

BMP ID  
MO-Res-07

Benefits	
Peak Flow Attenuation	
Nutrient Uptake	
Sediment Removal	✓
Beautification	✓
Improved Stream Function	✓

Site Location			
Parcel Number	181A1 C001	Latitude	33° 55' 55.56" N
Date of Field Visit	10/11/2017	Longitude	83° 23' 19.34" W
Field Visit Personnel	EG, CH	Street Address	Gran Ellen Dr.
Major Watershed	Middle Oconee	Landowner	Athens-Clarke Co.

Project Narrative	
Memorial Park – Gran Ellen Drive Erosion Control This project involves construction of ditch and channel improvements including bank stabilization and energy dissipation measures in areas of the park where concentrated runoff from adjacent roads and residential areas is resulting in significant erosion and sediment transport. Areas of concern were identified along the parks border with Gran Ellen Drive. Potential benefits include reduction of sediment transport, beautification, and improved stream function.	

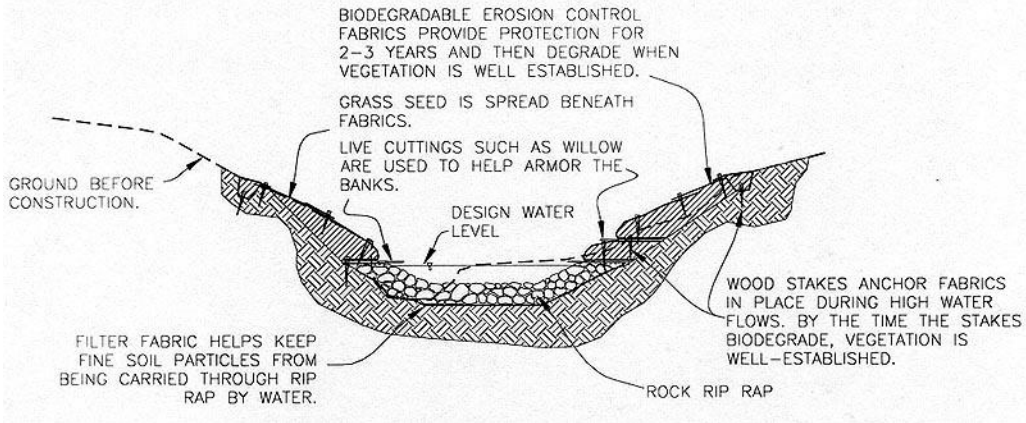
Cost Level			
LOW	MODERATE	HIGH	VERY HIGH



Erosional activity near outfalls from residential areas, facing SW

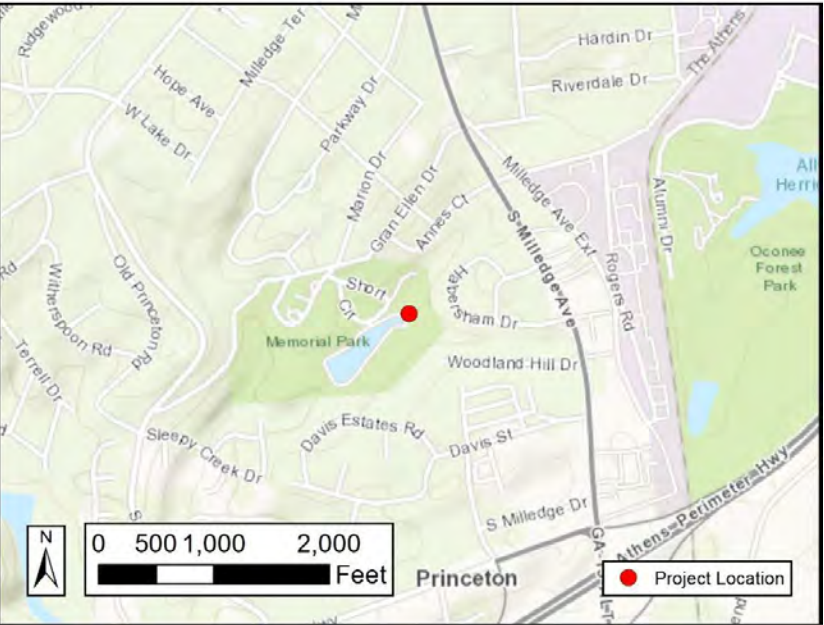
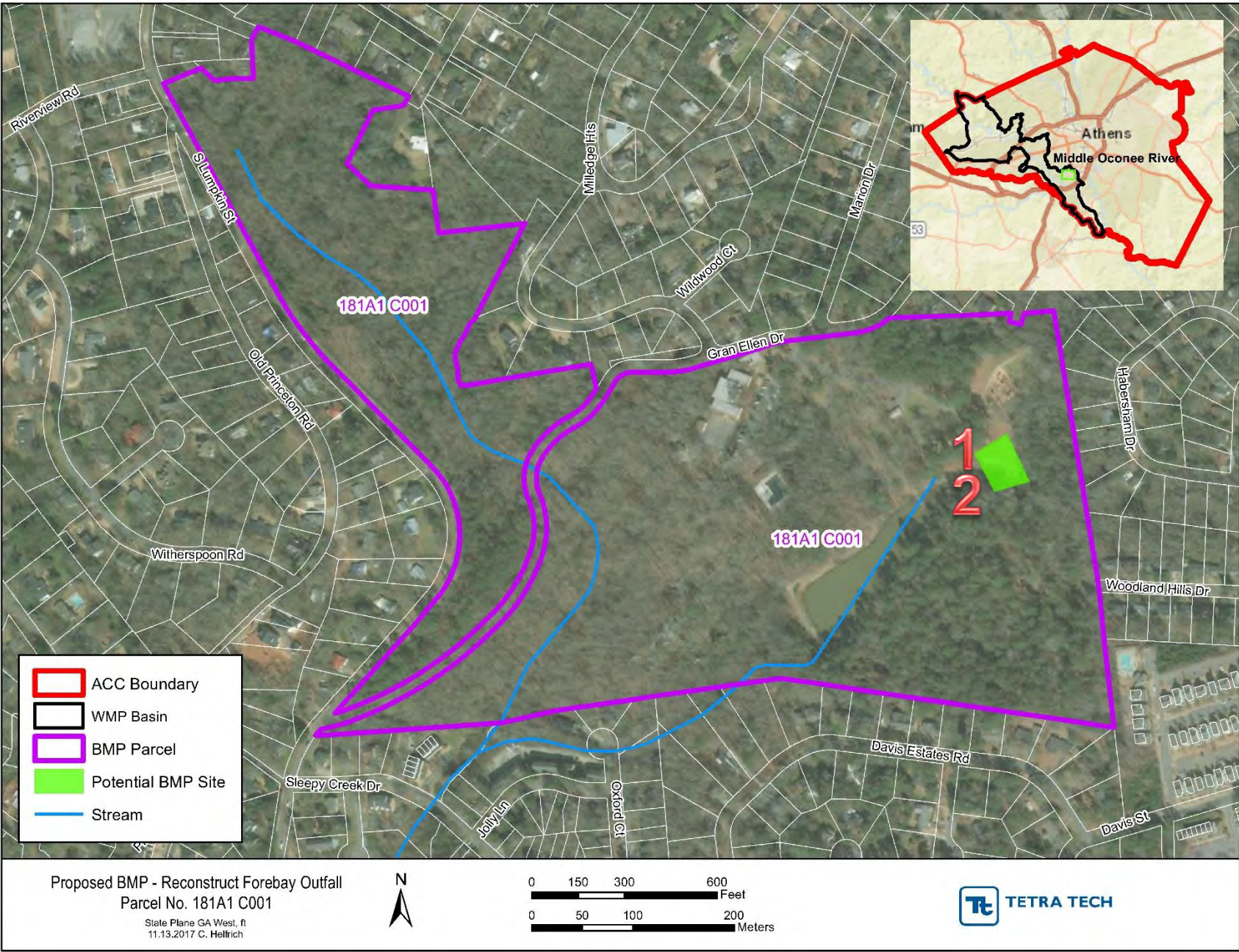


Unstable outfall along Gran Ellen Dr., facing West



Example stabilization cross section using rip rap channels and a vegetated buffer





BMP ID	
MO-Res-08	
Benefits	
Peak Flow Attenuation	
Nutrient Uptake	
Sediment Removal	✓
Beautification	✓
Improved Stream Function	

Site Location			
Parcel Number	181A1 C001	Latitude	33° 55' 55.56" N
Date of Field Visit	10/11/2017	Longitude	83° 23' 19.34" W
Field Visit Personnel	EG, CH	Street Address	Gran Ellen Dr.
Major Watershed	Middle Oconee	Landowner	Athens-Clarke Co.

Project Narrative	
Memorial Park Forebay Restoration This project involves replacing the Memorial Park Pond forebay outfall and possibly reconfiguring the forebay outfall into aesthetic feature. Benefits include sediment removal and beautification.	

