

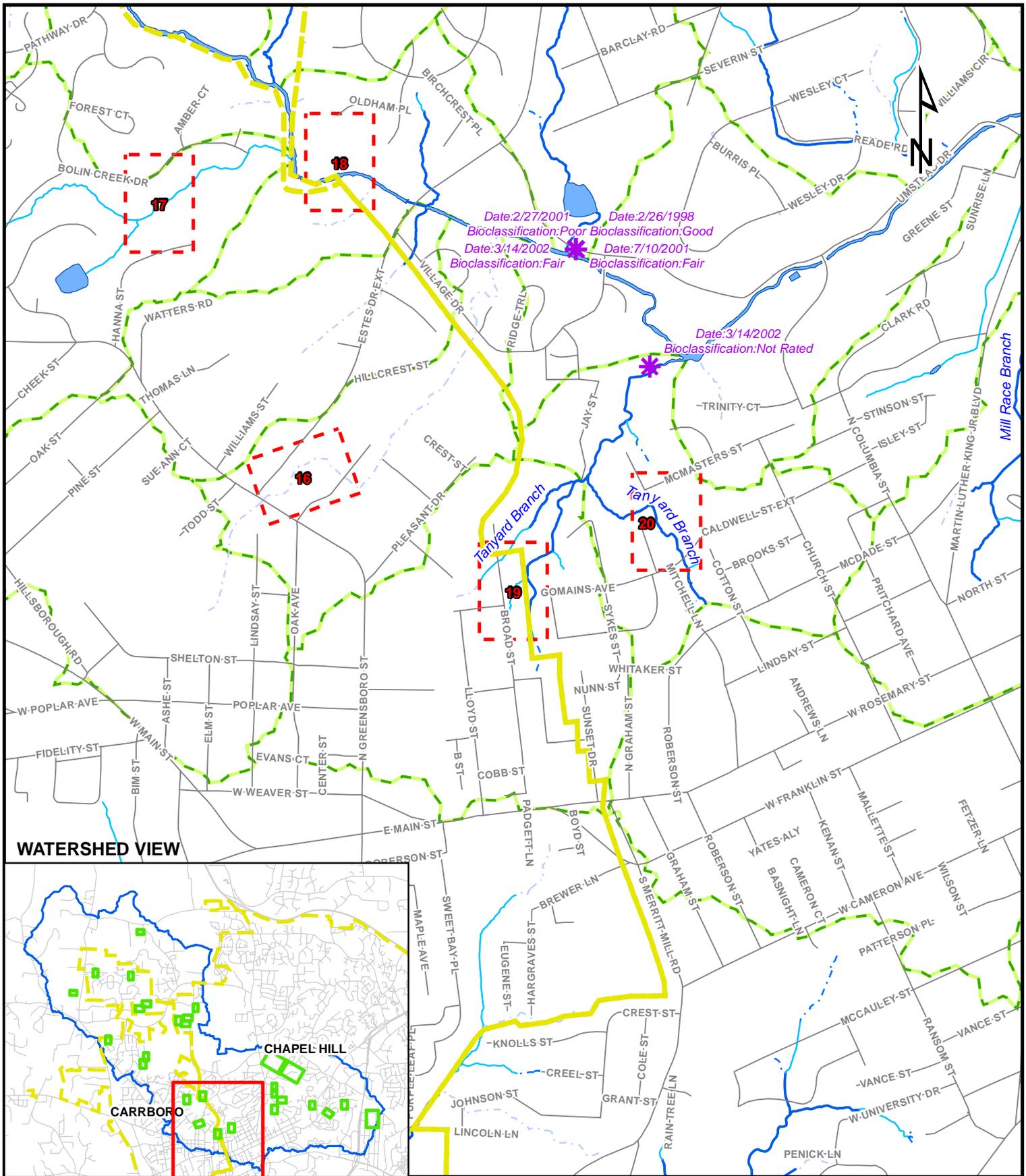
SITE 19

Stream Restoration/Bank Stabilization in Park

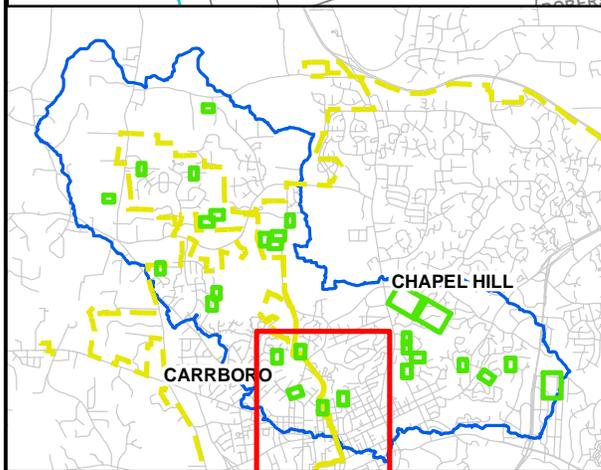
Index Sheet No.: 23
Raw Data Name: TA 29-31



Estimated Construction Cost: \$10,300-\$15,500



WATERSHED VIEW



Legend

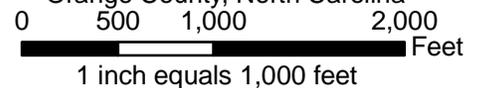
- Ambient Monitoring
- Benthic Monitoring
- Fish Sampling
- Municipal Boundary
- Orange County Roads
- Subwatersheds
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Stream, unknown flow



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**SITE 19
VICINITY MAP**

Geomorphic Analysis and Identification of Potential Sites for Stormwater BMPs
Orange County, North Carolina



Project Description

	Drainage Area (acres)	Impervious Area (acres)	% Impervious
Site 19	149.5	31.5	21.0%

Location

Site 19 is located in a public park off of Broad Street and approximately 0.25 miles north of Rosemary Street/E. Main Street.

