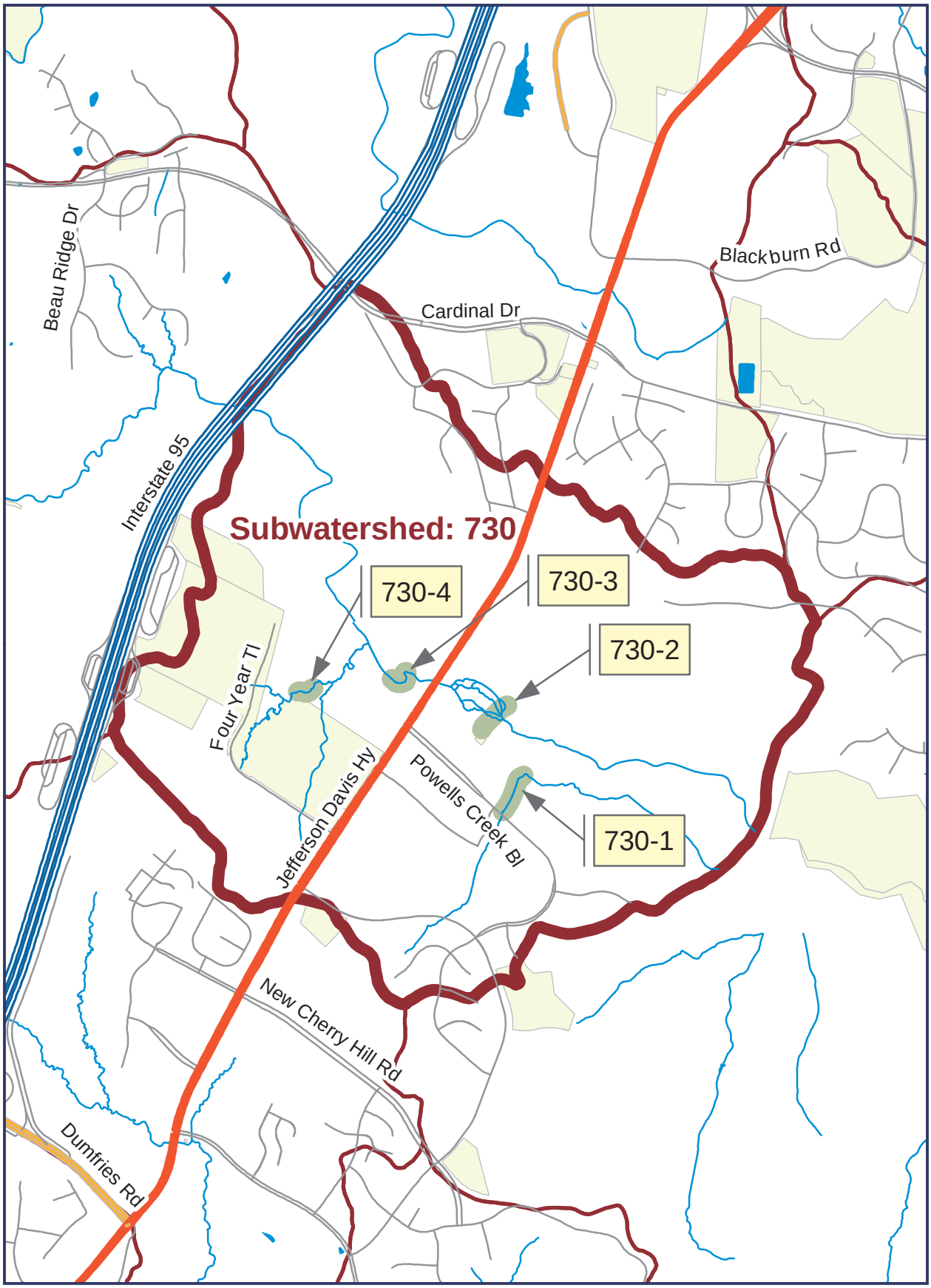
Appendix

Proposed Project Concept Plans


Subwatershed: 730
730-4
730-3
730-2
730-1
Beau Ridge Dr
Cardinal Dr
Blackburn Rd
Interstate 95
Four Year Tl
Jefferson Davis Hy
Powells Creek Bl
New Cherry Hill Rd
Dumfries Rd

Project Concept Plan

Stream Reach ID: PCL003
Catchment Code: 730
Candidate Site: 730-1
Type: Stream Restoration
Size or Length: 550 LF
Location: Off Route 1, North of Powells Creek Boulevard
Drainage Area: 114 Acres

Problem Description: The box culvert under Powells Creek Boulevard discharges into a wide, trapezoidal channel with a grouted rip rap lining. The channel functions as a flume rather than a natural channel, lacking buffer, habitat, and aesthetics. The concrete is in good shape and may be fairly new (perhaps 6 years old). An existing beaver dam at the outfall location provides existing energy dissipation, however, if the beaver dam were not present, the energy created by the "flume" would produce substantial scour and erosion into the tidal areas of backwater from the Potomac River.

Project Description: This project consist of the restoration of the man-made channel back to a functionally natural condition, providing stability, habitat and acceptable sediment transport. This will involve invasive construction, removing the existing rip rap concrete channel, installing structures (rip rap from existing channel is likely to be too small), planting livestakes and enhancing the riparian buffer.

Benefits:

Quantity (Flow): The receiving channel is the main stem of Powells Creek in the vicinity of the confluence with the Potomac River. Therefore, impact to rate of discharge would be considered negligible.

Quality (Pollution reduction): Stream restoration projects are expected to provide significant and holistic water quality improvements. Natural channel design approaches improve the ecosystem, as a whole, reduce sediment and phosphorus export, improve the assimilation of nitrogen and reconnect the groundwater table to the root mass of riparian vegetation resulting in improved receiving water quality.

Erosion Control: The existing beaver dam currently provides energy dissipation, while the concrete provides stabilization to the channel. If the beaver dam were to go away, significant erosion would be expected at the outfall due to the accelerated discharge velocity created by the concrete flume. A natural channel design would, by definition, reduce shear stresses to that which the receiving channel can handle in a stable regime.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting through the Corps of Engineers and State authorities. Land disturbance permits and erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
Powells Creek Apartments Ltd Ptsp - GPIN 8290-60-9198
Powells Creek Towne Square Ltd - GPIN 8290-70-5746

Facility Access: Access to the project site is provided by way of Powells Creek Boulevard and local driveways and parking lots.