Cost Level			
LOW	MODERATE	HIGH	VERY HIGH



Existing deteriorating forebay outfall, facing NE

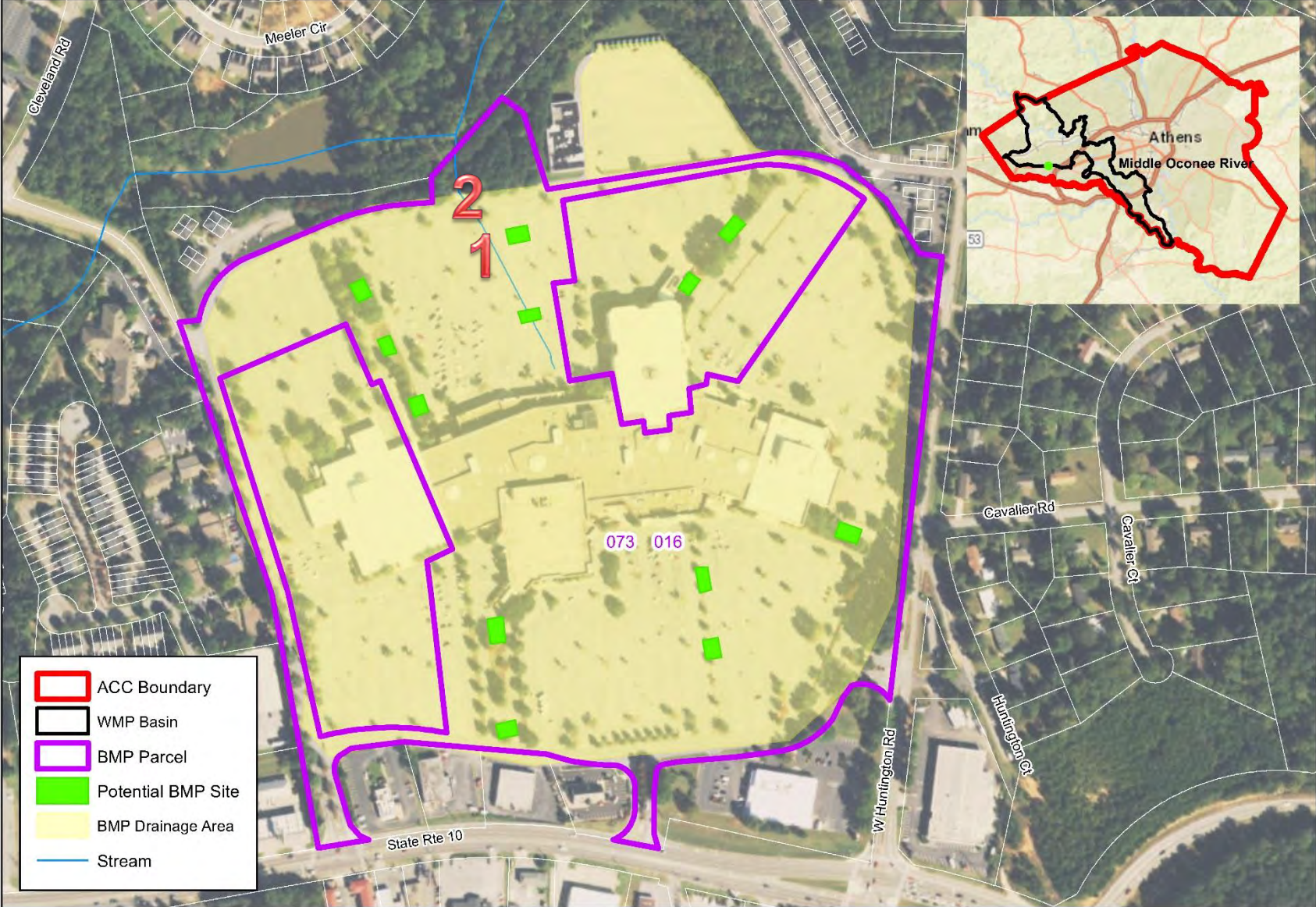


Forebay accumulating sediment, facing NE



Example outfall with cascading water feature

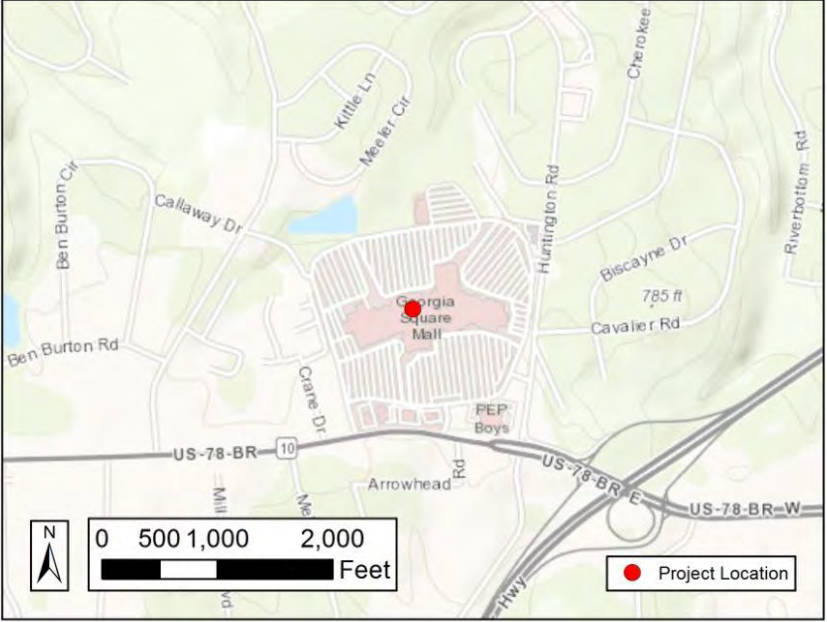




Proposed Structural BMP - Bioretention  
Parcel No. 073 016

0 100 200 400  
Feet

0 50 100 200  
Meters



BMP ID	
MO-Str-01	
Benefits	
Peak Flow Attenuation	
Nutrient Uptake	✓
Sediment Removal	✓
Beautification	✓
Improved Stream Function	

Site Location			
Parcel Number	073 016	Latitude	33° 56' 56.63" N
Date of Field Visit	06/02/2017	Longitude	83° 28' 04.57" W
Field Visit Personnel	JC, JK	Street Address	Atlanta Hwy
Major Watershed	Middle Oconee	Landowner	KDI Athens Mall LLC

Project Narrative

Georgia Square Mall Bioretention  
This project involves retrofitting the current parking lots through a system of bioretention cells distributed throughout the property. Bioretention cells outfitted with underdrains would collect stormwater runoff from the mall roof and parking lots currently serviced by a convential drain system. Overflow from larger storms could be routed to the existing stormwater drainage system. Bioretention would provide nutrient uptake, remove sediment from runoff, and beautification benefits.

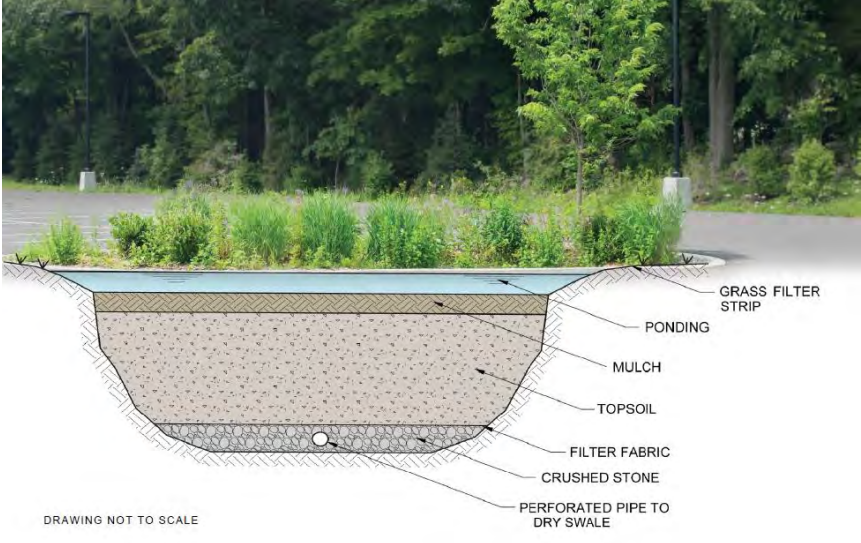
Cost Level			
LOW	MODERATE	HIGH	VERY HIGH



Current parking lot and typical stormwater inlet, facing South

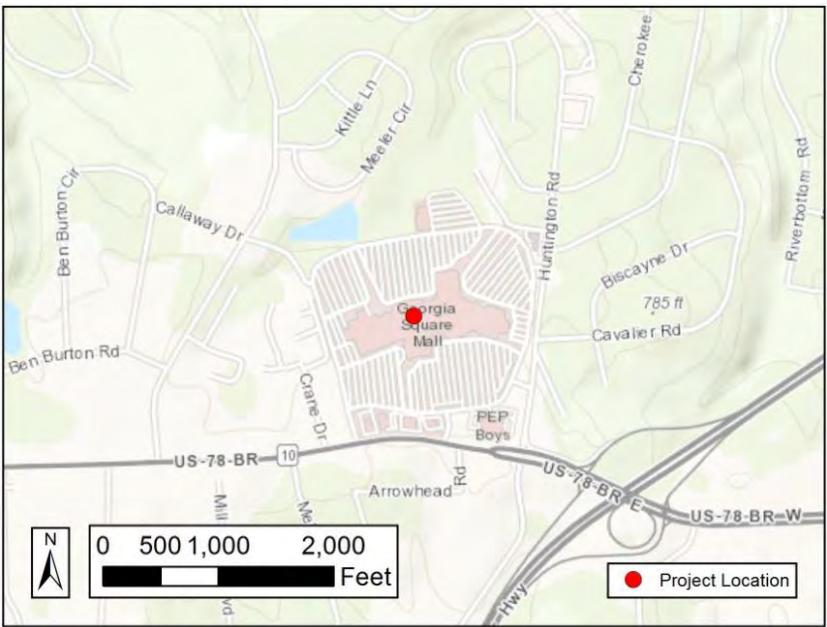
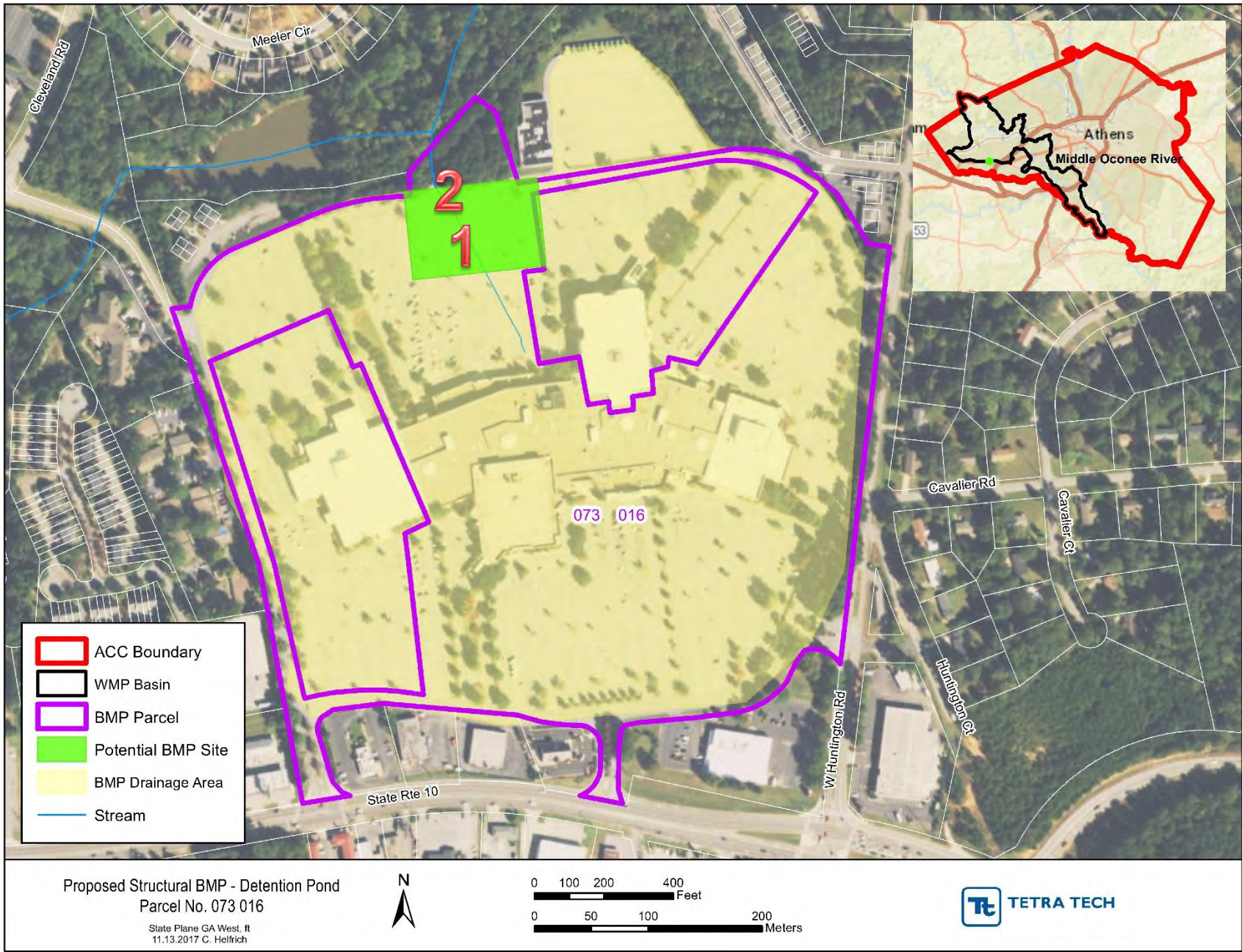


