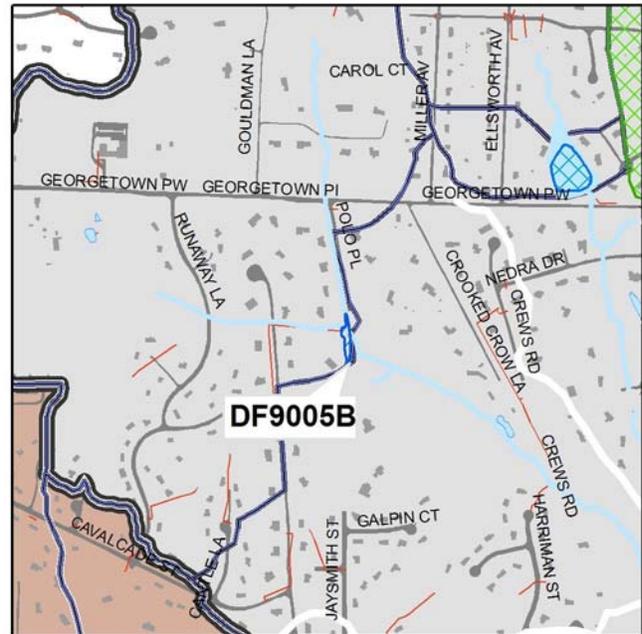


Project Number: DF9005B
Catchment Code: DFCH0002
Candidate Site: D-05

Project Type: Culvert Retrofit
Project Size: 0.3 acres
Treated Area: 235 acres

Project Location: On the upstream side of Polo Place.

Project Description: This project consists of modifying the existing culvert crossing at Polo Place to provide detention storage. The drainage area of this system is made up of large lot residential units with little or no stormwater management facilities. There is an established wetland within the project limits, providing increased nutrient uptake from vegetation.



Potential Project Benefits:

Streamflow	This site provides approximately 20% of the channel protection storage for the drainage area.
Water Quality	The main water quality improvements from this project would be nutrient uptake from vegetation.

Potential Project Constraints:

Environmental	This project is located between a stormwater outfall and a culvert, so permitting requirements should be minor. There will be wetland impacts, but the loss will be mitigated or replaced by the project. Projects in RPAs may require exceptions or waivers.
Facility Access	Access to this facility is excellent along Polo Place.
Design / Construction	No design or construction issues were identified.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.1	AC	\$5,000.00	\$500
Excavation	520	CY	\$35.00	\$18,200
Impoundment Structure	1	LS	\$5,000.00	\$5,000
Landscaping	240	SY	\$2.50	\$600
Wetland Planting	80	SY	\$2.00	\$160
Base Construction Cost				\$24,460
Mobilization (5%)				\$1,223
Subtotal 1				\$25,683
Contingency (25%)				\$6,421
Subtotal 2				\$32,104
Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%)				\$14,447
Estimated Project Cost				\$47,000

*This project is part of the alternative project group for Regional Pond D-05.
 See Table 5-2 for the recommended disposition.*

Concept Sketch:



Project Number: DF9006B
Catchment Code: DFCH9701
Candidate Site: D-06

Project Type: Drainage Retrofit
Project Size: 4 Sites

Project Location: Along Hickory Run Road at all culvert outlets.

Project Description: The stream channel shows signs of erosion and scour in the upper reach of this catchment from the existing farm pond down to the main floodplain valley. This erosion appears to be related to the steep channel slope and the influences of the series of driveway culverts and the one culvert under Hickory Run. This project would consist of providing outlet protection on the downstream side of each of these culverts.



Potential Project Benefits:

Streamflow	The project will reduce velocity from the culvert outlets and erosive potential immediately downstream.
Water Quality	The primary benefit to the water quality would come from the reduction of sediment loads associated with high velocity at the culvert locations.