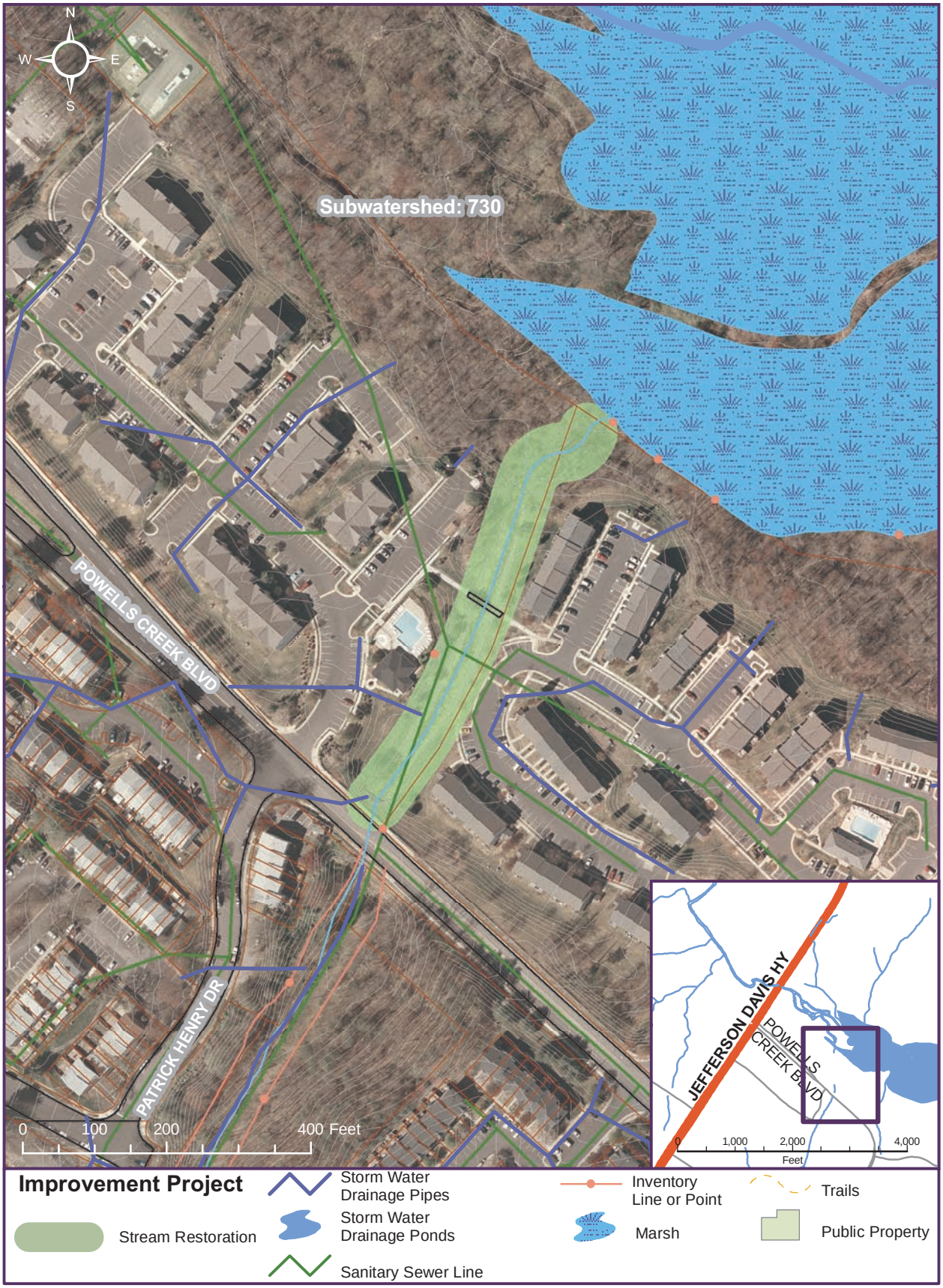
Design or Construction: Site is laterally constrained by existing development.

Design Assumptions: Natural Channel Design Approach

Estimated Costs:

Design:	$	55,000
Construction:	$	275,000
Total:	$	330,000

Project Concept Plan



Project Concept Plan

Downstream face of culvert under Powells Creek Boulevard

Looking at channel upstream of footbridge

Looking at channel upstream of footbridge. Footbridge can be seen in the distance.

Project Concept Plan

Stream Reach ID: PCL009
Catchment Code: 730
Candidate Site: 730-2
Type: Stream Restoration
Size or Length: +/- 500 LF
Location: Powells Creek, below Route 1
Drainage Area: 9,342 Acres

Problem Description: Powells Creek downstream of US Route 1 becomes a wide braided channel due to topography, geology and ecology. A sanitary gravity main was recently installed, spanning the floodplain and resulting in: channel instability, headcutting, and undermining of the sanitary sewer (which should be unerneath the channel) in several of the sections of the braided channel network. Rehabilitation of this reach of Powells Creek should be considered a high priority. Failure to address this section of channel will result in continued scour and undercutting and ultimately may result in a catastrophic failure of the sanitary main, which would have a devastating effect on Powells Creek and the Potomac River.

Project Description: Build constructed riffle/cross vane sequences to create a stable channel in the vicinity of the sanitary sewer. This sequence will provide for channel flows to reach downstream elevations without undercutting the sanitary sewer.

Benefits:

Quantity (Flow): The reach to be restored would be limited to a small section of Powells Creek that is very close to the confluence with the Potomac River. No effect on the peak rate of flow would be provided.

Quality (Pollution reduction): Rehabilitating the stream in the vicinity of this sewer crossing should be considered a high priority project to ensure that a future sewer leak/spill does not occur. While the approach recommended is a natural channel design approach, it is focused primarily on energy reduction and hydraulic aspects, rather than ecologic or chemical water quality improvements. Therefore, the only water quality benefit provided by this project would be the prevention of a sewer failure and a reduction in sediment export from the unstable portions of Powells Creek.

Erosion Control: The existing sewer crossing creates an artificial grade control that has developed into severe scour in the channel. This project would emphasize lowering the channel elevation in such a way as to eliminate scour at the sanitary crossing. The result would significant decreases in sediment export along Powells Creek.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
Port Potomac Homeowners Assoc., Inc. - GPIN 8290-71-3861
Powells Creek Apartments Ltd. Ptsp - GPIN 8290-60-9198

Facility Access: Access is available by the existing sanitary pump station located at the end of Dettingen Place along Powells Creek Boulevard.

Design or Construction: Site lies in along a wide braided floodplain near the bottom of Powells Creek. This area is subject to bearing capacity limits and high water. Solution will require importing significant structural material from which to construct riffles and steps.

Design Assumptions: Natural Channel Design Approach. Will require close coordination between Public Works and the Prince William County Service Authority.

Estimated Costs:

Design:	$	50,000
Construction:	$	300,000
Total:	$	350,000

Project Concept Plan

Project Concept Plan

Looking down at the Sanitary Sewer from an upstream perspective.

Scour across sanitary sewer is exposing sanitary manhole.

Project Concept Plan

Stream Reach ID: PCL010
Catchment Code: 730
Candidate Site: 730-3

Type: Stream Restoration
Size or Length: 500 LF
Location: Powells Creek, Upstream of Route 1
Drainage Area: 9,118 Acres

Problem Description: Channel instability was found along the main stem of Powells Creek, beginning approximately 1000' upstream of Route 1. The upstream meander bend has migrated and eroded down valley while the next downstream meander bend remains relatively in place and appears to be stable due to adequate vegetation. The migrating meander outside bank is actively eroding and has no buffer. Without corrective action, this reach will continue to export excessive sediment to receiving waters.

Project Description: Shift the migrating bend upstream and to the left for a better alignment. Slopes would be seeded, strawed, matted and livestaked along with buffer plantings. In the channel, a few J-Hook Vanes could be used for future habitat and to improve the stability of the bend.

Benefits:

Quantity (Flow): The reach to be restored would be limited to a small section of Powells Creek. Impacts to the discharge rate would be considered negligible.

Quality (Pollution reduction): Stream restoration projects provide significant and holistic water quality improvements. Natural Channel Design approaches improve the ecosystem, as a whole, reduce sediment and phosphorus export, improve the assimilation of nitrogen and reconnects the groundwater table to the root mass of riparian vegetation resulting in improved receiving water quality.