Current conditions at stormwater outfall location, facing North



Typical bioretention island section



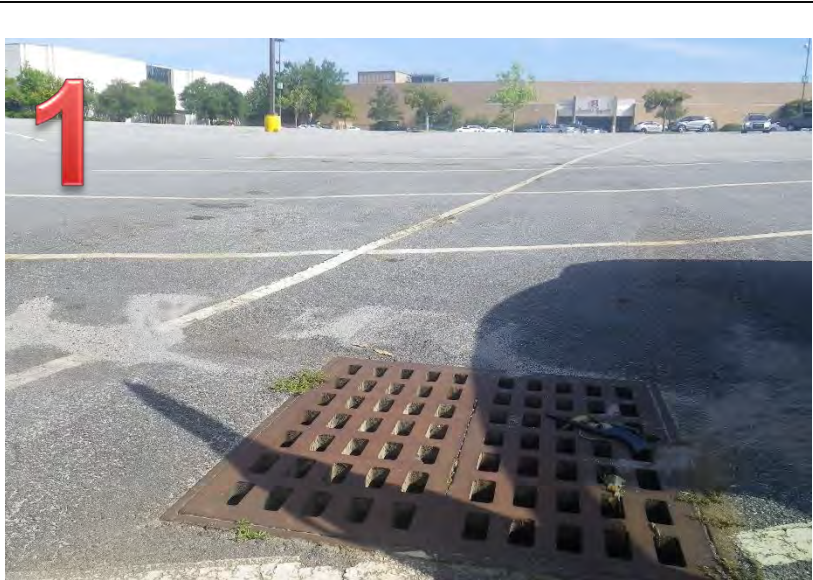


BMP ID	
MO-Str-02	
Benefits	
Peak Flow Attenuation	✓
Nutrient Uptake	
Sediment Removal	✓
Beautification	✓
Improved Stream Function	✓

Site Location			
Parcel Number	073 016	Latitude	33° 56' 56.63" N
Date of Field Visit	06/02/2017	Longitude	83° 28' 04.57" W
Field Visit Personnel	JC, JK	Street Address	Atlanta Hwy
Major Watershed	Middle Oconee	Landowner	KDI Athens Mall LLC

Project Narrative	
Georgia Square Mall Detention This project involves the construction of a large wet detention pond to manage stormwater runoff for the Mall property. The mall property is 95% impervious. Stormwater runoff is conveyed through a conventional stormwater system that does not contain any stormwater BMPs and does not meet current stormwater management requirements. Benefits include substantial peak flow attenuation, sediment removal, beautification, and improved stream function.	

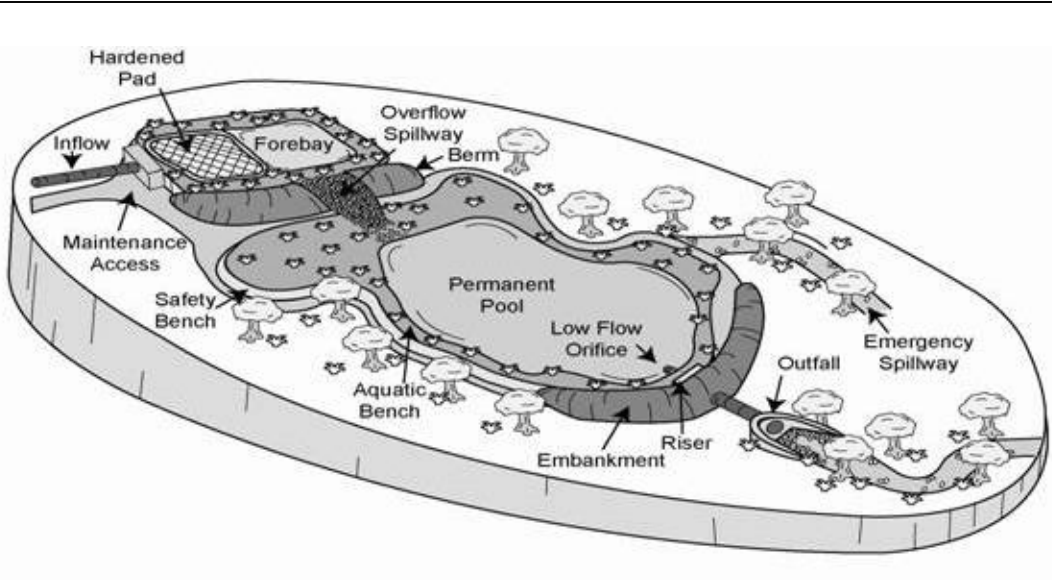
Cost Level			
LOW	MODERATE	HIGH	VERY HIGH



Current parking lot and typical stormwater inlet, facing South

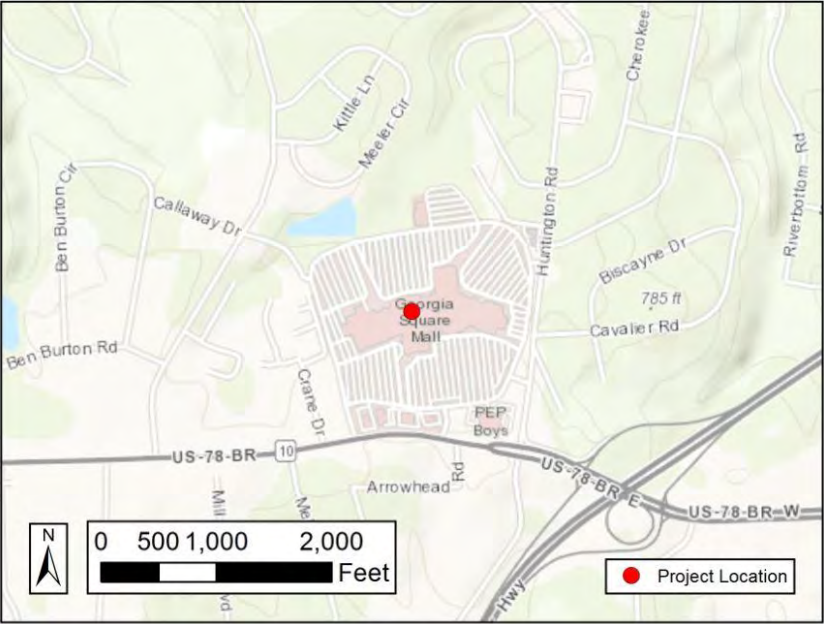
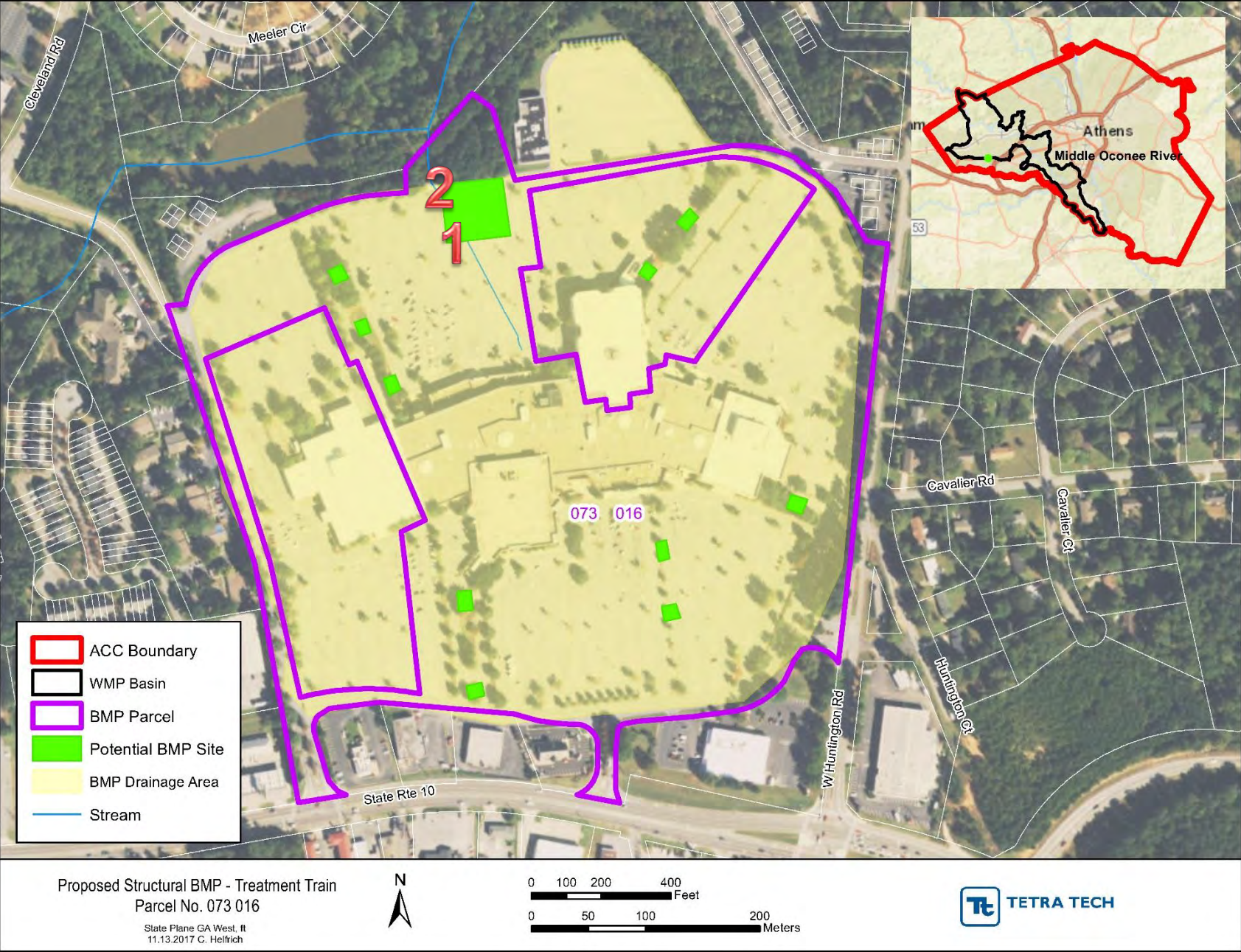


Current conditions at stormwater outfall location, facing North



Example wet pond configuration





BMP ID	
MO-Str-03	
Benefits	
Peak Flow Attenuation	✓
Nutrient Uptake	✓
Sediment Removal	✓
Beautification	✓
Improved Stream Function	

Site Location			
Parcel Number	073 016	Latitude	33° 56' 56.63" N
Date of Field Visit	06/02/2017	Longitude	83° 28' 04.57" W
Field Visit Personnel	JC, JK	Street Address	Atlanta Hwy
Major Watershed	Middle Oconee	Landowner	KDI Athens Mall LLC

Project Narrative	
Georgia Square Mall Treatment Train This project involves the design and construct a stormwater runoff treatment train consisting of bioretention cells in the mall parking lots that overflow into a detention basin. The combination of these two BMP practices is a cost effective strategy to gain the benefits of each, including peak flow attenuation, nutrient uptake, sediment removal, and beautification.	