Potential Project Constraints:

Environmental	No environmental constraints or permitting issues are anticipated. Projects in RPAs may require exceptions or waivers.
Facility Access	Excellent access to this site can be obtained from the roadway and driveways.
Design / Construction	No significant design or construction issues were identified for this project.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Outfall Protection	4	EA	\$8,000.00	\$32,000
Base Construction Cost				\$32,000
Mobilization (5%)				\$1,600
Subtotal 1				\$33,600
Contingency (25%)				\$8,400
Subtotal 2				\$42,000
Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%)				\$18,900
Estimated Project Cost				\$61,000

*This project is part of the alternative project group for Regional Pond D-06.
 See Table 5-2 for the recommended disposition.*

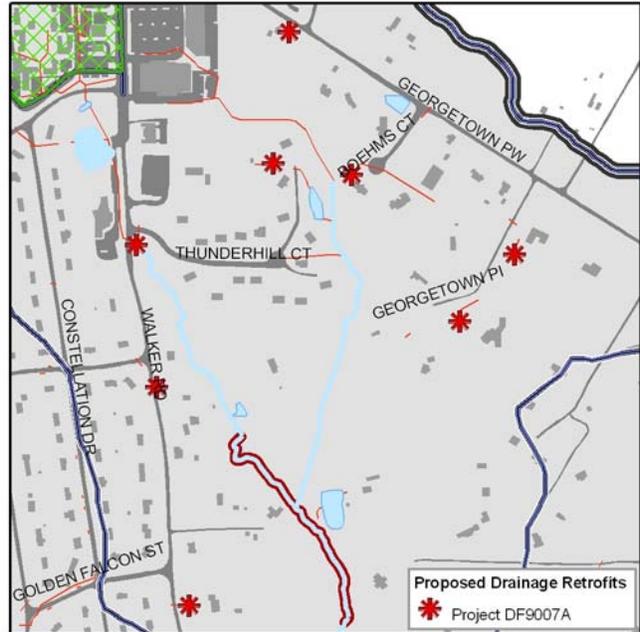
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Project Number: DF9007A
Catchment Code: DFCH9801
Candidate Site: D-07

Project Type: Drainage Retrofit
Project Size: 8 Outlets

Project Location: This project will be distributed throughout the catchment where piped drainage systems outfall into natural channels. Two locations that may need particular attention are the outfall locations near high impervious levels in the commercial areas.

Project Description: In this catchment, there are signs of erosion and scour at each location where the drainage network discharges into the floodplain. Improvements are recommended throughout the catchment to provide adequate energy dissipation at every interface from storm drain systems to natural channels.



Potential Project Benefits:

Streamflow	The project will reduce velocity from the outfall and erosive potential immediately downstream.
Water Quality	The primary benefit to the water quality would come from the reduction of sediment loads associated with high velocity at the outfall locations.

Potential Project Constraints:

Environmental	No environmental constraints or permitting requirements are anticipated. Projects in RPAs may require exceptions or waivers.
Facility Access	Generally, access can be obtained from adjacent roads or storm drain easements.
Design / Construction	No significant design or construction issues were identified for this project.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Outfall Protection	8	EA	\$8,000.00	\$64,000
Base Construction Cost				\$64,000
Mobilization (5%)				\$3,200
Subtotal 1				\$67,200
Contingency (25%)				\$16,800
Subtotal 2				\$84,000
Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%)				\$37,800
Estimated Project Cost				\$122,000

*This project is part of the alternative project group for Regional Pond D-07.
 See Table 5-2 for the recommended disposition.*

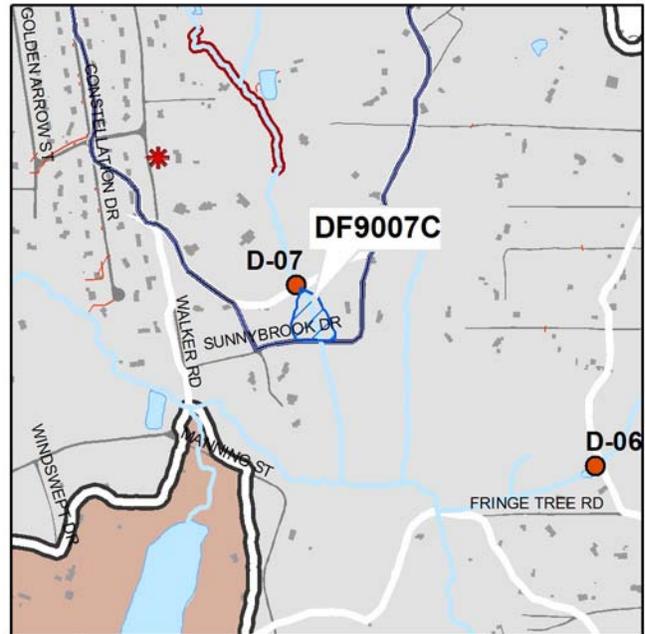
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Project Number: DF9007C
Catchment Code: DFCH9801
Candidate Site: D-07