Erosion Control: This stream reach has been monitored for several years and has consistently shown signs of significant erosion, scour and sediment export. A restoration project would improve this condition and reduce the sediment export from this reach.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
American Eagle - GPIN 8290-52-8071
Virginia Housing Development Authority - GPIN 8290-52-1605

Facility Access: The site is wooded, without direct access. Route 1 along with an existing sanitary sewer easement provides reasonable access.

Design or Construction: N/A

Design Assumptions: Natural Channel Design Approach

Estimated Costs:

Design:	$	50,000
Construction:	$	200,000
Total:	$	250,000

Project Concept Plan

Project Concept Plan

Trees were observed being undercut by bank erosion.

Bank erosion can be see along the bank at the left side of this view. Once the roots of the vegetation on the bank are no longer in contact with the groundwater, a significant amount of water quality benefit is lost.

Project Concept Plan

Stream Reach ID: PCL013
Catchment Code: 730
Candidate Site: 730-4
Type: Stream Restoration
Size or Length: 200 LF
Location: Off Route 1, between Fox Lair Drive and Potomac High School
Drainage Area: 126 Acres

Problem Description: The bottom of the reach has two headcuts (approx. 1' and 2') near a severe meander that is on the verge of cutting a new channel. As a result, the upstream channel will subsequently become entrenched and lose connection with its floodplain. Entrenchment will create further erosion and more sediment loss. The upstream section of the reach is flowing against the hill slope, but no major erosion is currently occurring. Once the headcuts are remedied, the immediate upstream would need to be realigned to prevent future toe of slope erosion

Project Description: The approach to this project would consist of a channel realignment, to move the channel away from the hill slope. A step pool should be installed at the bottom of the reach to protect the channel from the energy associated with the hydraulic jump at the headcut.

Benefits:

Quantity (Flow): Additional storage provided by making better use of floodplain area would have a minor impact on the discharge at the lower end of the project. However, this effect would be negligible in isolation.

Quality (Pollution reduction): Stream restoration projects provide significant and holistic water quality improvements. Natural Channel Design approaches improve the ecosystem, as a whole, reduce sediment and phosphorus export, improve the assimilation of nitrogen and reconnect the groundwater table to the root mass of riparian vegetation resulting in improved receiving water quality.

Erosion Control: This stream reach has been monitored for several years and has consistently shown signs of significant erosion, scour and sediment export. A restoration project would dramatically improve this condition and reduce the sediment and nutrient production within the reach.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
Eagles Point Subdivision (Common Area) - GPIN 8290-42-4126
Virginia Housing Development Authority - GPIN 8290-52-1605
PWC School Board - GPIN 8290-22-9052

Facility Access: The stream valley is tight, but access should be available by way of a maintenance road on the School Property or by way of the nearby sanitary easement.

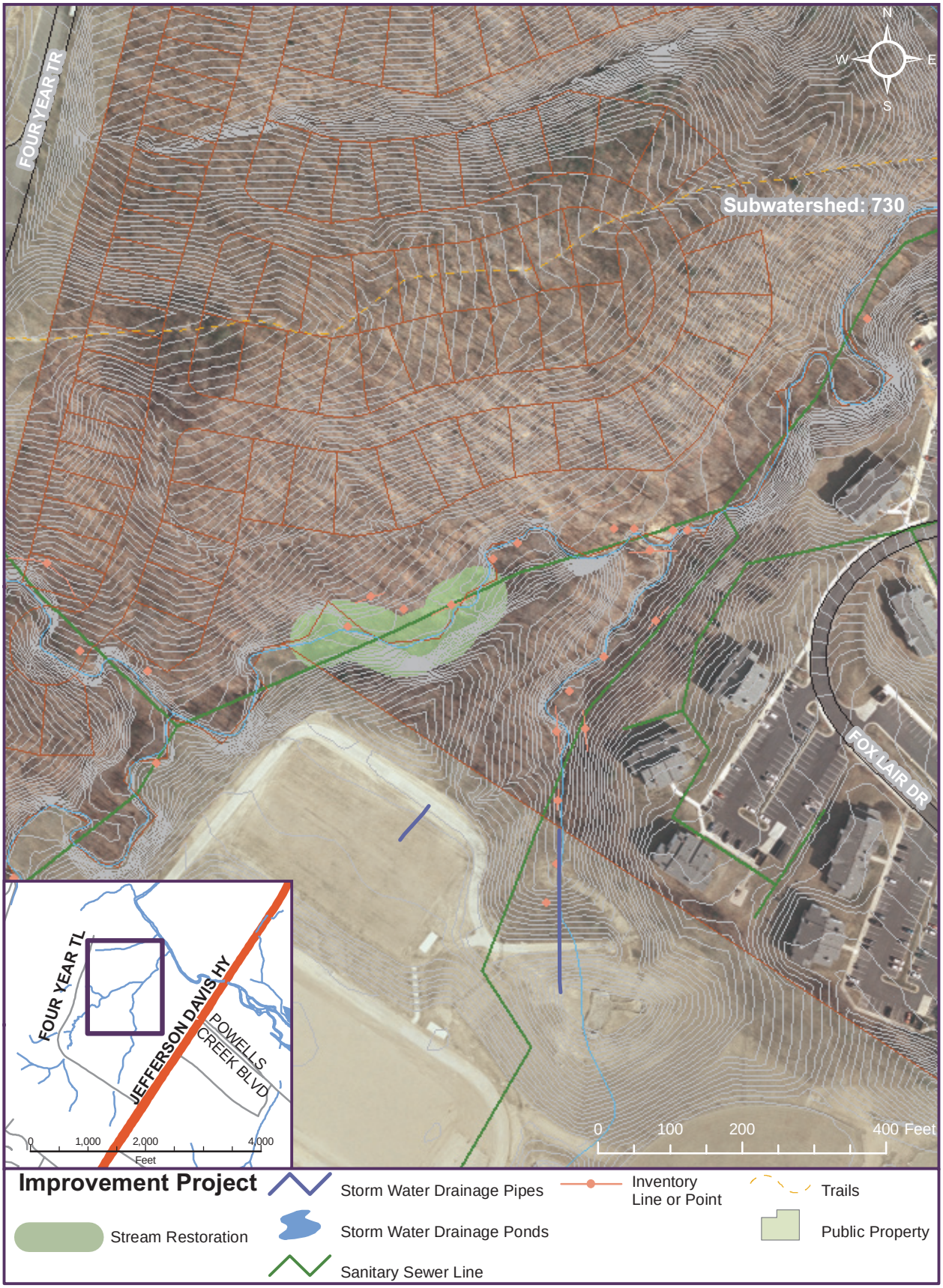
Design or Construction: N/A

Design Assumptions: Natural Channel Design Approach

Estimated Costs:

Design:	$	50,000
Construction:	$	200,000
Total:	$	250,000

Project Concept Plan

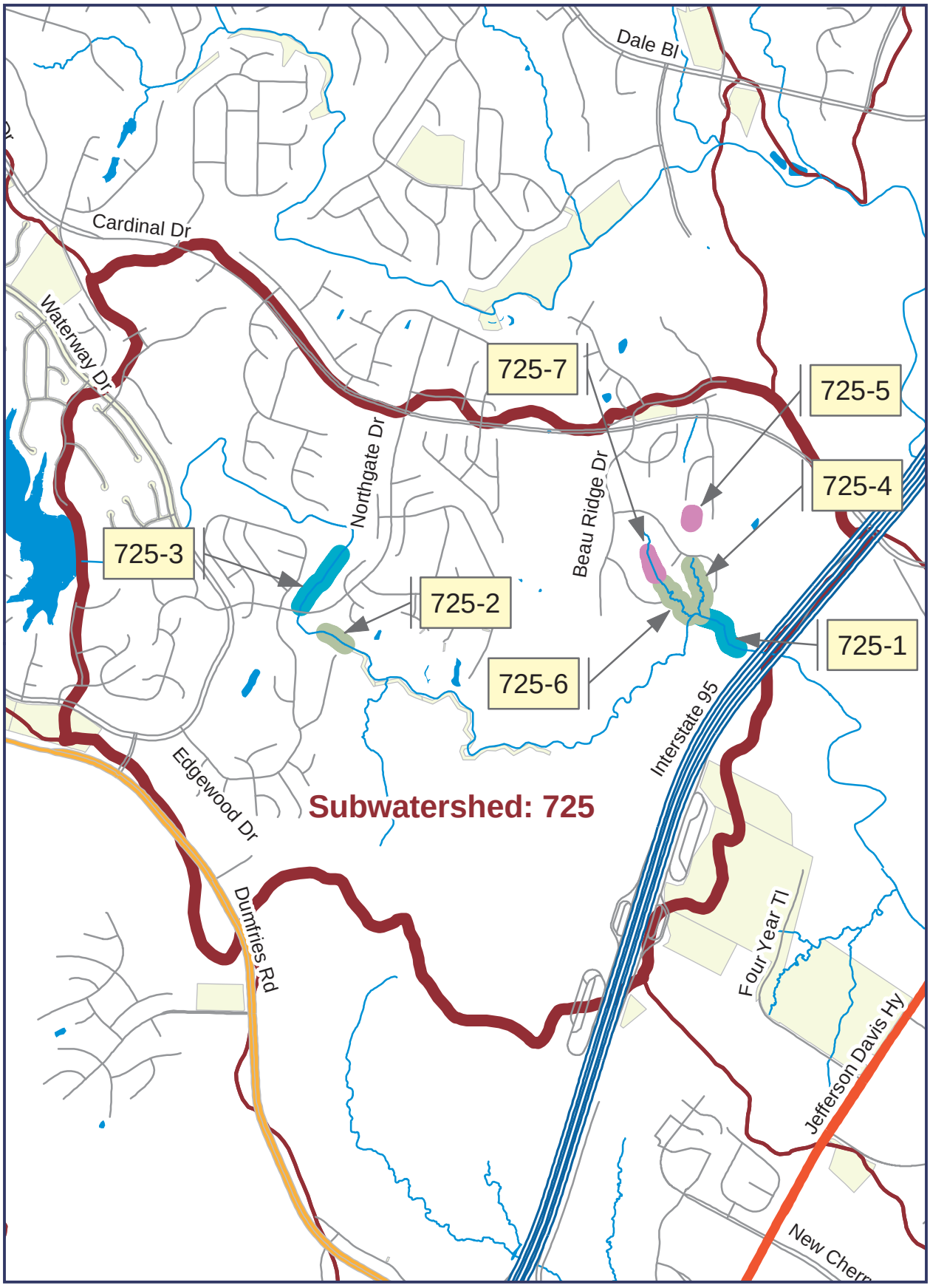


Project Concept Plan

Downstream end of proposed project.

Area of active entrenchment in the foreground.

Upstream hillslope is currently in reasonable shape. However, field observations of channel morphology suggest that the stream will continue to migrate into the hillslope without intervention.


Dale Bl
Cardinal Dr
Waterway Dr
Northgate Dr
Beau Ridge Dr
725-7
725-5
725-4
725-3
725-2
725-1
725-6
Interstate 95
Edgewood Dr
Subwatershed: 725
Dumfries Rd
Four Year Tl
Jefferson Davis Hy
New Cherr

Project Concept Plan

Stream Reach ID: PCL020
Catchment Code: 725
Candidate Site: 725-1
Type: Stream Enhancement
Size or Length: 900 LF
Location: The enhancement reach starts at the confluence of Powells Creek and PCL024 and continues downstream about 900' to a bedrock knick point in Powells Creek near I-95.
Drainage Area: 8,425 Acres

Problem Description: Bank height ratios range from 1 to 1.3. The banks have some erosion and the stream channel is overly wide for about a 350' stretch, carrying a relatively high sediment load, evidenced by the multiple mid-channel and side channel bars.

Project Description: Eroded banks should be sloped, seeded, strawed and matted. Livestakes and other riparian vegetation should be installed to aid in developing a stable floodprone area.

Benefits:

Quantity (Flow): Additional storage provided by making better use of floodplain area would have a minor impact on the discharge at the lower end of the project. However, this effect would be negligible in isolation.

Quality (Pollution reduction): A stream enhancement project would be focused on eliminating the existing aspects of this reach that are negatively impacting the water quality. Natural channel design approaches improve the ecosystem, reduce sediment and phosphorus export, improve the assimilation of nitrogen and reconnects the groundwater table to the root mass of riparian vegetation resulting in improved receiving water quality.

Erosion Control: The primary role of this approach would be to stabilize an existing source of sediment export. Substantial erosion control would be provided by implementing this project.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities, although work in the channel should be minimized for enhancement projects. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
Beau Ridge Homeowners Association - GPIN 8290-26-1394
Kramer/Republic LLC - GPIN 8290-37-6389
Kramer/Republic LLC - GPIN 8290-15-2265
and I-95 right-of-way

Facility Access: The potential site is wooded, but access should be available by way of an existing sanitary sewer easement that runs adjacent to Powells Creek in this location.