Cost Level			
LOW	MODERATE	HIGH	VERY HIGH



Current parking lot and typical stormwater inlet, facing South

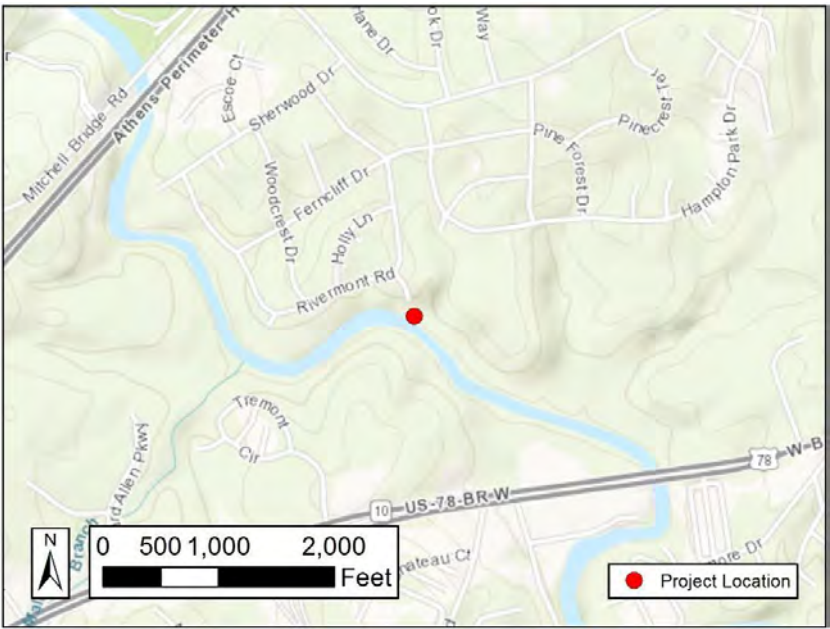
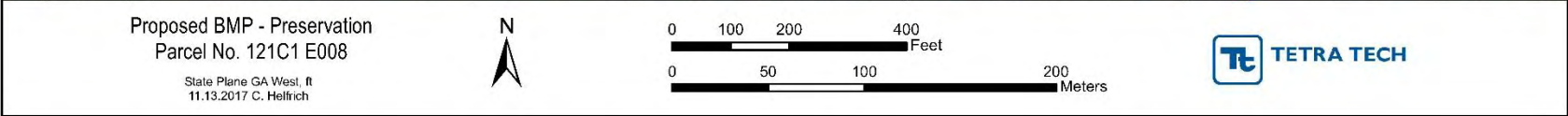


Current conditions at stormwater outfall location, facing North



Example commercial parking lot retrofit





BMP ID  
MO-Res-02

Benefits	
Peak Flow Attenuation	
Nutrient Uptake	✓
Sediment Removal	✓
Beautification	✓
Improved Stream Function	✓

Site Location			
Parcel Number	121C1 E008	Latitude	33° 25' 47.11" N
Date of Field Visit	10/11/2017	Longitude	83° 30' 18.08" W
Field Visit Personnel	EG, CH	Street Address	River Ct.
Major Watershed	Middle Oconee	Landowner	Athens-Clarke Co.

Project Narrative	
Middle Oconee River Buffer Preservation Tetra Tech recommends the continued preservation of this parcel when ACC considers County-wide development plans. The area surrounding the property has experienced the expansion of suburban housing development, the effects of which include disturbing natural stream drainage through increased runoff that tends to cause erosion and the transport of pollutants and sediment. Benefits of preservation include nutrient uptake, sediment removal, beautification, and improved stream function.	

Cost Level			
LOW	MODERATE	HIGH	VERY HIGH



Typical stream conditions throughout parcel, facing North

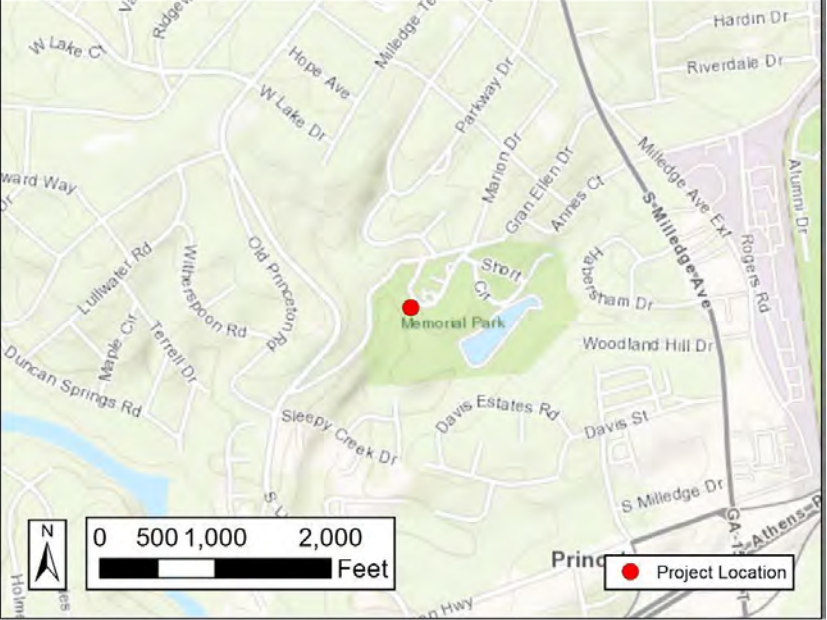
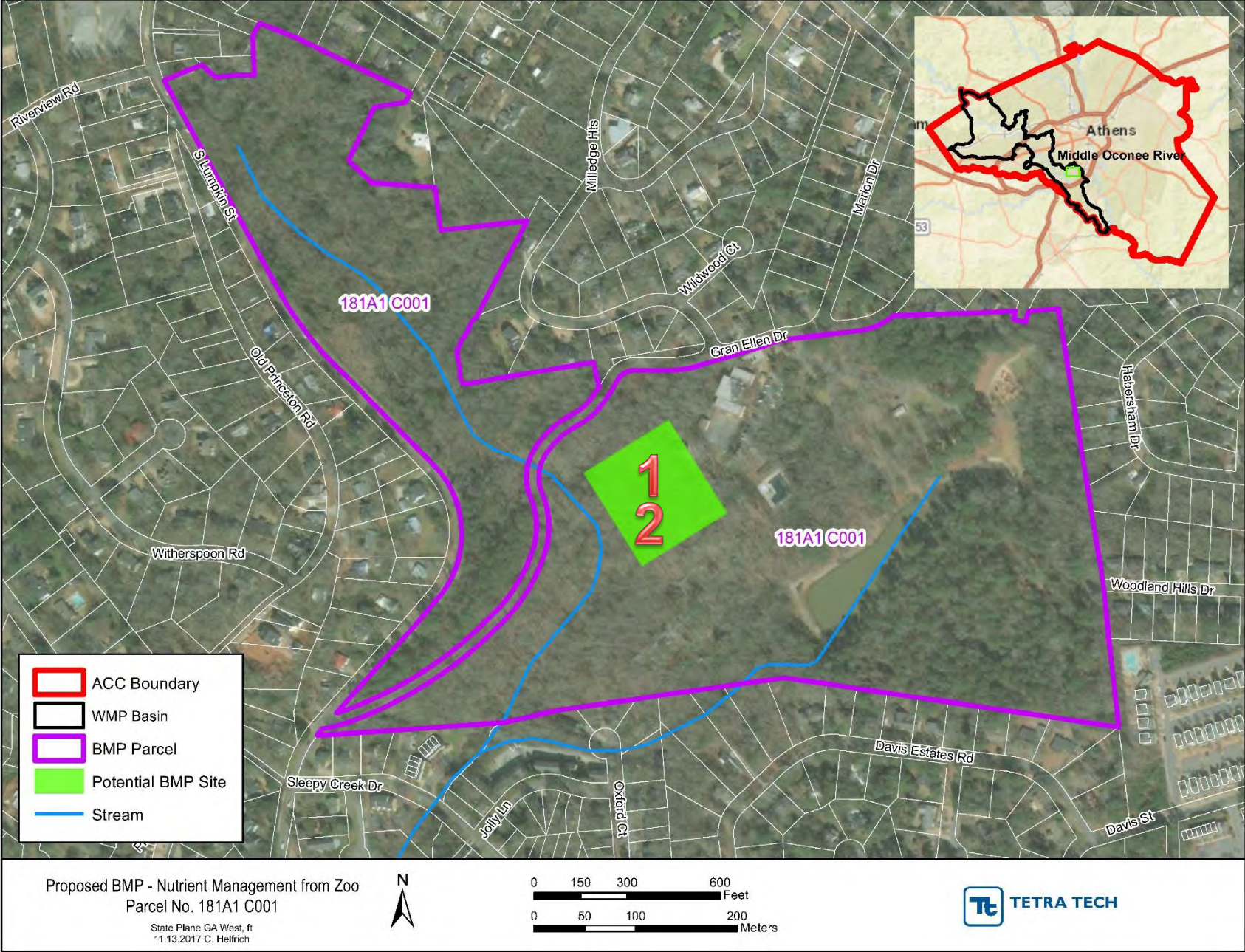


Typical stream conditions throughout parcel, facing SE



Existing preservation signage on site





BMP ID MO-Prog-02	
Benefits	
Peak Flow Attenuation	
Nutrient Uptake	✓
Sediment Removal	
Beautification	
Improved Stream Function	

Site Location			
Parcel Number	181A1 C001	Latitude	33° 55' 55.62" N
Date of Field Visit	10/11/2017	Longitude	83° 23' 15.02" W
Field Visit Personnel	EG, CH	Street Address	Gran Ellen Dr.
Major Watershed	Middle Oconee	Landowner	Athens-Clarke Co.