Project Type: Culvert Retrofit
Project Size: 1.7 acres
Treated Area: 208 acres

Project Location: This project is on the north side of Sunnybrook Drive.

Project Description: The culvert at Sunnybrook Drive is a low head crossing with a wide floodplain and has an established wetland upstream. The project would consist of a redundant embankment which would retain stormwater within the floodplain temporarily and would not have a permanent pool. This facility would also settle out sediment and allow vegetative uptake to reduce pollutant loads.



Potential Project Benefits:

Streamflow	The project would provide about 30% of the channel protection volume.
Water Quality	Water quality improvements could be accomplished via nutrient uptake from the wetland and additional landscaping. Some settling of sediment on the floodplain is expected.

Potential Project Constraints:

Environmental	Some wetland impacts are expected with construction of the impoundment; however, these should be mitigated onsite in the facility. Permits will be required from the Corps of Engineers and VDEQ. Projects in RPAs may require exceptions or waivers.
Facility Access	Access from Sunnybrook Drive is excellent.
Design / Construction	No significant design or construction issues were noted.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.4	AC	\$5,000.00	\$2,000
Excavation	850	CY	\$35.00	\$29,750
Impoundment Structure	1	LS	\$5,000.00	\$5,000
Landscaping	1,020	SY	\$2.50	\$2,550
Wetland Planting	1,020	SY	\$2.00	\$2,040
Base Construction Cost				\$41,340
Mobilization (5%)				\$2,067
Subtotal 1				\$43,407
Contingency (25%)				\$10,852
Subtotal 2				\$54,259
Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%)				\$24,416
Estimated Project Cost				\$79,000

*This project is part of the alternative project group for Regional Pond D-07.
 See Table 5-2 for the recommended disposition.*

Concept Sketch:

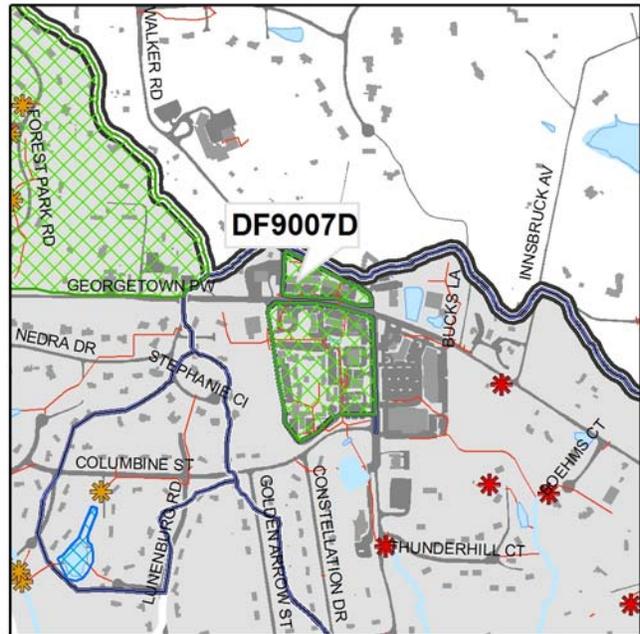


Project Number: DF9007D
Catchment Code: DFCH9801
Candidate Site: D-07

Project Type: LID Retrofit
Project Size: 746 SY
Treated Area: 15.0 acres

Project Location: This project is located at the intersection of Georgetown Pike and Walker Road.