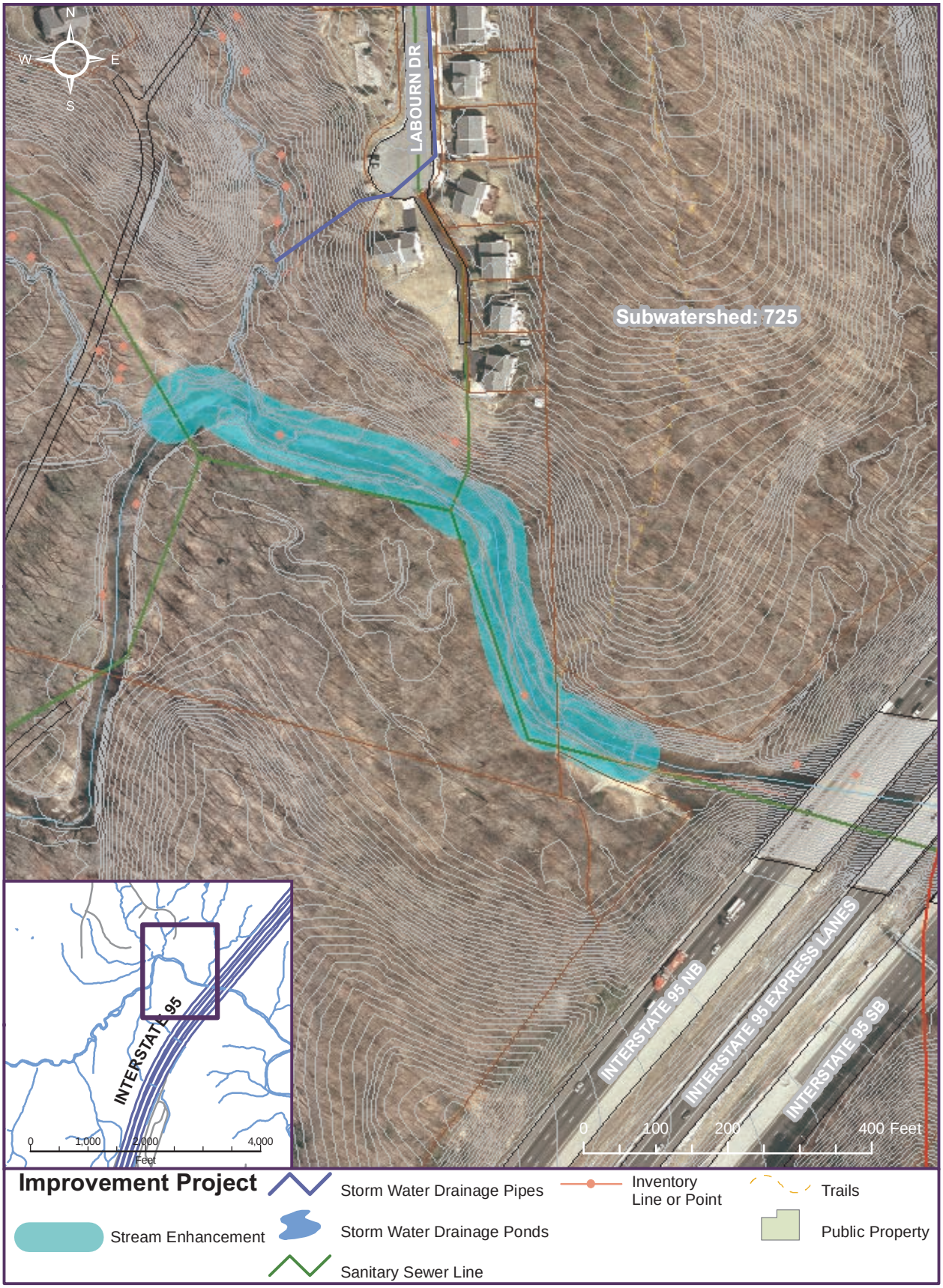
Design or Construction: N/A

Design Assumptions: Natural Channel Design Approach

Estimated Costs:

Design:	$	15,000
Construction:	$	72,000
Total:	$	87,000

Project Concept Plan



Project Concept Plan

Mid-channel bars were observed in multiple locations along this reach indicating a high sediment load.

Bank-Height ratios were up to 1.3.

Bedrock knick point near Interstate 95 provides downstream boundary for proposed project.

Project Concept Plan

Stream Reach ID: PCL020
Catchment Code: 725
Candidate Site: 725-2
Type: Stream Restoration
Size or Length: 300 LF
Location: This project site is located on Powells Creek below Northgate Road, and extends from the existing golf cart bridge to the downstream end of the existing mid-channel bar.
Drainage Area: 7,470 Acres

Problem Description: A sanitary manhole sits in the middle of Powells Creek and has created a mid-channel bar, diverting stream forces into the banks. This is causing erosion to a very steep hillside upon which sit two houses (at the end of Deer Park Drive). A restoration of this reach could result in the elimination of stresses on this hillside.

Project Description: The primary goal of this project is to reduce the stress on the bank underneath private houses. The project would consist of reshaping the mid-channel bar and installing multiple structures to deflect water away from the eroding bank, and to create a stable fluvial system.

Benefits:

Quantity (Flow): No impact to discharge rate would be expected from this project.

Quality (Pollution reduction): By restoring natural function to the stream while diverting energy away from the banks that are currently eroding, a reduction in the sediment export could be expected.

Erosion Control: The primary role of this approach would be to stabilize an existing source of sediment export. Significant erosion control would be provided, albeit in an isolated location, by implementing this project.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
Montclair Property Owners Association, Inc. - GPIN 8190-76-3432
US Golf Properties LP - GPIN 8190-66-9015

Facility Access: It appears that site access would need to be secured through the golf course property, which intersects Northgate Road.

Design or Construction: Access to the project may be difficult. This project may require close coordination with the Prince William County Service Authority.

Design Assumptions: Natural Channel Design Approach

Estimated Costs:

Design:	$	60,000
Construction:	$	150,000
Total:	$	210,000

Project Concept Plan

Project Concept Plan

The golf cart bridge establishes the upstream limit of this proposed project.

This mid-channel bar contains a sanitary manhole, which was in part responsible for the aggredation here.

Drainage systems discharge directly to the creek, contributing to the instability of the banks.

Project Concept Plan

Another view of the mid-channel bar formation.

There appears to be a number of unverified utilities throughout this reach of the creek.

Hillside being eroded by stress as the channel adjust to account for changes within the watershed and riparian areas.

Project Concept Plan

Stream Reach ID: PCL020
Catchment Code: 725
Candidate Site: 725-3
Type: Stream Enhancement
Size or Length: 900 LF
Location: This project site is located on Powells Creek above Northgate Road, primarily in the vicinity of the existing fairway.
Drainage Area: 7,275 Acres

Problem Description: This section of Powells Creek has almost no functional buffer due to its proximity to the golf course fairway. Erosion along this reach was observed and has been reported in previous stream assessment studies. There is some concrete rubble in the channel, which may or may not be protecting a utility line. Minor debris was found at the inlet to the culvert under Northgate Road.

Project Description: This project consist of creating a minimal buffer along the creek to help protect the creek from pollution associated with golf course runoff and to provide some root mass to stabilize the stream banks. If possible, streambanks could be laid back to provide additional floodplain and to allow root mass to interact with groundwater for additional pollutant removal. Miscellaneous debris should be removed while on site.

Benefits:

Quantity (Flow): No impact to discharge rate would be expected from this project.

Quality (Pollution reduction): Buffer enhancements have been shown to improve water quality and aid in the stabilization of stream banks. Both of these goals would improve the overall quality of Powells Creek.

Erosion Control: A primary goal for this project would be to reduce bank erosion from unprotected banks along the golf course. This would reduce the sediment export from this reach of stream.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
US Golf Properties LP - GPIN 8190-77-2247

Facility Access: Access would be provided along the Golf Course Property from Northgate Road.

Design or Construction: Sanitary Sewer crosses stream and may present a design constraint.

Design Assumptions: Natural Channel Design Approach and Landscaping to ensure consistency with landuse (i.e. Golf Course).

Estimated Costs:

Design:	$	18,000
Construction:	$	90,000
Total:	$	108,000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E
S
Subwatershed: 725
EDGEWOOD DR
NORTHGATE DR
0
100
200
400 Feet
NORTHGATE DR
WATERWAY DR
DUMFRIES RD
0
1,000
2,000
4,000
Feet
Improvement Project
Stream Enhancement
Storm Water Drainage Pipes
Storm Water Drainage Ponds
Sanitary Sewer Line
Inventory Line or Point
Trails
Public Property

Project Concept Plan

Minor debris was observed just above the culvert under Northgate Road.

Maintenance of the riparian buffer along the golf course has eliminated vegetation that serves to stabilize stream banks. Maintained fairways may contribute nutrients from fertilizers directly into the Creek.

Debris in the channel and a sanitary sewer crossing may need to be factored into the design approach.

Project Concept Plan

Stream Reach ID: PCL021
Catchment Code: 725
Candidate Site: 725-4
Type: Stream Restoration
Size or Length: 900 LF
Location: This project extends from Labourn Drive, off of Beau Ridge Drive, down to Powells Creek
Drainage Area: 52 Acres

Problem Description: This catchment is fully developed consisting of conventional drainage systems resulting in a rainfall runoff response that is flashy. The bank height ratio at Powells Creek ranges from 5 at the downstream end to 2 as you walk upstream to Labourn Drive. There's a 2.5'-3' bedrock knick point about 100' upstream of Powells Creek. Above this knick point, the stream is moving back and forth between the hill slopes, with outside bends eroding severely underneath the root mass of trees above the channel. In some cases, meander bends have migrated further down valley than the next downstream bend, causing the stream to flow up valley. The channel floodplain ranges from 20' to 70' and would benefit from buffer enhancements. A tributary rip rap ditch is suspended approximately 4' above this reach due to localized scour.