Project Narrative	
Memorial Park Nutrient Management This involves a possible investigation into nutrient contamination from the Bear Hollow Park Zoo. Innovative waste management practices can reduce potential harmful effects of stormwater runoff that could be contributing nutrient loads to the surrounding natural water ways. Benefits include nutrient uptake.	

Cost Level	
UNKNOWN/VARIES	



Variety of animals living at Bear Hollow Zoo

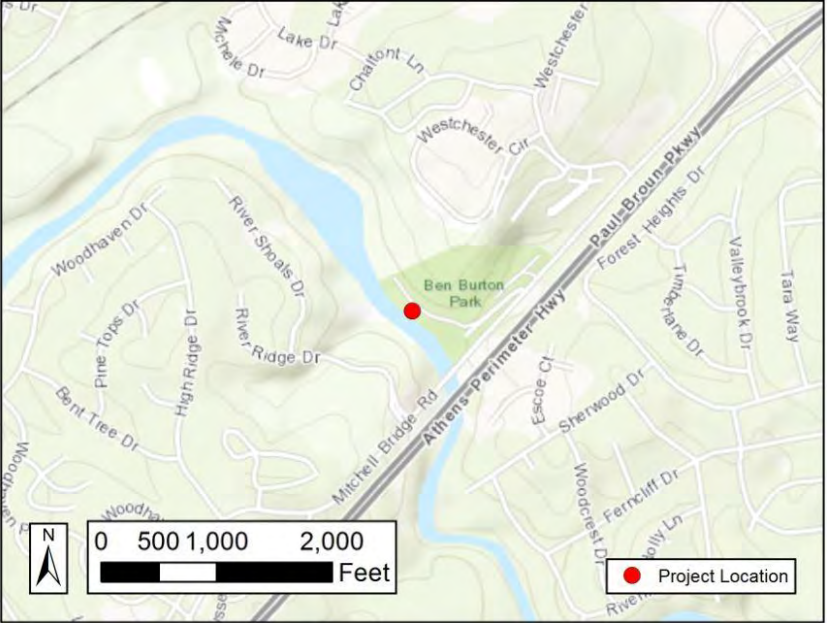
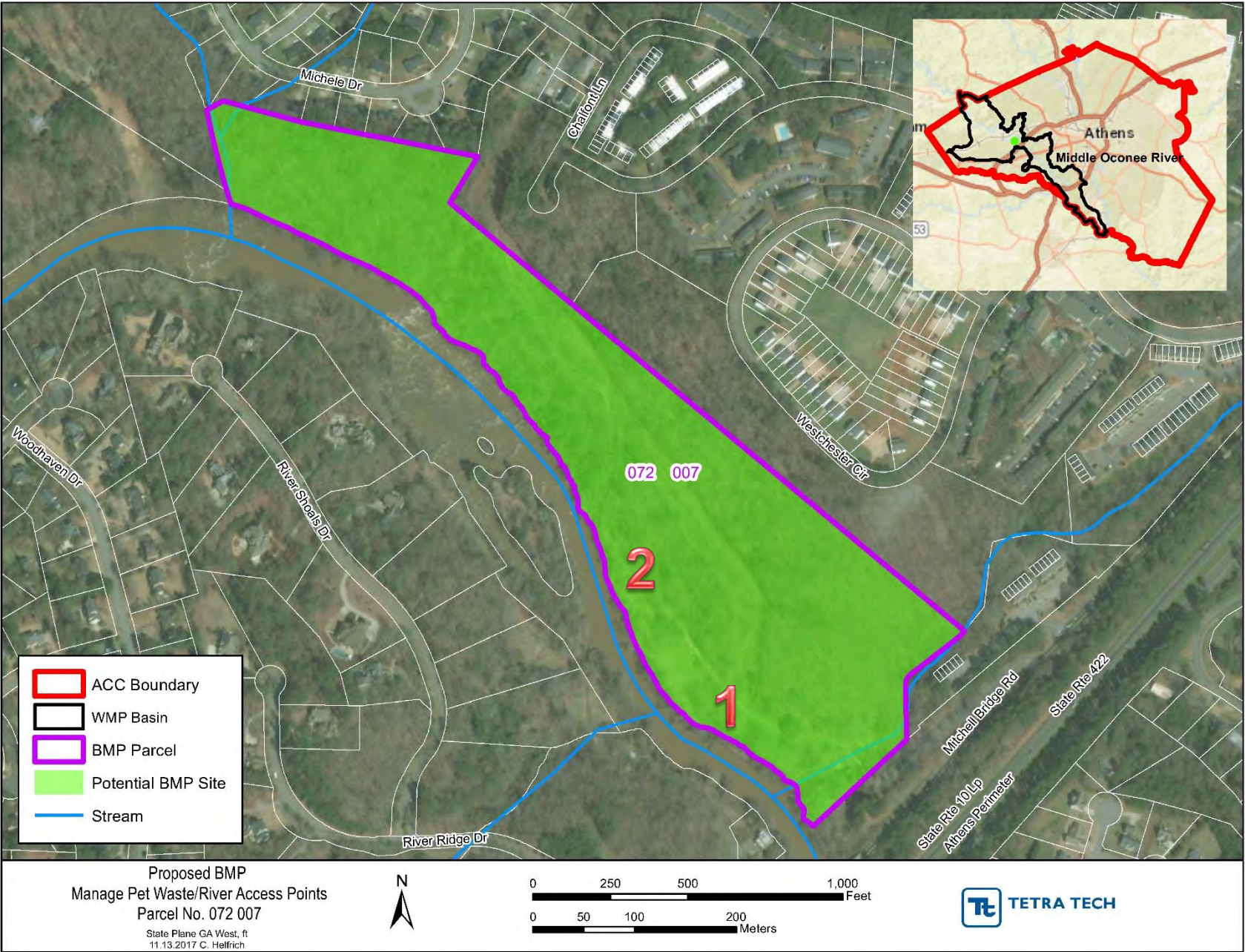


Lynx and enclosure in Bear Hollow Zoo



Innovative solution to animal waste management at the Detroit Zoo





BMP ID	
MO-Res-01	
Benefits	
Peak Flow Attenuation	
Nutrient Uptake	✓
Sediment Removal	✓
Beautification	✓
Improved Stream Function	

Site Location			
Parcel Number	072 007	Latitude	33° 57' 57.48" N
Date of Field Visit	05/31/2017	Longitude	83° 26' 18.93" W
Field Visit Personnel	JC, JK	Street Address	Mitchell Bridge Rd
Major Watershed	Middle Oconee	Landowner	Athens-Clarke Co.

Project Narrative	
Ben Burton Park Pet Waste and Managed Access This project involves the augmentation of pet waste collection measures through pet waste stations and additional signage to reduce fecal coliform pollution in conjunction with construction of managed access points to the Middle Oconee River that include steps and a vegetated buffer to mitigate bank erosion. Potentially deter park users from unofficial access points through fencing and strategic vegetation. Benefits include nutrient uptake, runoff sediment reduction, and beautification.	

Cost Level			
LOW	MODERATE	HIGH	VERY HIGH



Erosional activity at river access point, facing East

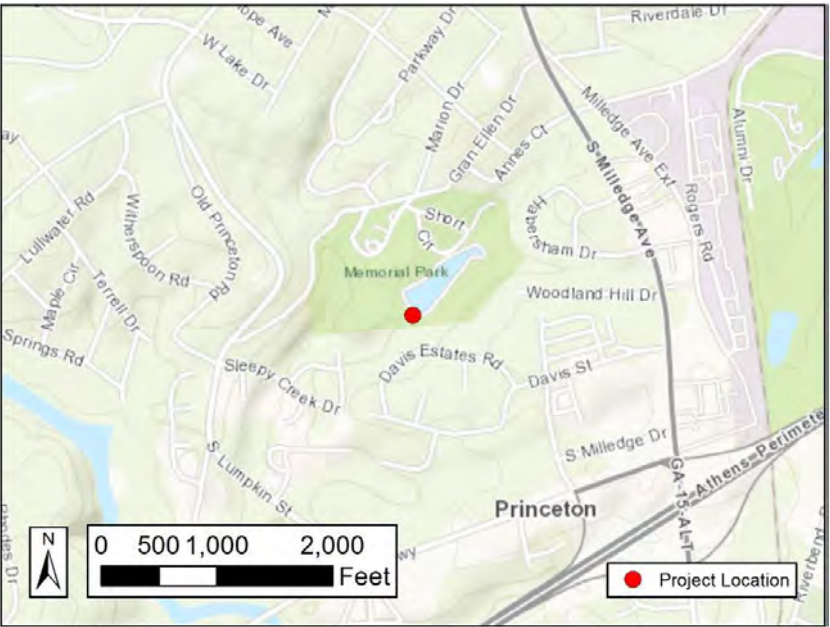
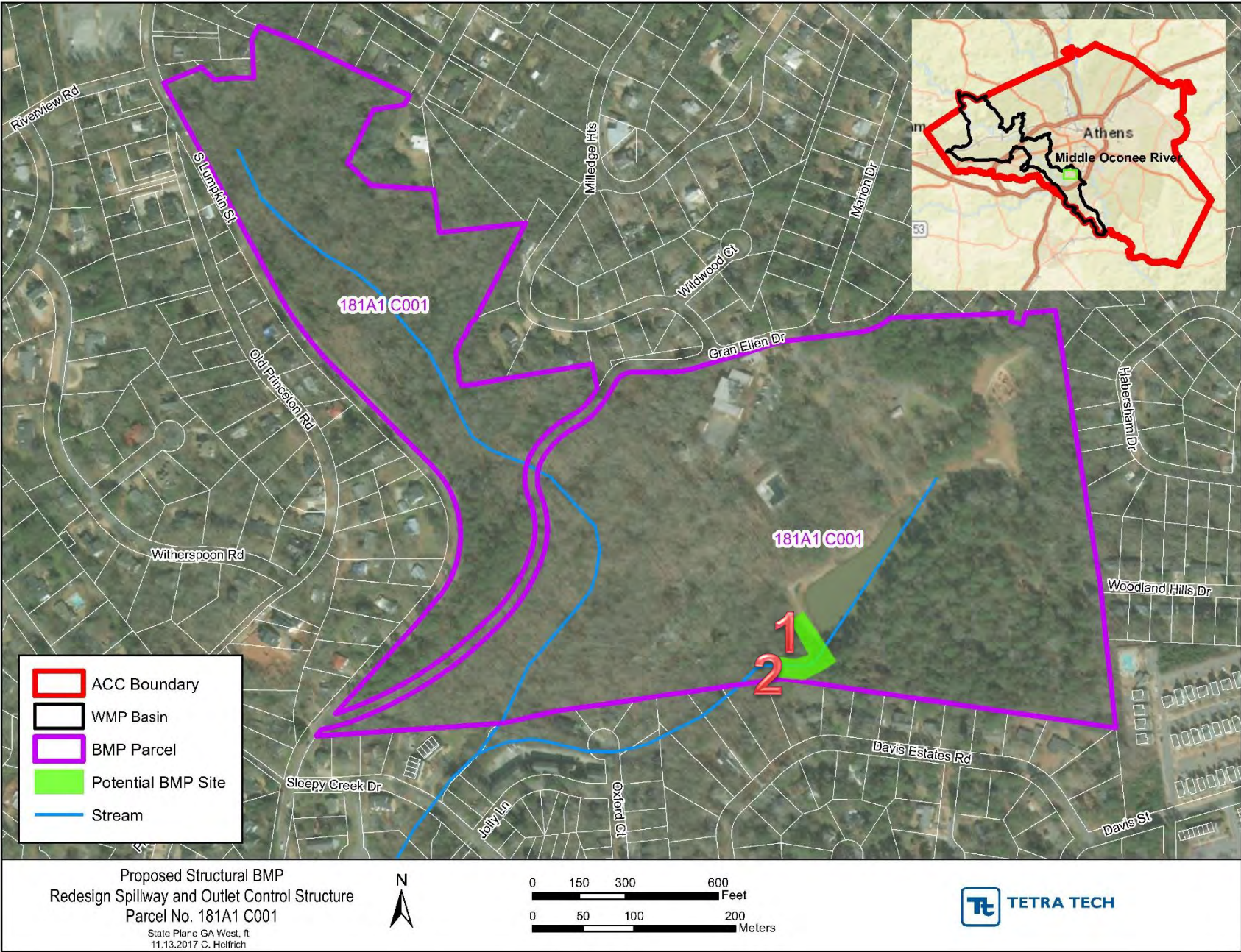


Open grassed area of park, facing SE



Example river access paths with stabilized banks





BMP ID	
MO-Res-03	
Benefits	
Peak Flow Attenuation	✓
Nutrient Uptake	✓
Sediment Removal	✓
Beautification	✓
Improved Stream Function	✓

Site Location			
Parcel Number	181A1 C001	Latitude	33° 55' 55.54" N
Date of Field Visit	10/11/2017	Longitude	83° 23' 09.03" W
Field Visit Personnel	EG, CH	Street Address	Gran Ellen Dr.
Major Watershed	Middle Oconee	Landowner	Athens-Clarke Co.

Project Narrative	
Memorial Park Outlet Control and Spillway This project involves redesigning and modifying emergency spill way and outlet control structure of Memorial Park Pond, including repairs to the gully. Observations during the field visit indicated that high flows are contributing to mass wasting of the banks in the gully downstream of the emergency spillway and high sediment deposits. Benefits include peak flow attenuation, nutrient uptake, sediment removal, beautification, and improved stream function.	

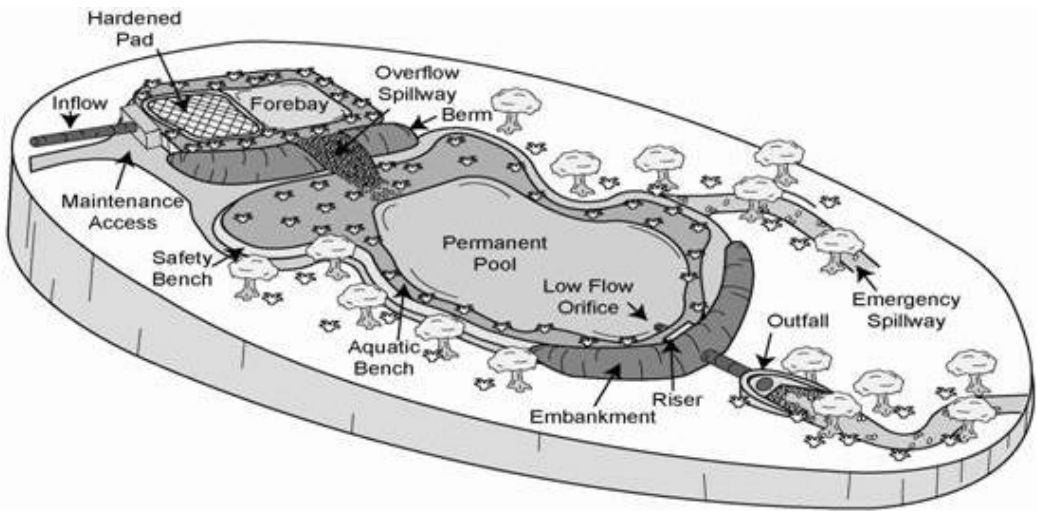
Cost Level			
LOW	MODERATE	HIGH	VERY HIGH



Location of emergency spillway, facing NE towards pond

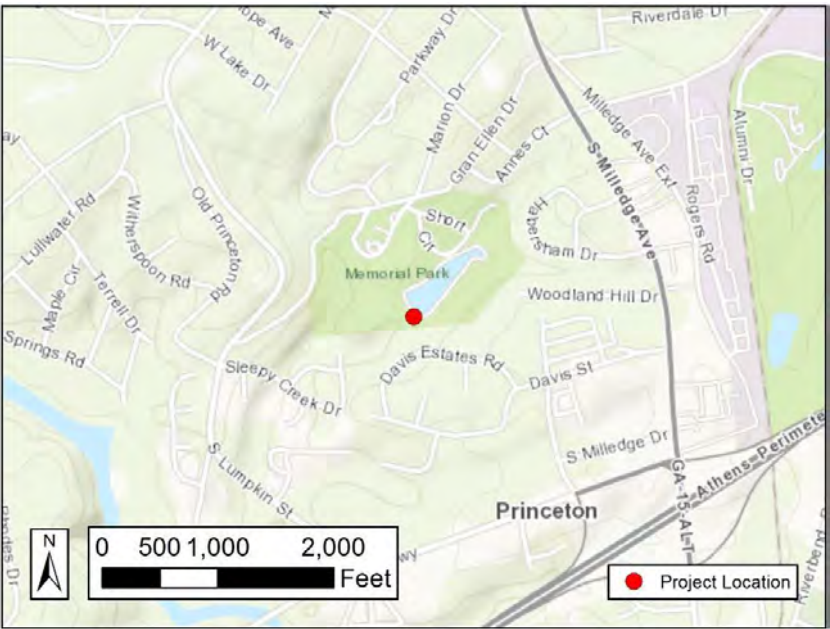
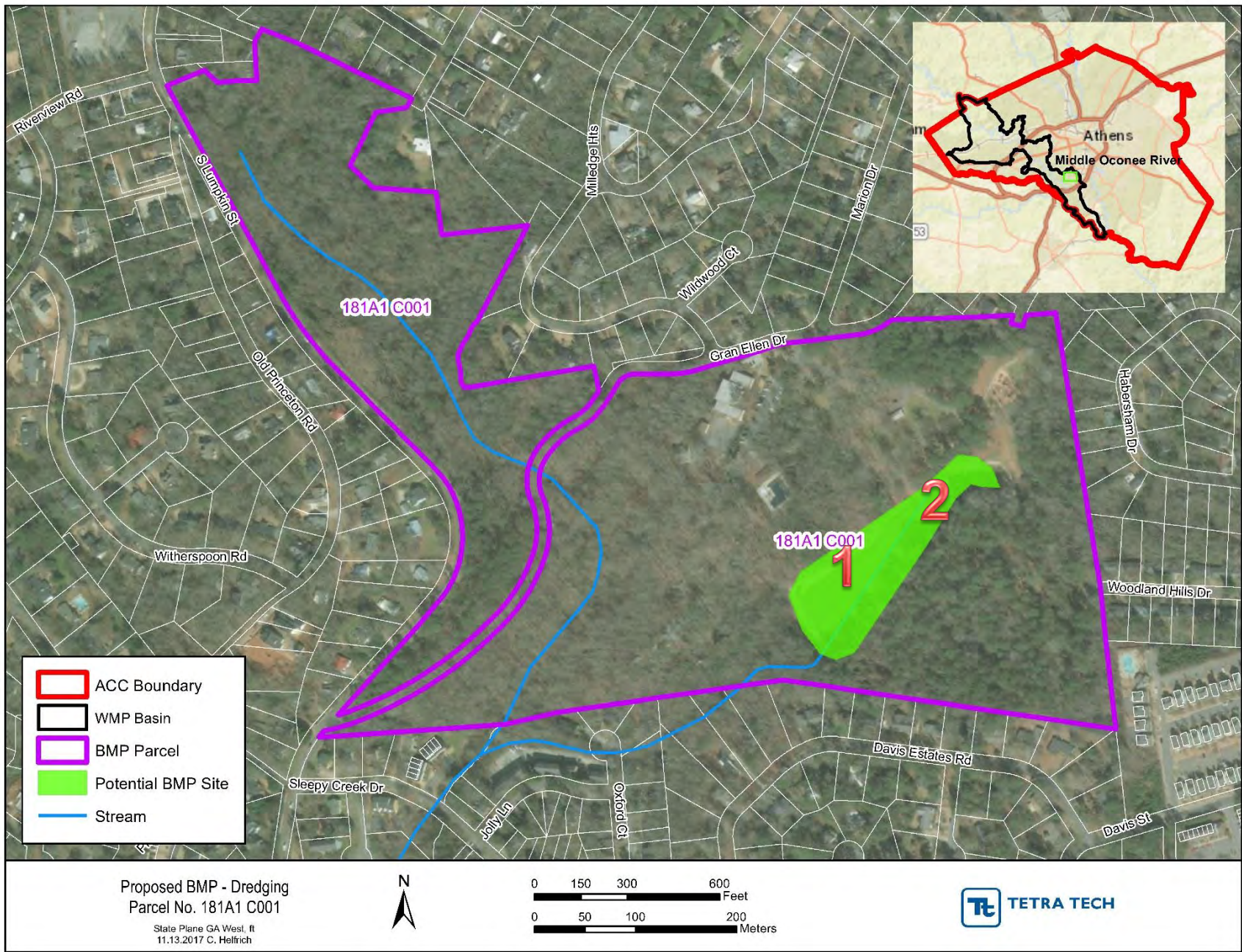


Typical conditions of the emergency spillway gully, facing West



Example typical detention pond and emergency spillway configuration





BMP ID  
MO-Res-04

Benefits

Peak Flow Attenuation	
Nutrient Uptake	✓
Sediment Removal	✓
Beautification	✓
Improved Stream Function	

Site Location

Parcel Number	181A1 C001	Latitude	33° 55' 55.54" N
Date of Field Visit	10/11/2017	Longitude	83° 23' 09.03" W
Field Visit Personnel	EG, CH	Street Address	Gran Ellen Dr.
Major Watershed	Middle Oconee	Landowner	Athens-Clarke Co.

Project Narrative

**Memorial Park Pond Dredging**  
This project involves the analysis of sediment load being delivered to the Memorial Park Pond and desired amount of material, and possibly remove the island in the upper portion of the pond, to continue to provide a safe and enjoyable public amenity. Benefits include nutrient uptake, sediment removal, and beautification.

Cost Level

LOW	MODERATE	HIGH	VERY HIGH
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ATHENS-CLARKE COUNTY  
WATERSHED MANAGEMENT PLAN  
LOCATION: MIDDLE OCONEE RIVER WATERSHED



Pond tributary contributing sediment, facing NE

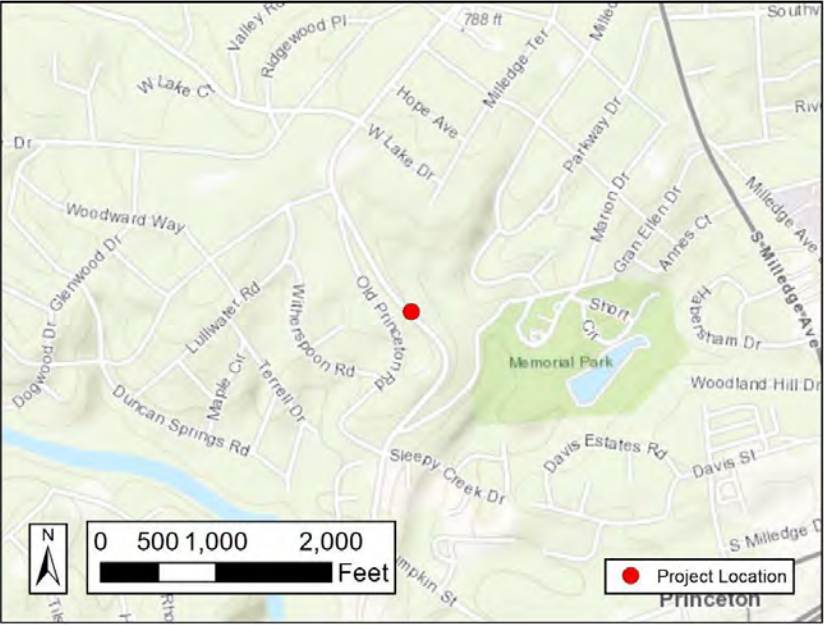


Algal buildup near "island" at North end of pond, facing North



Typical mechanical pond dredging operations





BMP ID MO-Res-05	
Benefits	
Peak Flow Attenuation	
Nutrient Uptake	
Sediment Removal	✓
Beautification	✓
Improved Stream Function	✓

Site Location			
Parcel Number	181A1 C001	Latitude	33° 55' 55.67" N
Date of Field Visit	10/11/2017	Longitude	83° 23' 26.07" W
Field Visit Personnel	EG, CH	Street Address	S. Lumpkin St.
Major Watershed	Middle Oconee	Landowner	Athens-Clarke Co.

Project Narrative			
Memorial Park – South Lumpkin Street Outfall Repair and Bank Stabilization This project involves the construction of a stormwater outfall and reshape/stabilize the banks of a drainage channel that are currently mass wasting during high flows from a road culvert crossing South Lumpkin Street. The channel is nearly six feet deep with bare vertical walls and is a tributary to one of the main streams flowing through Memorial Park. Benefits include reduced sediment transport, beautification, and improved stream function.			
Cost Level			
LOW	MODERATE	HIGH	VERY HIGH



Mass wasting at outfall, facing West towards Lumpkin St.

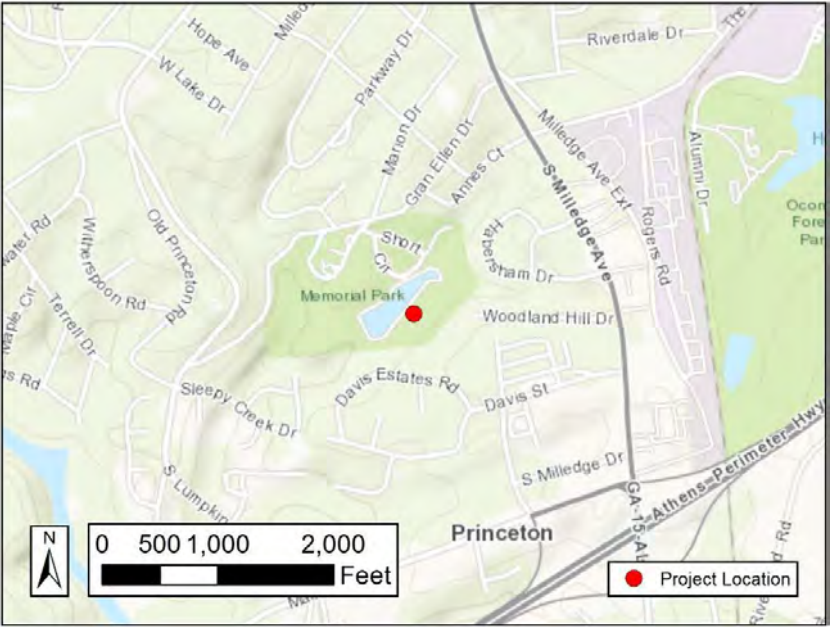
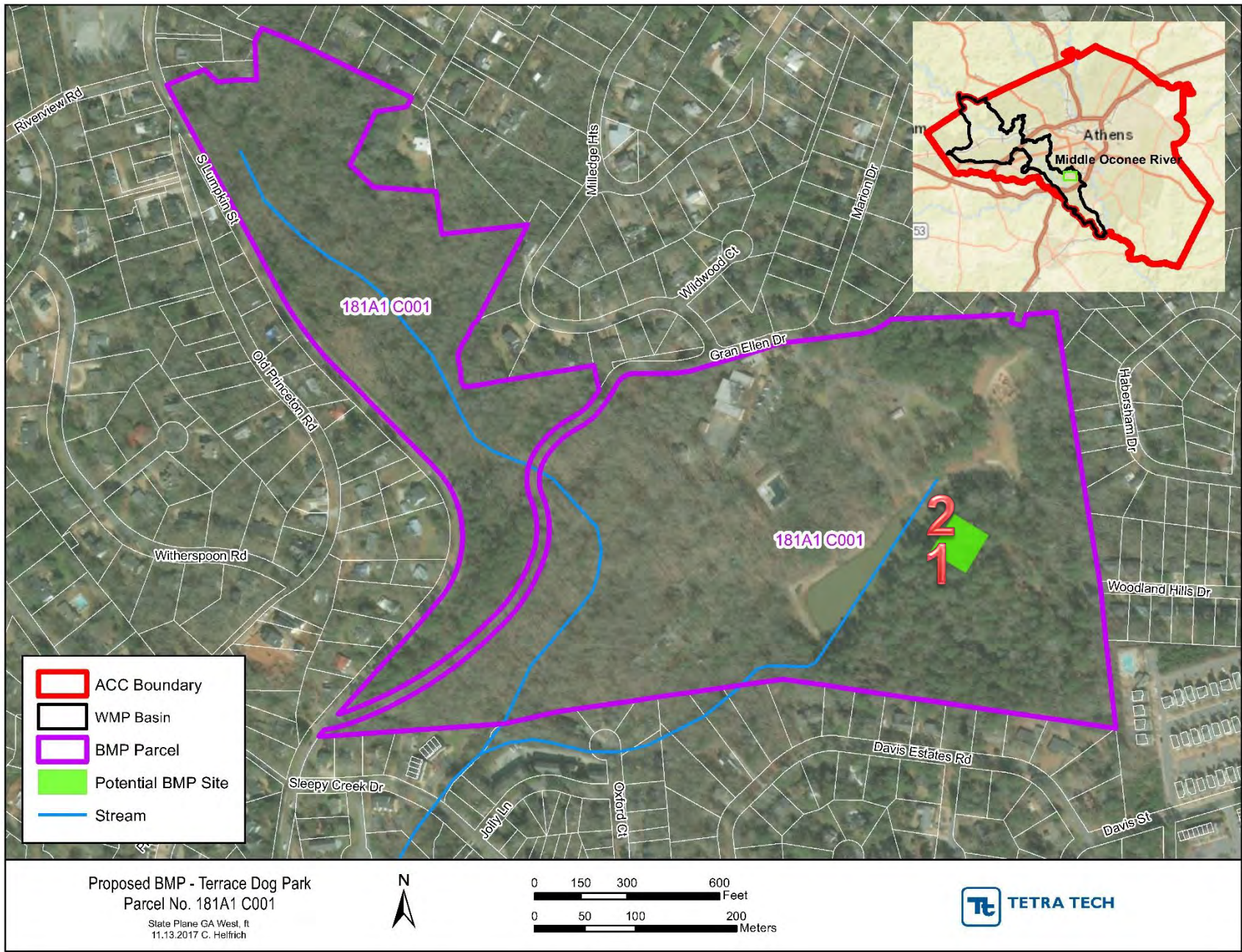


Mass wasting at outfall, facing East



Example stormwater outfall retrofit using regenerative stormwater conveyance





BMP ID	
MO-Res-06	
Benefits	
Peak Flow Attenuation	
Nutrient Uptake	
Sediment Removal	✓
Beautification	✓
Improved Stream Function	

Site Location			
Parcel Number	181A1 C001	Latitude	33° 55' 55.57" N
Date of Field Visit	10/11/2017	Longitude	83° 23' 04.44" W
Field Visit Personnel	EG, CH	Street Address	Gran Ellen Dr.
Major Watershed	Middle Oconee	Landowner	Athens-Clarke Co.

Project Narrative	
Memorial Park – Dog Park Terracing This project includes regrading or terracing the sloped area currently being used as a dog park and planting additional vegetative cover. Groundcover vegetation is sparse and overland stormwater flow has caused widespread erosion that visibly transports soil to the lake below. Regrading or terracing this area, possibly using supplemental dredge material from the lake, may allow for vegetation to become established and reduce erosional activity. This project should be done prior to dredging the pond in Memorial Park, if feasible.	

Cost Level			
LOW	MODERATE	HIGH	VERY HIGH

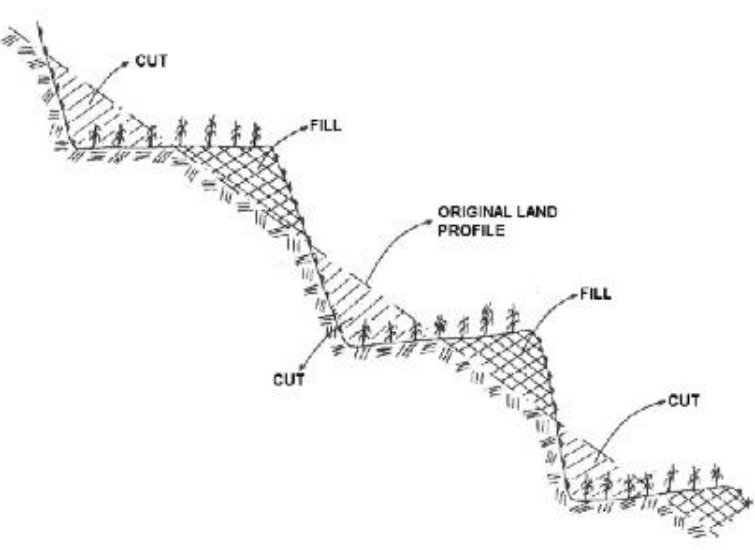
ATHENS-CLARKE COUNTY  
WATERSHED MANAGEMENT PLAN  
LOCATION: MIDDLE OCONEE RIVER WATERSHED



Existing bare sloped surface of dog park, facing East



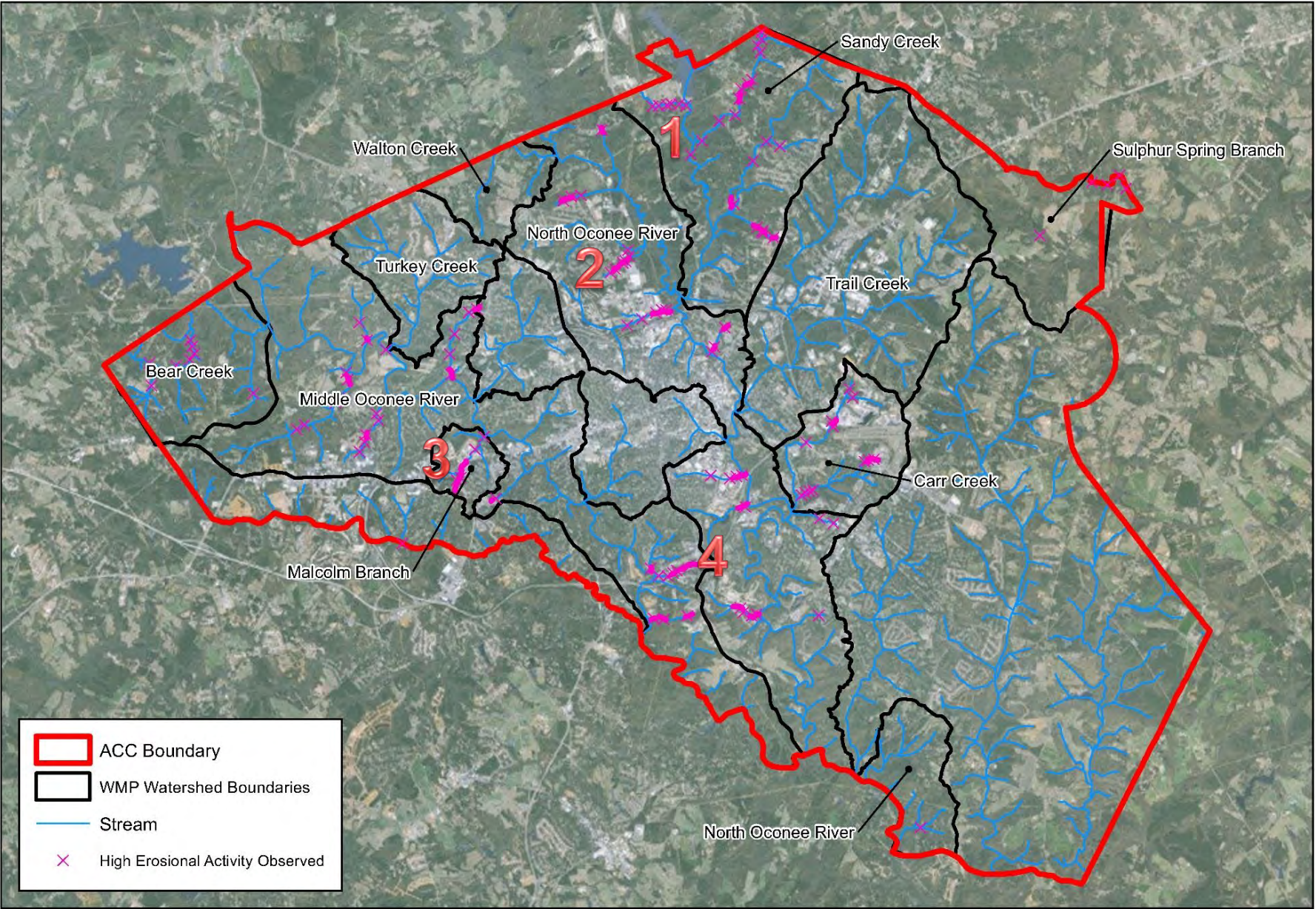
Existing slope to pond from dog park, facing West



Typical bench terrace profile







Proposed Programmatic BMP  
Implement Bank Stability Activities

State Plane GA West, ft  
11.13.2017 C. Helfrich

0 0.5 1 2 3 Miles  
0 1 2 4 Kilometers

**TETRA TECH**



Bank erosion and failure along Sandy Creek/Cooks Trail



Bank erosion along a tributary to the North Oconee River



Bank erosion and failure along a tributary to the Middle Oconee River



Bank erosion along Malcolm Branch

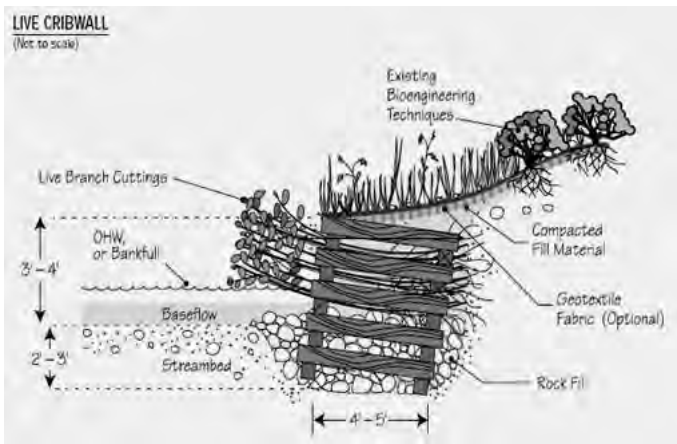
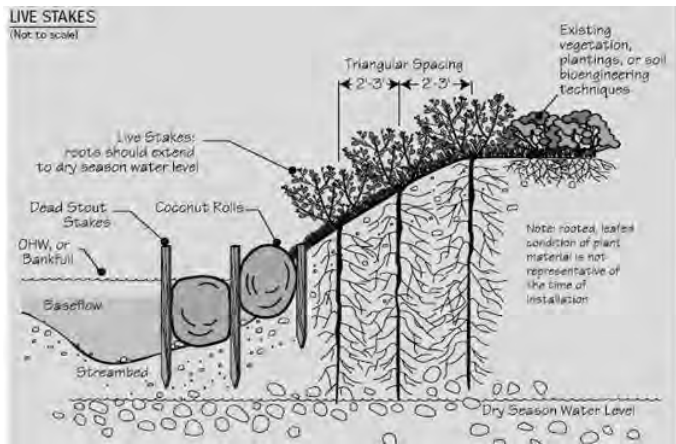
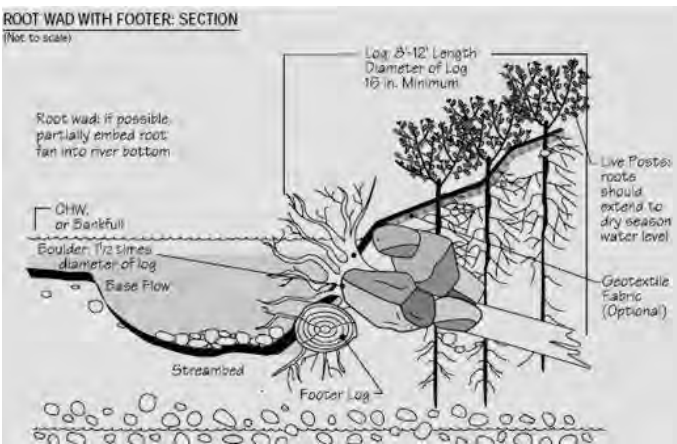
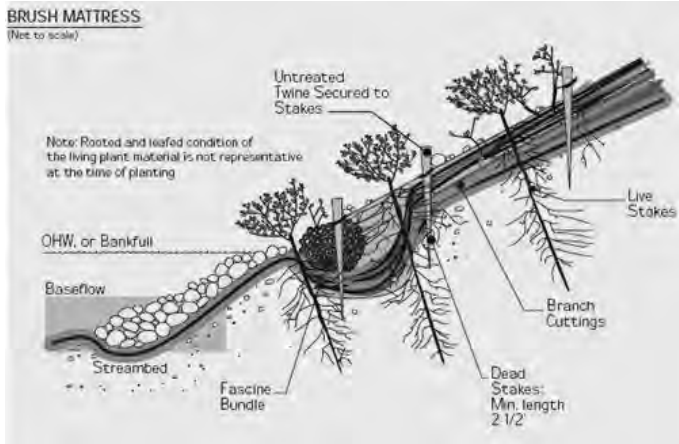
BMP ID ACC-Prog-02	
Project Narrative	Benefits
Bank Stabilization Bank stabilization activities along Sandy Creek/Cooks Trail and other high erosion areas can control and prevent erosion at problem spots along ACC streams. Measures such as vegetative stabilization, bioengineering, sills, riprap, revetment, gabion baskets, stream barbs, and bulkheads, or combinations of these techniques can be implemented under Nationwide Permit #13, provided the activity is no more than 500 feet in length along the bank, and will not exceed an average of one cubic yard per running foot below the ordinary high water mark. Work with the Sustainability Office to utilize silviculture and forestry options as part of vegetative maintenance.	Peak Flow Attenuation
	Nutrient Uptake
	Sediment Removal
	Beautification
Cost Level	
VARIES	

ATHENS-CLARKE COUNTY  
WATERSHED MANAGEMENT PLAN  
LOCATION: HIGH EROSION AREAS





# TYPICAL STREAM BANK STABILIZATION DESIGNS AND EXAMPLES



## ALTERNATIVES

Concrete revetment at tributary entrance



Gabion baskets



Riprap revetment