Project Description: LID or Filterra systems would be installed at storm drain inlets and parking islands where high impervious levels are located in a commercial area west of Walker Road. Approximately 750 SY of bioretention, swales, or other structural LID controls would be installed to treat the existing impervious area. The project would be designed to reduce pollutant loads; storage volume for channel protection is not provided.



Potential Project Benefits:

Streamflow	Some improvement may occur in runoff volume from reduction of impervious area and the detention and infiltration components of the LID systems.
Water Quality	Water quality will be improved from filtration and nutrient uptake in bioretention or Filterra systems.

Potential Project Constraints:

Environmental	No environmental constraints or permitting issues are anticipated.
Facility Access	Access to the site is excellent by public roads and parking areas.
Design / Construction	No significant design or construction issues were noted.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
LID Structural Control	746.0	SY	\$120.00	\$89,520
Base Construction Cost				\$89,520
Mobilization (5%)				\$4,476
Subtotal 1				\$93,996
Contingency (25%)				\$23,499
Subtotal 2				\$117,495
Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%)				\$52,873
Estimated Project Cost				\$170,000

*This project is part of the alternative project group for Regional Pond D-07.
 See Table 5-2 for the recommended disposition.*

Concept Sketch:

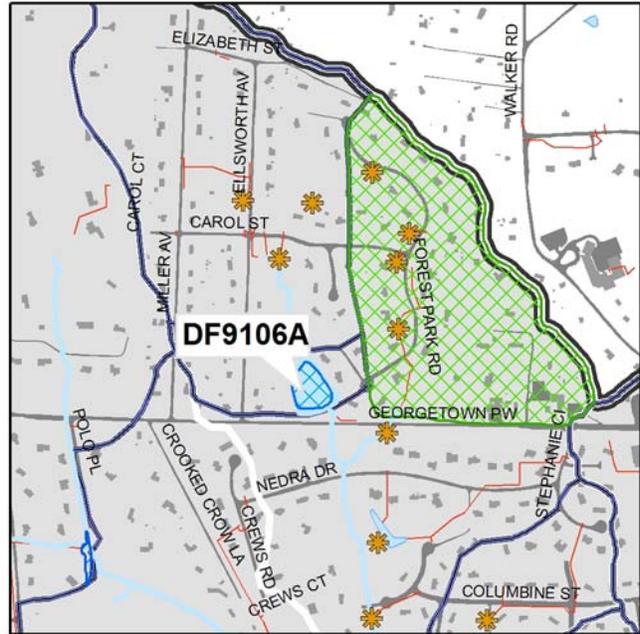


Project Number: DF9106A
Catchment Code: DFCH0003
Candidate Site: C06

Project Type: Pond Retrofit
Project Size: 1.4 acres
Treated Area: 96 acres

Project Location: This project is located upstream of Georgetown Pike.

Project Description: The existing pond facility is mature and is showing signs of conversion into a wetland area. The wet storage volume within this pond meets the water quality storage volume value, with enough excess storage volume to construct an aquatic bench around the entire perimeter of this facility. The control structure should be upgraded to a multi-stage riser with a low flow orifice sized for channel protection. Sediment should be removed and the basin should be regraded to a shallower depth to increase the surface to depth ratio.



Potential Project Benefits:

Streamflow	100% of the channel protection volume can be achieved by modifying the control structure.
Water Quality	100% of the water quality volume can be met at this location.

Potential Project Constraints:

Environmental	Environmental permitting issues would not be expected for this project. There are no significant environmental impacts. Projects in RPAs may require exceptions or waivers.
Facility Access	Facility access is excellent, both from the roadway and the private drive.
Design / Construction	No significant design or construction issues were identified. County staff will coordinate with the facility owner to implement the project.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.1	AC	\$5,000.00	\$500.00
Excavation/Grading (aquatic bench)	1552	CY	\$30.00	\$46,560.00
Riser	1	LS	\$10,000.00	\$10,000.00
Wetland Planting (aquatic bench)	806	SY	\$2.00	\$1,612
Base Construction Cost				\$58,672
Mobilization (5%)				\$2,934
Subtotal 1				\$61,606
Contingency (25%)				\$15,401
Subtotal 2				\$77,007
Engineering Design, Surveys, Land Acquisition, Utility Relocations and Permits (45%)				\$34,653
Estimated Project Cost				\$112,000