Project Description: This reach is in need of substantial restoration to establish a stable dimension, pattern and profile and restore hydrologic function to the catchment. Step pool grade controls are recommended in areas where incoming channels are suspended above the tributary to alleviate undercutting and scour. This channel should be realigned and benches excavated such that the stresses on the banks are reduced and flow is not conveyed under undercut banks.

Benefits:

Quantity (Flow): Channels that suffer from flashy inflow conditions generally tend to perpetuate the flashiness of the runoff by conveying the flow at a faster rate within incised channels, resulting in reduced storage and attenuation. Restoration for a severely degraded system such as this would have an appreciable decrease in the discharge between existing and post-project conditions, particularly for smaller flows.

Quality (Pollution reduction): Stream restoration projects can provide significant and holistic water quality improvements. Natural Channel Design approaches improve the ecosystem, reduce sediment and phosphorus export, improve the assimilation of nitrogen and reconnect the groundwater table to the root mass of riparian vegetation resulting in improved receiving water quality.

Erosion Control: Scour depths of up to 5 ft found on this reach are a clear indicator of massive sediment export. If left alone, this channel will continue to evolve toward a stable condition, but will take many years to reach this point and will continue to export tons of sediment in the process. Restoring this reach will have the effect of dramatically reducing the sediment load to Powells Creek and the Potomac River.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
Beau Ridge Homeowners Association - GPIN 8290-26-1394

Facility Access: Access to this project exist at two locations along Labourn Drive.

Design or Construction: N/A

Design Assumptions: Natural Channel Design Approach

Estimated Costs:

Design:	$	95,000
Construction:	$	450,000
Total:	$	545,000

Project Concept Plan

Project Concept Plan

Bank-Height ratios were up to 5 at the lower end of the downstream end of the reach. This contributes to excessive sediment export, lack of connection of the groundwater to riparian vegetation and decreased times of concentration and channel attenuation.

Channel adjustments where the incised channel is rapidly migrating within the channel valley result in tremendous sediment export. The vegetation is clearly not connected to groundwater and is doing very little to stabilize the banks.

Evidence of the channel downcutting can be seen by channels that are falling into the stream. This conveyance will certainly fall victim to headcutting without intervention.

Project Concept Plan

Stream Reach ID: PCL021 **SWM Facility ID:** 233
Catchment Code: 725
Candidate Site: 725-5
Type: Pond Retrofit
Size or Length: Size will be determined by a more detailed hydrologic and hydraulic analysis and the available space, but increasing the footprint by 20% would provide significant attenuation of peak flow rates.
Location: This project would be a retrofit to the existing dry pond facility located behind the houses at the end of Powells Crossing Court.
Drainage Area: 25 Acres

Problem Description: The catchment in which this pond is located is fully developed resulting in a rainfall runoff response that is flashy. This pond outfalls into a channel that flows under Labourn Drive, which leads to severe channel incision and erosion all the way to the main stem of Powells Creek. Excessive energy in the channel needs to be reduced through attenuation to reduce the degredation below.

Project Description: This project should include expanding the footprint of the existing pond, and reconfiguring the outlet to increase the attenuation provided to address the instability of the downstream tributary by reducing the flashiness of the catchment. The retrofit design would focus on holding a greater volume of runoff for a longer period of time, thereby reducing the peak rate of runoff associated with flashy catchments. Size, space and cost would primarily determine the amount of storage that could be provided, but minimum performance should be based on the ability to hold the 1 year, 24 hour event such that the peak is delayed by 24 hours. If a greater volume could be provided, the receiving stream would benefit. Innovative means of increasing the water quality performance of this facility should be explored, such as installing vegetation to aid in the uptake of nutrients and contaminants and outlet protection, both inside the facility and at the primary outfall.

Project Concept Plan

Benefits:

Quantity (Flow): The primary function of this retrofit project is to increase the residence time of the existing facility such that the flow rate will be reduced to a rate that the receiving channel can better handle without scour and erosion. Reductions in flow rates would be focused toward the smaller, more frequent events (i.e. 1 to 5 year storms).

Quality (Pollution reduction): Water quality benefits would be achieved by this project by: a) reducing sediment export in the channel below; b) settling of sediment, phosphorus and other contaminants in the facility itself and c) through additional water quality features that could be incorporated into the design (e.g. plantings, baffles, etc) that may remove contaminants through uptake, infiltration or other means.

Erosion Control: Reduction of the flash and flow rate of this catchment would result in a significant reduction in scour and sediment export for the entire reach below.

Constraints:

Environmental permits: This project should not require 401/404 permits, but would be expected to require County permits for land disturbance.

Property Ownership: The following properties may be affected by this project:
Cardinal Oaks Homeowners Association - GPIN 8290-28-2900

Facility Access: This site has direct access from Powells Crossing Court and Labourn Drive

