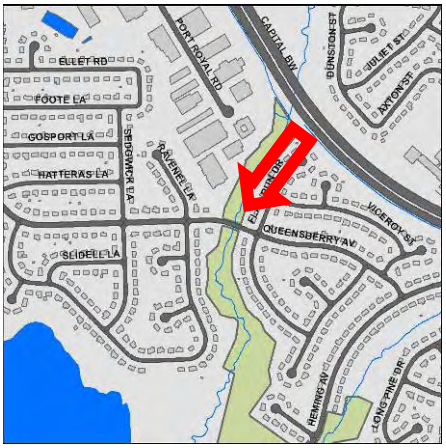
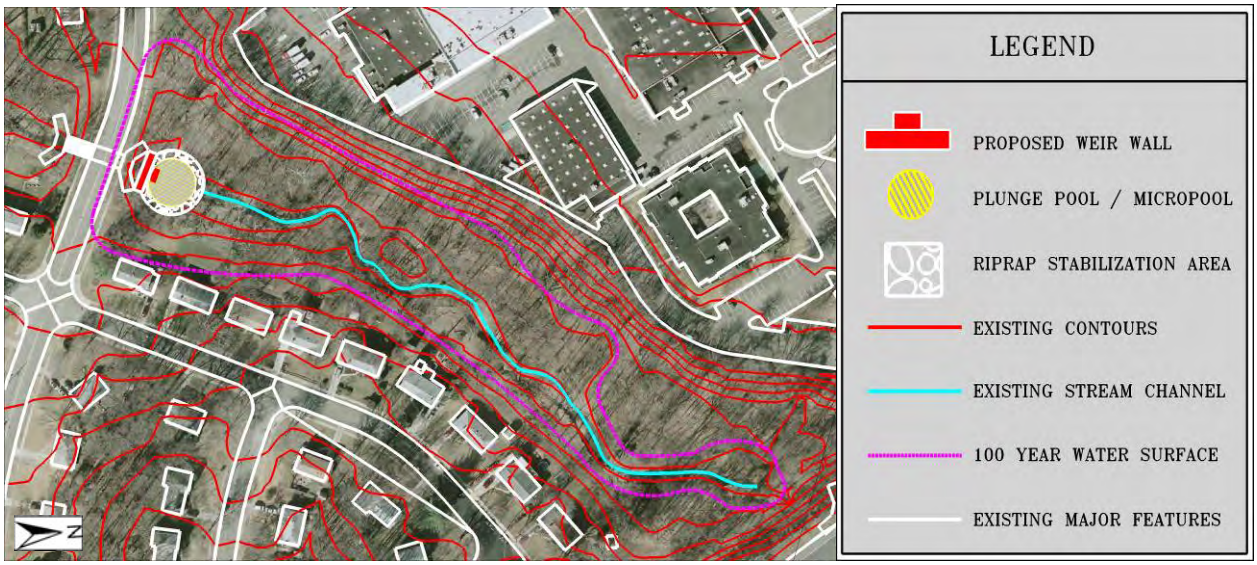
AC9400 - Culvert Retrofit



Address:	Under Queensberry Avenue, near the intersection of Flag Run Drive and Queensberry Avenue
Location:	Queensberry Avenue
Land Owner:	County - FCPA
PIN:	0792 01 0001A
Control Type	Water Quality
Drainage Area	99.86 acres
Receiving Waters	Flag Run

Description: This project is located on the upstream side of Queensberry Avenue between Flag Run Drive and Ravenel Lane. The upstream floodplain is flat and open with possible wetland areas. This culvert retrofit would add a weir wall control structure on the upstream side of the culvert to regulate discharge of smaller, more frequent storm events and provide water quality treatment.

The project is located downstream of stream restoration project AC9229 and culvert retrofit AC9401. Design of all three projects should be performed concurrently.