No Site Photo

Concept Sketch:

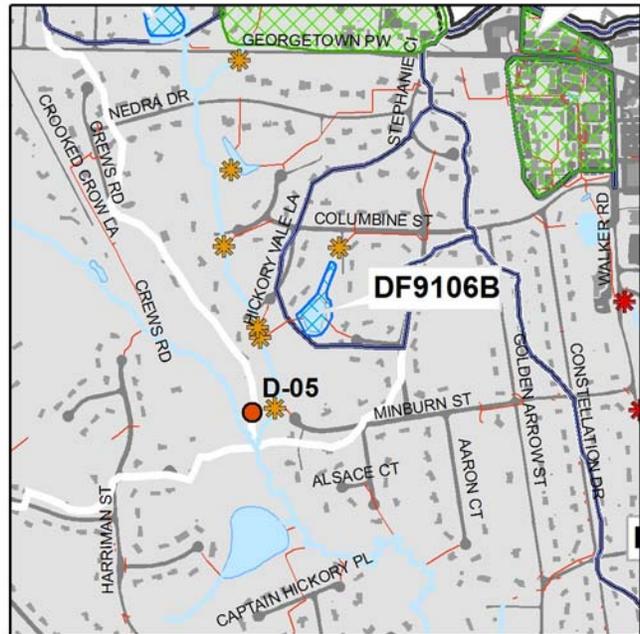


Project Number: DF9106B
Catchment Code: DFCH0003
Candidate Site: C06

Project Type: Pond Retrofit
Project Size: 1.4 acres
Treated Area: 31 acres

Project Location: This project is located south of Columbine Street.

Project Description: The pond at this site treats storm drain runoff from residential properties off of Columbine Street. This retrofit project will focus on maximizing the performance of the facility within its existing footprint. Increased management of high frequency storm events can be achieved by installing a multistage control structure. Water quality treatment can be improved by reducing erosive velocities at the outfall and also encouraging vegetative uptake of nutrients. A sediment forebay is proposed at the base of the single inflow pipe to treat runoff.



Potential Project Benefits:

Streamflow	This project will reduce peak discharge rates and provide 20% of the channel protection volume.
Water Quality	A combination of extended detention, sediment forebay and scour reduction at the outfall will improve water quality.

Potential Project Constraints:

Environmental	There are minimal environmental impacts associated with this retrofit, and no permitting issues are anticipated. Projects in RPAs may require exceptions or waivers.
Facility Access	Facility access is fair from the existing roadway.
Design / Construction	No unusual design or construction issues were noted. County staff will coordinate with the facility owner to implement the project.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Clear and Grub	0.1	AC	\$5,000.00	\$500.00
Forebay	98	CY	\$45.00	\$4,410.00
Outlet Protection	1	EA	\$8,000.00	\$8,000.00
Riser	1	LS	\$10,000.00	\$10,000.00
Base Construction Cost				\$22,910
Mobilization (5%)				\$1,146
Subtotal 1				\$24,056
Contingency (25%)				\$6,014
Subtotal 2				\$30,069
Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%)				\$13,531
Estimated Project Cost				\$44,000

Site Photo:



Concept Sketch:

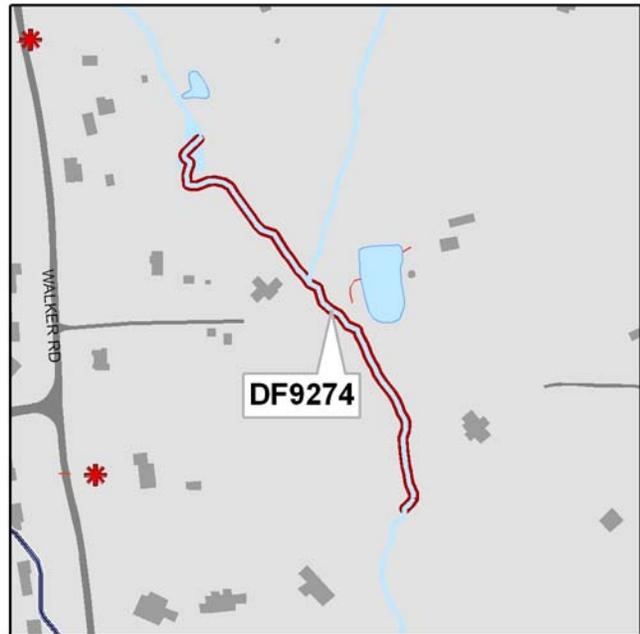


Project Number: DF9274
Catchment Code: DFCH9801
Candidate Site: S74

Project Type: Stream Restoration
Project Size: 1,294 Linear Feet

Project Location: This project is located between a private driveway off of Walker Road and Sunnybrook Road.

Project Description: This stream reach is moderately to severely incised with raw, eroding, near vertical banks. The bed has eroded to weathered rock and riffle pool bed forms are largely absent. The stream is located in an open pasture area between several private residences.



The proposed restoration would involve complete reconstruction of the stream within the existing floodplain, and abandonment of the incised channel to be filled or converted to ponds. The reconstructed channel would be developed with a pattern, dimension, and profile designed for existing flows and consistent with a natural stream. This would prevent further mass erosion associated with channel widening and bank failure, would improve instream habitat, and provide access to a functional floodplain. The buffer area in the new floodplain would be planted with native woody vegetation and grasses.

Potential Project Benefits:

Stream Stability	The pattern, dimension, and profile of the stream will be reconstructed and a floodplain connection will be created.
Water Quality	Water quality will be improved by a significant reduction in current and future bank and bed erosion.
Instream Habitat	Erosion reduction, recreated stream channel, and establishment of a riparian buffer will improve physical habitat conditions.

Potential Project Constraints:

Environmental	The site will not require forest clearing or impacts to jurisdictional wetlands. However, it will require a permit from both the U.S. Army Corps of Engineers and VDEQ. Projects in RPAs may require exceptions or waivers.
Facility Access	Access to this facility will require an easement on private property but is open and unconstrained adjacent to the stream.
Design / Construction	Design efforts are moderate compared to other stream restoration projects. General constructability is good.

Difficult Run Watershed Management Plan
 Concept Plans
Captain Hickory Run

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Construct new channel	1294	LF	\$200.00	\$258,800
Buffer restoration	included above	LF	\$25.00	\$0
Add'l cost, first 500 LF	500	LF	\$200.00	\$100,000
Base Construction Cost				\$358,800
Mobilization (5%)				\$17,940
Subtotal 1				\$376,740
Contingency (25%)				\$94,185
Subtotal 2				\$470,925
Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%)				\$211,916
Estimated Project Cost				\$683,000

Concept Sketch:

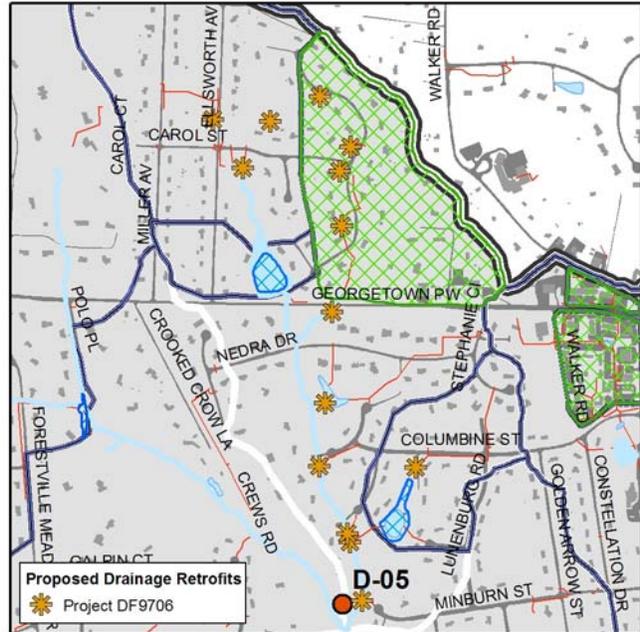


Project Number: DF9706
Catchment Code: DFCH0003
Candidate Site: C06

Project Type: Drainage Retrofit
Project Size: 14 Outfalls

Project Location: This project is located at various locations distributed throughout the catchment.