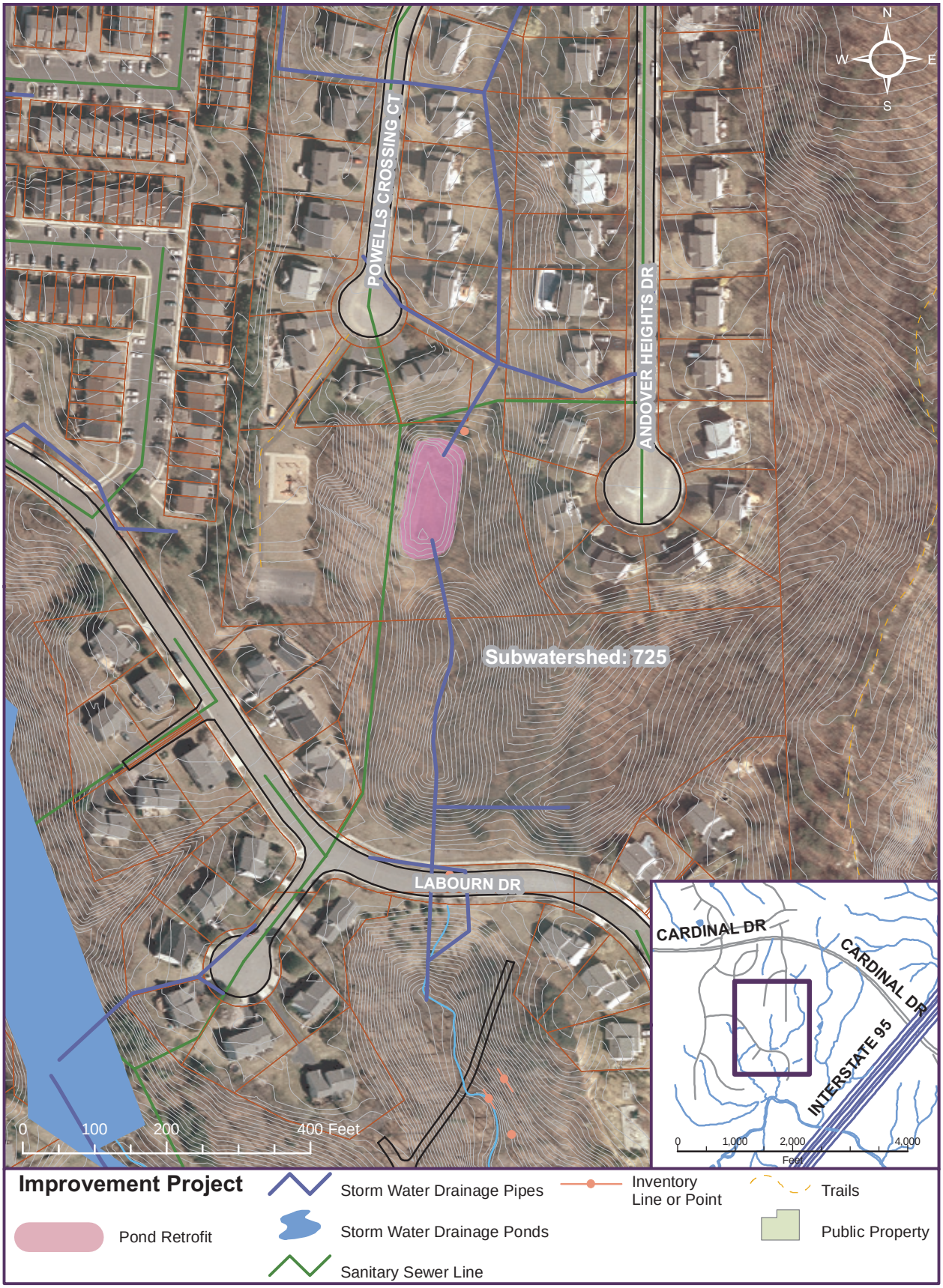
Design or Construction: N/A

Design Assumptions: At a minimum, this project should achieve extended detention control of the one year storm.

Estimated Costs:

Design:	$	25,000
Construction:	$	125,000
Total:	$	150,000

Project Concept Plan



Project Concept Plan

The outfall channel downstream of Labourn Road shows severe signs of instabilty that could be partially addressed by greater attenuation of storm flows.

Project Concept Plan

Stream Reach ID: PCL024
Catchment Code: 725
Candidate Site: 725-6
Type: Stream Restoration
Size or Length: 800 LF
Location: Between Lacrosse Court and Labourn Drive, just off Beau Ridge Drive
Drainage Area: 55 Acres

Problem Description: This reach is incised with an average bank height ratio of approximately 2. There is an abandoned access road that is creating some of the channelization. Due to the built out nature of this catchment, the runoff response is flashy, which ensures that this channel will remain unstable for the foreseeable future. Vertical and undercut banks predominate and the banks lack mature vegetation to aid with stability.

Project Description: The restoration starts at the confluence with Powells Creek and continues upstream for approximately 800'. Realignment of the channel and raising the bed elevation to reconnect to the floodplain are viable options for this stream. Otherwise, realignment with benching of the channel such that the channel has a new floodplain would be required, but would entail substantial earthwork volumes and hauling costs.

Benefits:

Quantity (Flow): Creating a stable stream system with functional floodplains would increase the storage capacity of this stream and provide some reduction to peak flow rates. However, these reductions would be negligible in isolation.

Quality (Pollution reduction): Stream restoration projects are expected to provide significant and holistic water quality improvements. Natural Channel Design approaches improve the ecosystem, as a whole, reduce sediment and phosphorus export, improve the assimilation of nitrogen and reconnects the groundwater table to the root mass of riparian vegetation resulting in improved receiving water quality.

Erosion Control: Bank height ratios of 2 found on this reach are an indication of historical and future sediment export. Restoring this reach will have the effect of reducing the sediment load to Powells Creek and the Potomac River.

Project Concept Plan

Constraints:

Environmental permits: Any work performed in jurisdictional waters of the US will require 401/404 permitting with the Corps of Engineers and State authorities. Land disturbance permits and Erosion and sediment control plans will be required.

Property Ownership: The following properties may be affected by this project:
Beau Ridge Homeowners Association - GPIN 8290-26-1394

Facility Access: There is a sanitary sewer easement that runs along this reach with several access points from roads on either side of the stream.

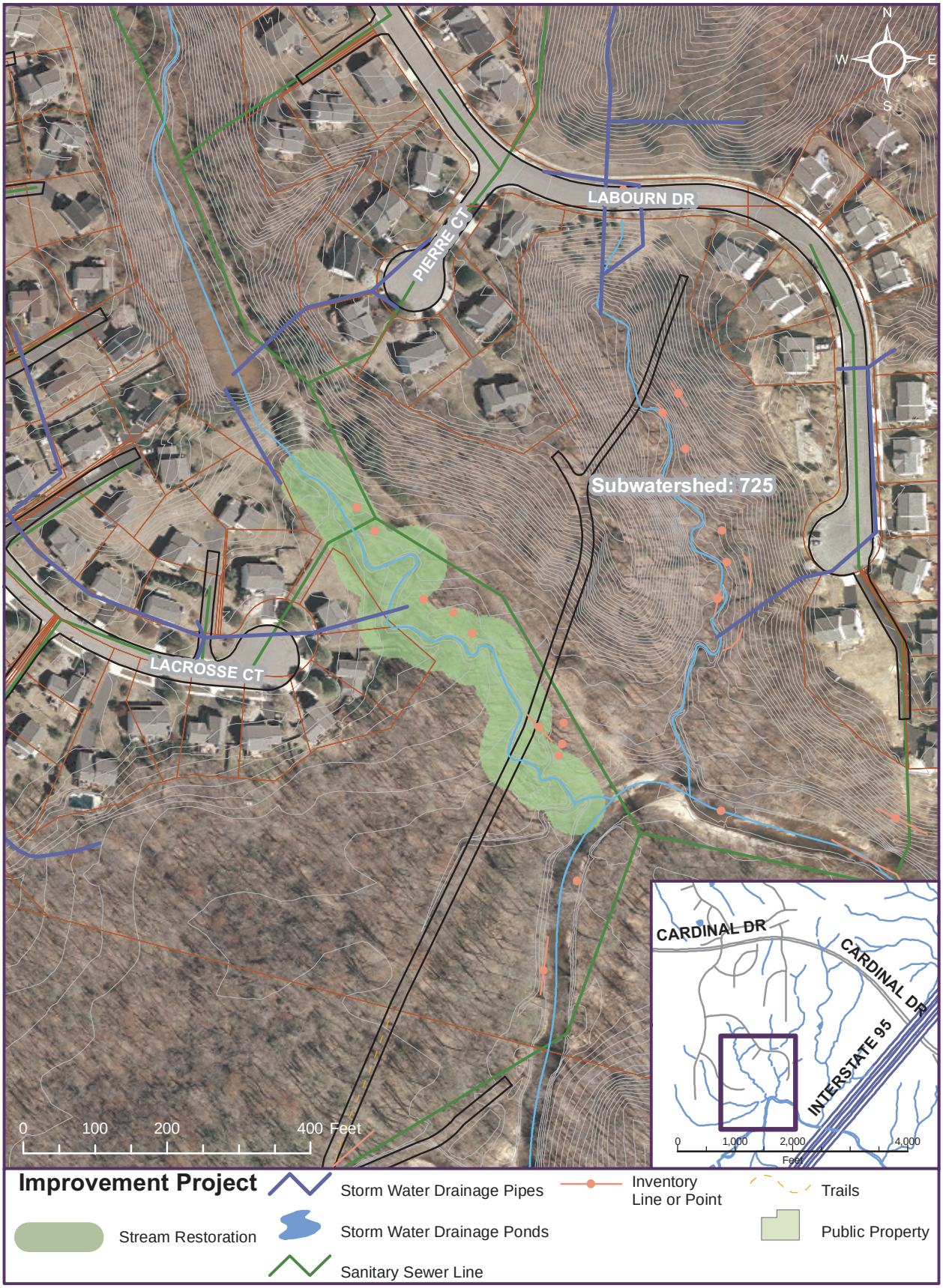
Design or Construction: N/A

Design Assumptions: Natural Channel Design Approach

Estimated Costs:

Design:	$	90,000
Construction:	$	400,000
Total:	$	490,000

Project Concept Plan



Project Concept Plan

Unprotected outfalls contribute to channelization of the floodplane and subsequent sediment export.

Bank height ratios of 2 were found along this reach of stream, which leads to disconnection of vegetation from the groundwater and minimizes vegetative bank stabilization.

Undercutting of the banks was found on the outside of tight meander bends. These indicate that the channel is far from reaching stable dimension, pattern and profile on its own.

Project Concept Plan

Stream Reach ID: PCL024 **SWM Facility ID:** 147
Catchment Code: 725
Candidate Site: 725-7
Type: Pond Retrofit
Size or Length: 0.25 to 0.50 acres
Location: Between Lacrosse Court and Labourn Drive, just off Beau Ridge Drive
Drainage Area: 53 Acres

Problem Description: The channel below this existing wet pond is incised with a bank height ratio of approximately 2 feet. Due to the built out nature of this catchment, the runoff response is flashy, which has served to create an unstable channel. While the wet pond may provide better contaminant settling and uptake, it is not as effective at reducing the energy applied to downstream channels as dry detention volume can be.

Project Description: A retrofit should be considered to increase the dry storage of this facility to reduce peak rates of discharge. This may require: increasing the overall footprint of the facility, reconfiguring the wet and dry storage volumes and creating a structural energy dissipation solution at the outlet of the existing pond.

Benefits:

Quantity (Flow): The primary purpose of this project is to affect the peak rate of discharge from this facility to the receiving stream. At a minimum, this project should provide extended detention for the 1 year, 24 hour storm, but could accommodate extended detention of a larger event depending on the results of a more detailed analysis.

Quality (Pollution reduction): Presumably, this pond is meeting water quality requirements, therefore focusing on the dry storage volume would have a greater impact on the downstream water quality issues than on the water quality of the discharge from the facility. Water quality enhancements such as forebays, aquatic benching and other vegetative practices may be employed to optimize water quality benefits.

Erosion Control: Extended detention facilities have been shown to dramatically reduce destabilizing flashy peaks in receiving streams, which is the case in this situation. Increasing the detention volume would be expected to decrease, or aid in decreasing along with stream restoration below, the total sediment export from this tributary to Powells Creek.

Project Concept Plan

Constraints:

Environmental permits: Work should be limited to uplands and the existing facility. Therefore, 401/410 permits would not be anticipated. Land disturbance permits and Erosion and sediment control plans would be required.

Property Ownership: The following properties may be affected by this project:
Beau Ridge Homeowners Association - GPIN 8290-26-1394

Facility Access: There is a sanitary sewer easement that runs along this reach with several access points from roads on either side of this common area.

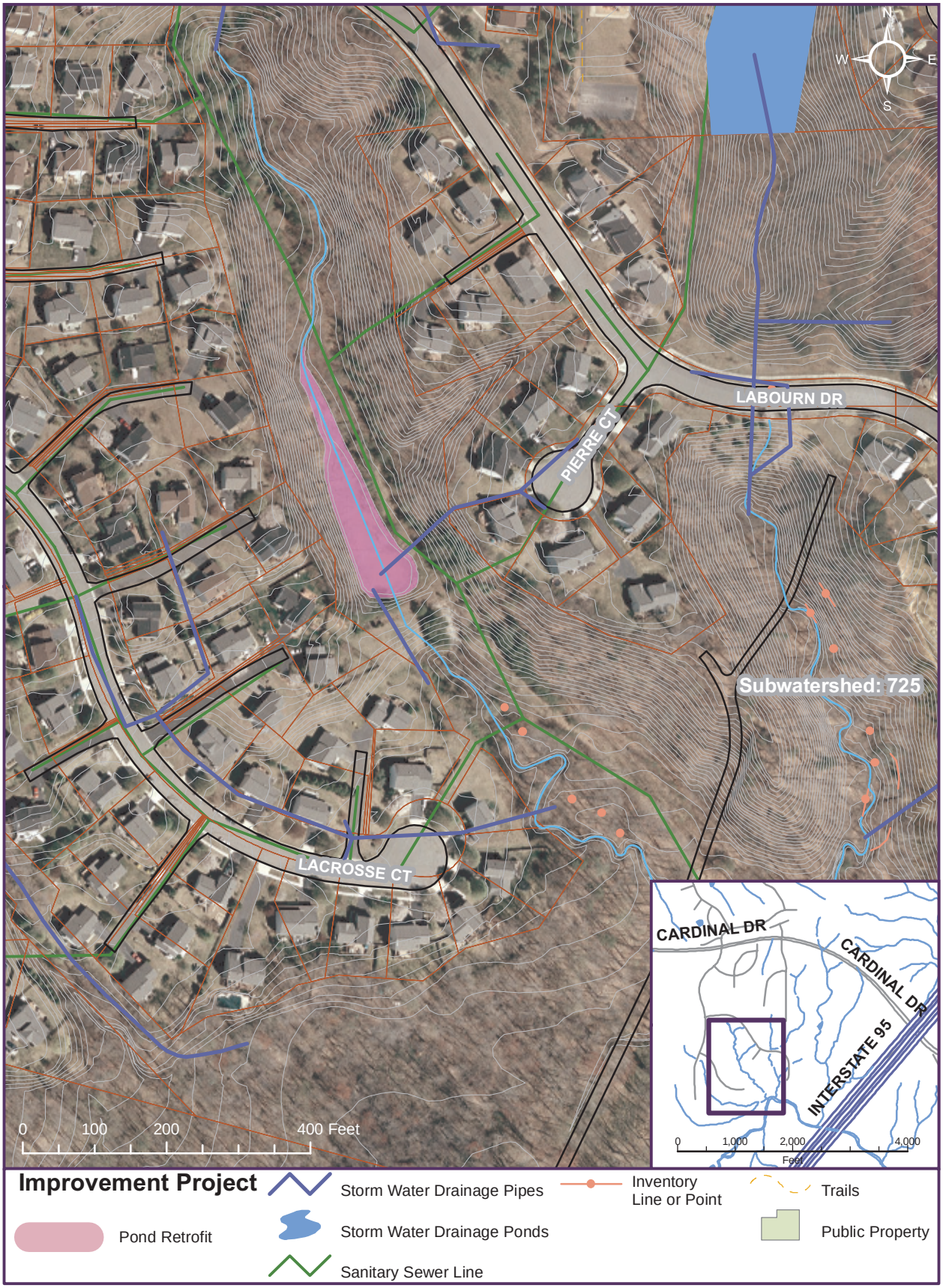
Design or Construction: All work should be limited to common area, which is adjacent to private lots. Coordination with affected homeowners should be considered.

Design Assumptions: Extended detention retrofit to the existing wet pond.

Estimated Costs:

Design:	$	25,000
Construction:	$	125,000
Total:	$	150,000

Project Concept Plan



Project Concept Plan

Incision below the facility is typical of urban drainage basins that have inadequate management of discharges and discharge outfalls.