Project Area Map: Conceptual plan showing potential project location

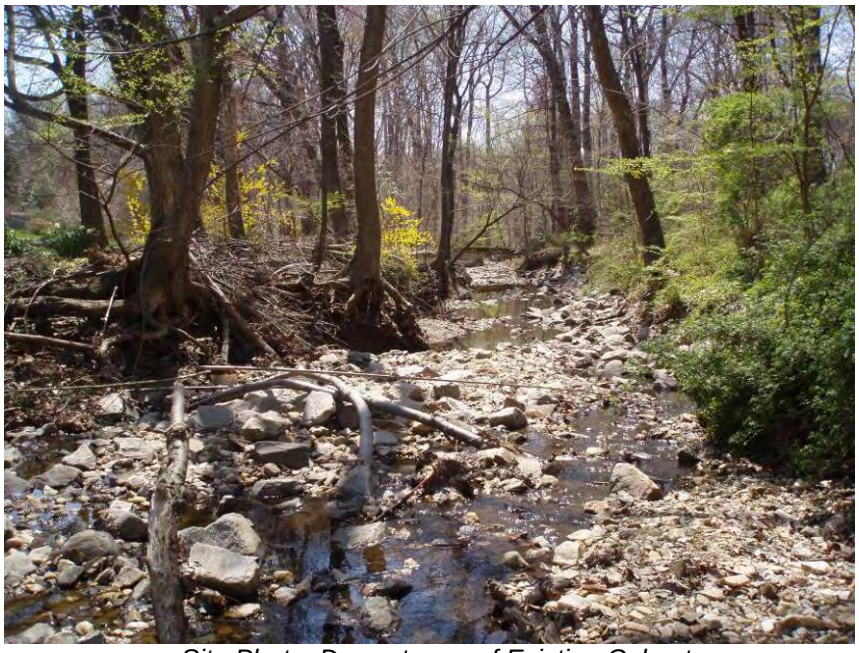
Project Benefits: This project has the potential to manage high frequency smaller storms with the addition of a weir wall as a control structure. The retrofit provides detention that will reduce downstream channel erosion by reducing flow rates back to pre-development conditions. The project will also help remove suspended solids through sedimentation. It is estimated that an annual total of 17,390 lbs of sediment, 126 lbs of nitrogen and 19 lbs of phosphorus would be reduced by this project.

Project Design Considerations: The upstream floodplain is bordered by a commercial / industrial park and several single family homes located adjacent to the stream channel, which should be considered in the design and construction phases. The base flow component of the control structure will require regular maintenance inspection to prevent clogging. All components of the existing embankment and stream channel should be analyzed to ensure that the integrity is not compromised as a result of the change in hydraulics. Retrofitting this culvert must adhere to FEMA regulations if it is located within the 100-year floodplain. Environmental permitting issues are expected due to the in-stream location of this facility. Moderate tree loss is expected for access and during construction. Existing utility conflicts are not anticipated with this retrofit. Access is good off of Queensberry Avenue.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Plungepool / Micropool	1	EA	$400.00	$400
New Control Structure - Weir	1	LS	$12,000.00	$12,000
Rip Rap Stabilization	200	SY	$100.00	$20,000
			Initial Project Costs	**$32,400**
Plantings	1	LS	5% of Project	$1,620
Ancillary Items	1	LS	5% of Project	$1,620
Erosion and Sediment Control	1	LS	10% of Project	$3,240
			Base Construction Costs	**$38,880**
			Mobilization (5%)	$1,944
			Subtotal 1	$40,824
			Contingency (25%)	$10,206
			Subtotal 2	$51,030
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	$22,964
			Estimated Project Cost	**$74,000**