Project Description: This project consists of providing additional outlet protection to locations where the storm drainage system discharges into the natural channel. Significant erosion and scour was noted in these areas.



Potential Project Benefits:

Streamflow	The project will reduce velocity from the outfalls and help reduce erosive potential immediately downstream.
Water Quality	Water quality improvements would be associated with the reduction of scour at outfall locations and within the channels downstream from them.

Potential Project Constraints:

Environmental	There are no environmental constraints or permitting issues associated with this project. Projects in RPAs may require exceptions or waivers.
Facility Access	Access to these sites can be obtained from roads, driveways, and drainage easements.
Design / Construction	No significant design or construction issues were identified for this project.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
Outfall Protection	14	EA	\$8,000.00	\$112,000
Base Construction Cost				\$112,000
Mobilization (5%)				\$5,600
Subtotal 1				\$117,600
Contingency (25%)				\$29,400
Subtotal 2				\$147,000
Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%)				\$66,150
Estimated Project Cost				\$213,000

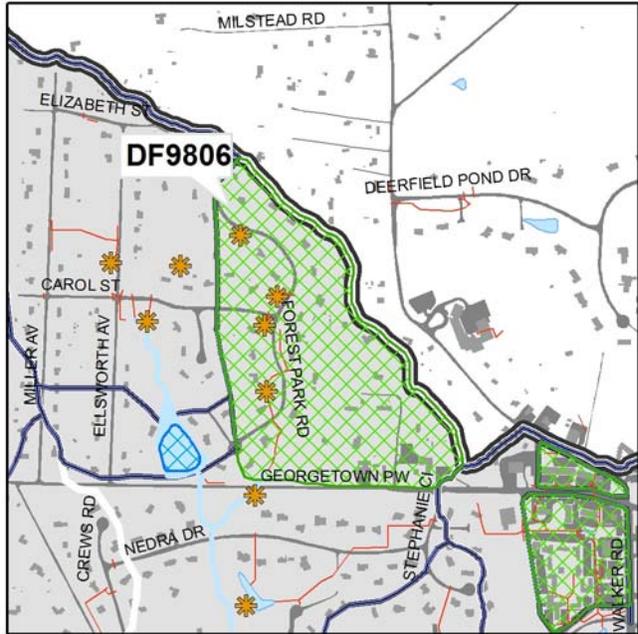
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Project Number: DF9806
Catchment Code: DFCH0003
Candidate Site: C06

Project Type: LID Retrofit
Project Size: 637 SY
Treated Area: 52.6 acres

Project Location: This project is located along the large natural gas easement upstream of Georgetown Pike.

Project Description: This project will consist of the replacement of a concrete channel with a LID system made up of a bioswale, bioretention facility and natural channel improvement. The area draining to this point in the catchment does not appear to be treated by any structural stormwater management measures and is made up of light to moderate residential land uses.



Potential Project Benefits:

Streamflow	Some improvement may occur in runoff volume from the detention and infiltration components of the LID systems.
Water Quality	This facility would be expected to provide water quality benefits through filtration and nutrient uptake.

Potential Project Constraints:

Environmental	Environmental permitting issues are expected to be minimal. There are no forest or wetland impacts.
Facility Access	Access to this facility is very good.
Design / Construction	The primary constraint is the location in the gas easement and any restrictions that may be associated with it. Relocation of the drainage course may be necessary.

Costs:

ITEM	QUANTITY	UNITS	UNIT COST	TOTAL
LID Structural Control	637.0	SY	\$120.00	\$76,440
Base Construction Cost				\$76,440
Mobilization (5%)				\$3,822
Subtotal 1				\$80,262
Contingency (25%)				\$20,066
Subtotal 2				\$100,328
Engineering, Survey, Land Acquisition, Utility Relocations and Permits (45%)				\$45,147
Estimated Project Cost				\$145,000

Concept Sketch:

