into the channel. Small widening of the structure is required which involves tearing down the existing box culvert. No other projects are located within the immediate vicinity. Homes in the vicinity are located close to the project area, therefore specific care should be taken to reduce impacts to private property. The project site can be accessed from Ashboro Dr.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Excavation	2100	CY	$30.00	$63,000
Stabilization graded base	600	CY	$50.00	$30,000
Structure (3 x 100 ft 4.5 CMP)	1	LS	$100,000.00	$100,000
Graded Base	560	SY	$15.00	$8,400
Curb and gutter	200	LF	$30.00	$6,000
Turfgrass establishment	480	SY	$3.00	$1,440
Placing topsoil	480	SY	$5.00	$2,400
Soil Stabilization matting	480	SY	$5.00	$2,400
			Initial Project Cost	**$213,640**
Plantings	1	LS	5% of project	$10,682
Ancillary Items	1	LS	5% of project	$10,682
Erosion and Sediment Control	1	LS	10% of project	$21,364
			Base Construction Cost	**$256,368**
			Mobilization (5%)	$12,818
			Subtotal 1	$269,186
			Contingency (25%)	$67,297
			Subtotal 2	$336,483
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$151,417
			Estimated Project Cost	**$488,000**

DC9600_1.jpg: View of existing culvert under Ashboro Dr

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