Site Photo: Downstream Side of Existing Culvert Crossing



Site Photo: Downstream of Existing Culvert

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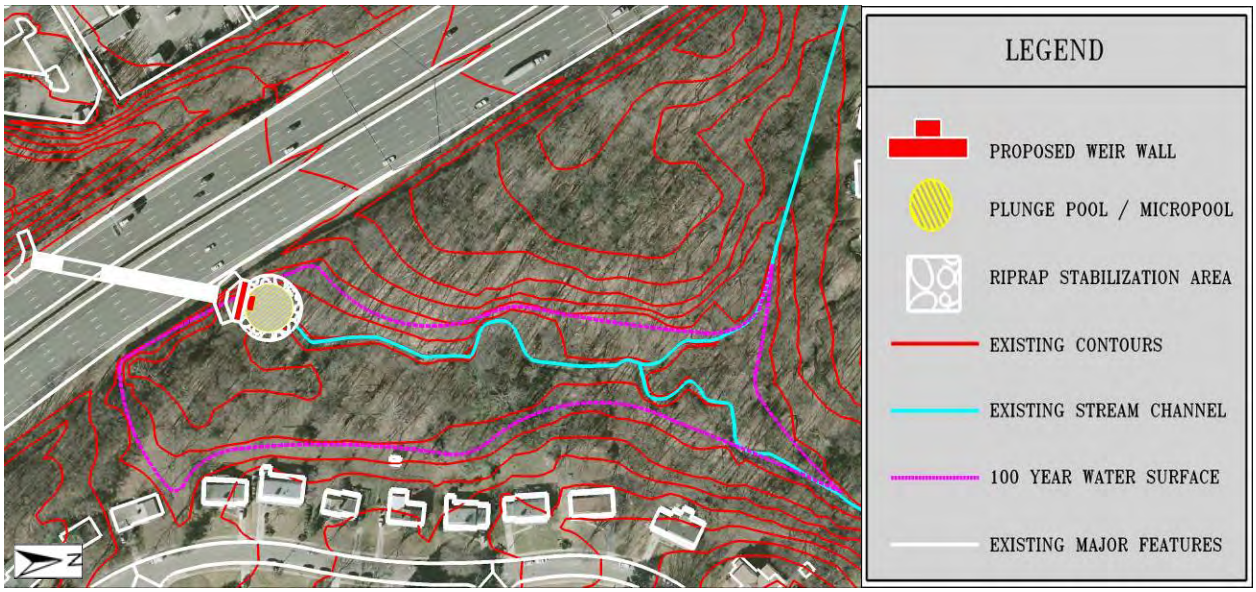
AC9401 - Culvert Retrofit

Address:	Under the Capital Beltway, near the intersection of Dunston Street and Juliet Street
Location:	I-495
Land Owner:	State - VDOT
PIN:	0792 01 0002
Control Type	Water Quality
Drainage Area	203.03 acres
Receiving Waters	Flag Run

Description: This project is located on the upstream side of the Capital Beltway (I-495) where Flag Run flows through a culvert under the Beltway. The upstream floodplain is bordered by several single family homes along Dunston and Axton Streets that are relatively close to the stream channel. This culvert retrofit would add a weir wall control structure on the upstream side of the culvert to regulate discharge of smaller high frequency storm events.

The project is located in the middle of two segments of stream restoration project AC9229 and upstream of culvert retrofit AC9400. Design of all three projects should be performed concurrently.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: The installation of a control structure on the upstream side of the existing culvert will provide detention to improve water quality and reduce flow rates and discharge velocities. Both improvements will help to improve the habitat in the downstream channel. Water quality improvements will be obtained through sedimentation during detention and filtering and nutrient uptake by floodplain vegetation. It is estimated that an annual total of 13,983 lbs of sediment, 148 lbs of nitrogen and 27 lbs of phosphorus would be reduced by this project.

Project Design Considerations: The base flow component of the control structure will require regular maintenance inspection to prevent clogging. All components of the existing embankment and stream channel should be analyzed to ensure the integrity of the culvert is not compromised as a result of the hydraulic changes. Retrofitting this culvert must adhere to FEMA regulations if it is located within the 100-year floodplain. Environmental permitting issues are expected due to the in-stream location of this facility. Significant tree loss is expected to obtain access and during construction. Existing utility conflicts are not anticipated with this retrofit. Access to this culvert is difficult and would require the use of an existing storm drain / utility easement off of Dunston Street and the crossing of several hundred feet of forested floodplain to get to the culvert.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Plunge Pool / Micropool	1	EA	$400.00	$400
New Control Structure - Weir	1	LS	$16,000.00	$16,000
Rip Rap Stabilization	200	SY	$100.00	$20,000
			Initial Project Costs	**$36,400**
Plantings	1	LS	5% of Project	$1,820
Ancillary Items	1	LS	5% of Project	$1,820
Erosion and Sediment Control	1	LS	10% of Project	$3,640
			Base Construction Costs	**$43,680**
			Mobilization (5%)	$2,184
			Subtotal 1	$45,864
			Contingency (25%)	$11,466
			Subtotal 2	$57,330
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$25,799
			Estimated Project Cost	**$83,000**

Site Photo: Downstream Side of Existing Culvert Crossing

Site Photo: Downstream of Existing Culvert

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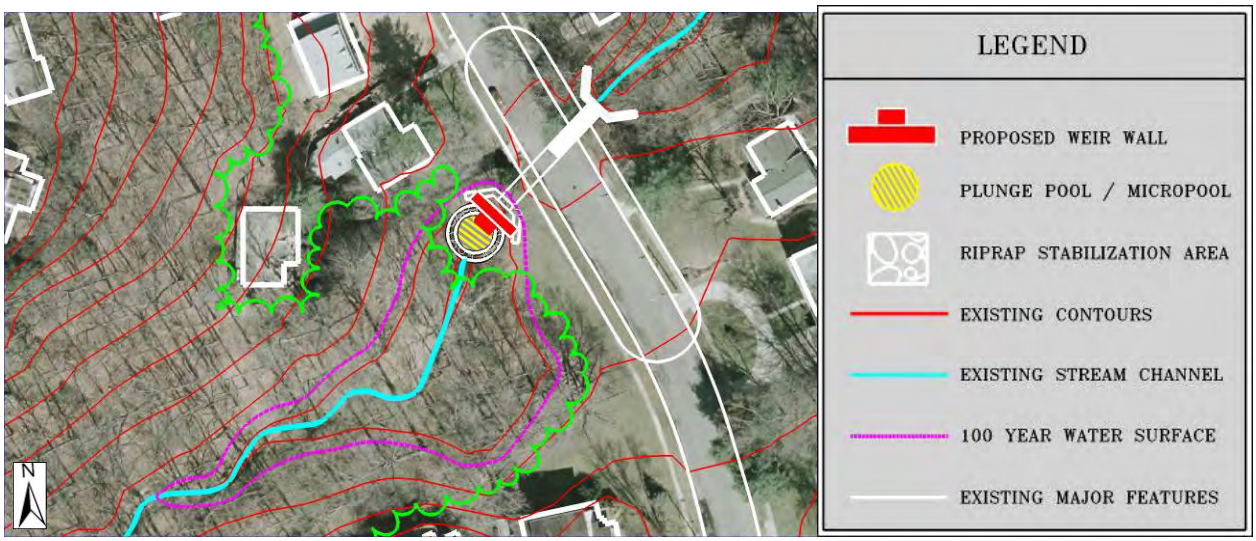
AC9405 - Culvert Retrofit

Address:	4602 Twinbrook Road
Location:	Old Forge Park
Land Owner:	County - FCPA
PIN:	0691 05 D1
Control Type	Water Quality
Drainage Area	59.5 acres
Receiving Waters	Tributary to Long Branch Central

Description: This project is located on the upstream side of Twinbrook Road in Old Forge Park. The floodplain at the project site is forested and flat with possible wetland areas. This culvert retrofit would add a weir wall control structure and stabilized micropool to regulate discharge of the smaller, high frequency storm events.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: Due to the size of the contributing drainage area and presence of base flow at the culvert, it is unlikely that peak flow management of the 2-year and 10-year design storm can be achieved by this project. The detention that will be provided will treat water quality by allowing sediment to settle out on the floodplain. Nutrient uptake by wetland vegetation will also reduce nitrogen and phosphorus loads. It is estimated that an annual total of 3,933 lbs of sediment, 41 lbs of nitrogen and eight lbs of phosphorus would be reduced by this project.

Project Design Considerations: Adding an in-stream control structure will cause a change in water levels on the upstream side of the embankment, which should be taken into account during the design phase. The base flow component of the control structure will require regular maintenance to prevent clogging. All components of the existing embankment and stream channel should be analyzed to ensure that the integrity of the cross culvert/stream is not compromised as a result of the change in hydraulic characteristics at this site. This project is located within the 100 year floodplain so any adjustments to the characteristics of stream must adhere to FEMA regulations. Environmental permitting measures are expected due to the in-stream location of this facility. Tree clearing is expected to provide access to the culvert and stream channel. Existing utility conflicts are not anticipated. Access is good from Twinbrook Road.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Plungepool / Micropool	1	EA	$600.00	$600
New Control Structure - Weir	1	LS	$12,000.00	$12,000
			Initial Project Costs	**$12,600**
Plantings	1	LS	5% of Project	$630
Ancillary Items	1	LS	5% of Project	$630
Erosion and Sediment Control	1	LS	10% of Project	$1,260
			Base Construction Costs	**$15,120**
			Mobilization (5%)	$756
			Subtotal 1	$15,876
			Contingency (25%)	$3,969
			Subtotal 2	$19,845
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits			(45%)	$8,930
			Estimated Project Cost	**$29,000**

Site Photo: Existing Control Structure

Site Photo: Existing Stream Channel

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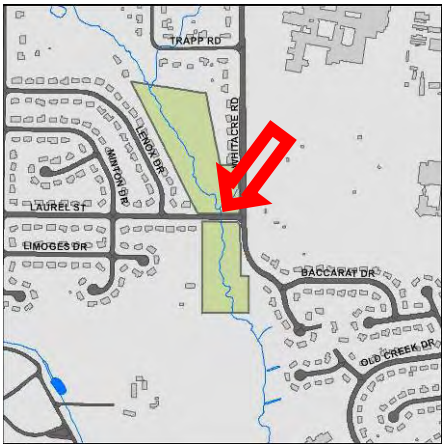
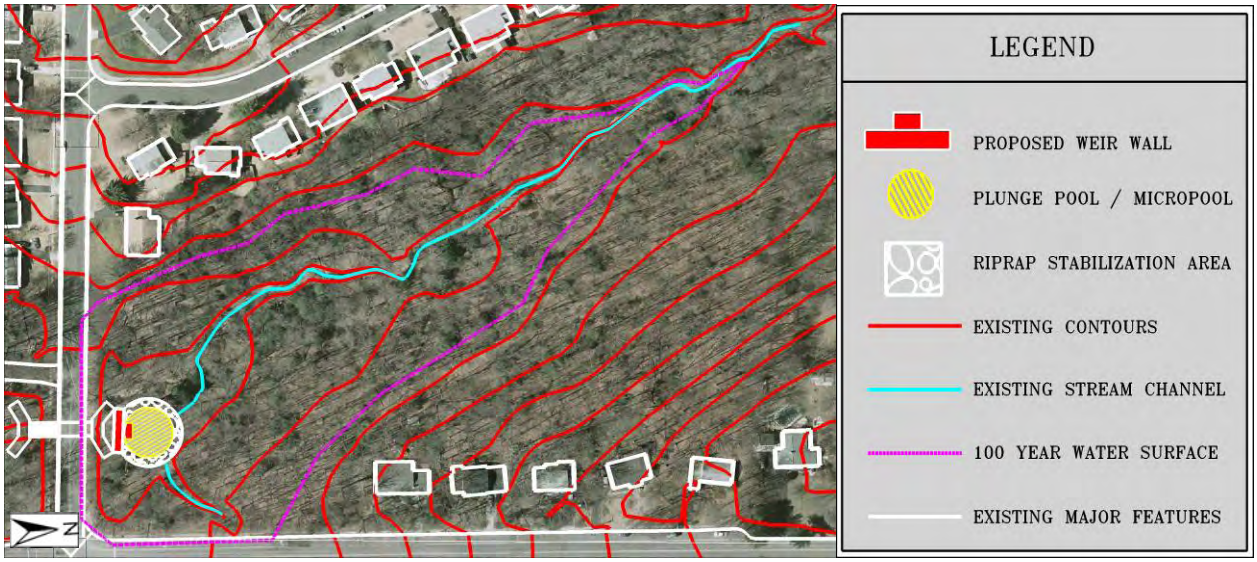
AC9406 - Culvert Retrofit



Address:	Under Laurel Street, near the intersection of Whitacre Road and Laurel Street
Location:	Long Branch Park
Land Owner:	County - FCPA
PIN:	0583 01 0004
Control Type	Water Quality
Drainage Area	161.16 acres
Receiving Waters	Long Branch Central

Description: This project is located in Long Branch Park on the upstream side of Laurel Street between Lenox Drive and Whitacre Road. The upstream floodplain is bordered by several single family homes along Lenox Drive, which are located relatively close to the stream channel. This culvert retrofit would add a weir wall control structure on the upstream side of the culvert to regulate discharge of smaller, high frequency storm events.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: This project has the potential to manage high frequency design storms with the addition of a control structure. Managing these frequent design storms will help to reduce flow rates and discharge velocities back to pre-development conditions. This will prevent further eroded conditions in the downstream channel and improve instream habitat. Installation of a control structure may also improve the health of the downstream channel by allowing suspended solids to settle out, and allow for nutrient uptake and filtering in the floodplain. It is estimated that an annual total of 9,219 lbs of sediment, 88 lbs of nitrogen and 18 lbs of phosphorus would be reduced by this project.

Project Design Considerations: All components of the existing embankment and stream channel should be analyzed to ensure that the integrity of the cross culvert is not compromised with the change in hydraulic characteristics. The base flow component of the control structure will require regular maintenance to inspect for clogging. Retrofitting this culvert must adhere to FEMA regulations if it is located within the 100-year floodplain. Environmental permitting issues are expected due to the instream location of this facility. Moderate tree loss is expected for access along the channel. Existing utility conflicts are not anticipated with this retrofit. Access is good from Laurel Street.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Plunge Pool / Micropool	1	EA	$400.00	$400
New Control Structure - Weir	1	LS	$16,000.00	$16,000
Rip Rap Stabilization	200	SY	$100.00	$20,000
			Initial Project Costs	**$36,400**
Plantings	1	LS	5% of Project	$1,820
Ancillary Items	1	LS	5% of Project	$1,820
Erosion and Sediment Control	1	LS	10% of Project	$3,640
			Base Construction Costs	**$43,680**
			Mobilization (5%)	$2,184
			Subtotal 1	$45,864
			Contingency (25%)	$11,466
			Subtotal 2	$57,330
			Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)	$25,799
			Estimated Project Cost	**$83,000**

Site Photo: Downstream Floodplain of Culvert

Site Photo: Existing Culvert

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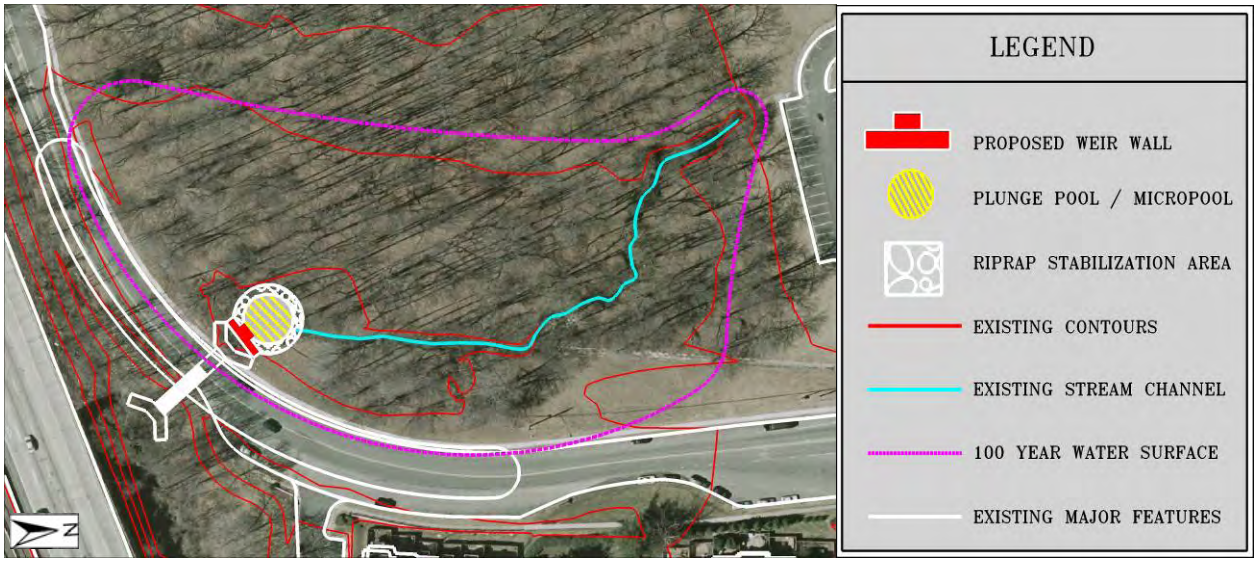
AC9409 - Culvert Retrofit

Address:	Under Sutton Road, near the intersection of Sutton Green Court and Sutton Road
Location:	Oakton High School
Land Owner:	County - FCPS
PIN:	0481 01 0111
Control Type	Water Quality
Drainage Area	42.10 acres
Receiving Waters	Unknown tributary of Accotink Creek

Description: This project is located on the upstream side of Sutton Road near Oakton High School. The floodplain upstream of Sutton Road is mostly forested in the area of the culvert. This culvert retrofit would add a weir wall control structure on the upstream side of the culvert to regulate discharge of smaller, more frequent storms.



Project Area Map: Conceptual plan showing potential project location

Project Benefits: The newly installed control structure will help prevent future downstream channel erosion by by reducing flow rates from smaller storms back to pre-development conditions. This project will also improve water quality through detention, settling of suspended solids, and filtration and uptake of nutrients by floodplain vegetation. The project would also provide an excellent environmental education or stewardship opportunity for students and parents of Oakton High School. It is estimated that an annual total of 4,183 lbs of sediment, 42 lbs of nitrogen and nine lbs of phosphorus would be reduced by this project.

Project Design Considerations: Moderate tree removal is anticipated in order to obtain access from Sutton Road, to clear the upstream embankment, and for construction around the channel. All components of the existing embankment and stream channel should be analyzed to ensure that the integrity is not compromised. Retrofitting this culvert must adhere to FEMA regulations if it is located within the 100-year floodplain. The base flow component of the control structure will require regular maintenance inspections to prevent clogging. Environmental permitting issues are expected due to the instream location of this facility.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Plunge Pool / Micropool	1	EA	$400.00	$400
New Control Structure - Weir	1	LS	$8,000.00	$8,000
Rip Rap Stabilization	200	SY	$100.00	$20,000
			Initial Project Costs	**$28,400**
Plantings	1	LS	5% of Project	$1,420
Ancillary Items	1	LS	5% of Project	$1,420
Erosion and Sediment Control	1	LS	10% of Project	$2,840
			Base Construction Costs	**$34,080**
			Mobilization (5%)	$1,704
			Subtotal 1	$35,784
			Contingency (25%)	$8,946
			Subtotal 2	$44,730
Engineering Design, Surveys, Land Acquisition, Utility Relocations, and Permits (45%)				$20,129
			Estimated Project Cost	**$65,000**

Site Photo: Erosion in Upstream Channel

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