Problem Description

Site 19 consists approximate 165 feet of an incised reach of Tanyard Branch, with actively eroding, vertical banks and lack of a riparian buffer. Upstream of the site, the stream is completely piped, and emerges from a culvert after passing under Broad Street, where it then flows through a town-owned park. The eroding streambanks are likely the result of what was observed to be repeated mowing up to the stream (mechanical stresses on the channel) and a lack of riparian buffer to resist the high shear stress coming from the concentrated flow discharge of the upstream pipe network. The eroding stream banks are causing export of sediment and associated nutrients. A preliminary investigation of streambank erosion potential using the BANCS model indicates that approximately 29 tons of sediment is being exported from the site each year. Concomitant nutrient export associated with the sediment has also been calculated and is listed in **Table 19.1**.

Table 19.1

Pre-Treatment	
Estimated Total Sediment Export	28.3 tons/year
Erosion per length of Channel	2.4 tons/yr/ft
Pounds of Nitrogen	56.6 lbs/year
Pounds of Phosphorus	28.3 lbs/year
Post-Treatment	
Estimated Total Sediment Export	0.5 tons/year
Erosion per length of Channel	0 tons/yr/ft
Pounds of Nitrogen	1 lbs/year
Pounds of Phosphorus	0.5 lbs/year

Proposed Solution

As with other bank stabilization/restoration projects, this site could benefit primarily from a change in the stream cross-section that provides the following:

Bolin Creek Watershed
Geomorphic Analysis and Potential Site Identification for Stormwater BMPs and Retrofits

- a bankfull bench that gives the stream a floodplain to access, thus significantly reducing near bank stress during above-bankfull events
- reduced slopes on the bank, at a maximum of 2:1, thus reducing potential for bank erosion
- vegetated banks with woody plants that will provide stabilization through rooting mass

In areas of fill soils, additional toe or bank protection using methods such as Bio-D or blocks or soil layering techniques may be necessary (see Appendix A- Details.)

Changes to the profile (riffle-pool sequence) could also be implemented at this site to restore in-stream habitat, but at a greater project cost (see Alternatives). The preferred alternative is one in which the banks are laid back and the streambank erosion reduced to the maximum extent possible. Calculated sediment and nutrient reductions as a result of this treatment are shown in **Table 19.1**.

In addition to the changes in stream cross-section, the banks of the stream should be planted with deep rooting plants that will provide banks stabilization through their rooting mass. As this site is located in an urban park, the needs of safety, aesthetics and functionality need to be met with a choice of plant species. While trees are preferred in the stabilization of stream banks, low-growing grasses and perennials may be more appropriate to a park setting. If low growing grasses pose a problem due to public concerns of thick brush, the select trees may provide stability with maintenance to the herb layer.

Constraints

Land acquisition is not a constraint here, as the stream travels through land owned by the Town of Chapel Hill.

Limited space available in the park may constrain the width of the buffer. Public relations and perception of re-vegetation may hinder the improvements to this site.

Alternatives

There are three alternatives at this site that could be implemented, based on available funds.

Alternative 1: Rather than laying back banks and incurring the expense of earthwork, brush matting (see Details) could be laid on all banks, providing a certain degree of resistance of erosive flows and reducing bank erosion. The riparian buffer area could then be re-vegetated with low-growing plants, as mentioned above.

Alternative 2: To reduce bank erosion rates to the greatest extent, lay back the stream banks at a maximum 2:1 slope and construct a bankfull bench. Then re-vegetate the riparian buffer with low-growing plants.

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Alternative 3: In addition to the treatment of Alternative 2, modify the profile of the stream, constructing pools at each meander bend of the existing channel. This will lead to further dissipation of energy, while improving in-stream habitat.

Cost-Estimate Breakdown

Tables 19.2, 19.3 and 19.4 show a conceptual itemized cost estimate for all three alternatives. These costs represent construction costs only.

Table 19.2
SITE 18 ALTERNATIVE 1

Pay Item Description	Estimated Quantity	Unit	Unit Bid Price	Bid Amount
Construction Safety Fence	700.00	LF	2.50	\$1,750
Site Preparation and Planting	0.13	Ac	7500.00	\$975
Brush Matting	75.00	LF	50.00	\$3,750
Construction Entrance	1.00	Ea	2500.00	\$2,500
Total				\$8,975
Mobilization (5%)	1.00	LS		\$449
Contingencies (10%)	1.00	LS		\$898
Total + Mobilization and Contingencies				\$10,321

Table 19.3
SITE 18 ALTERNATIVE 2

Pay Item Description	Estimated Quantity	Unit	Unit Bid Price	Bid Amount
Excavation	250.00	CY	15.00	\$3,750
Site Preparation and Planting	0.13	Ac	7500.00	\$975
Silt Fence	600.00	LF	3.75	\$2,250
Bio -D Blocks for Bank Stabilization	75.00	LF	20.00	\$1,500
Construction Safety Fence	700.00	LF	2.50	\$1,750
Construction Entrance	1.00	Ea	2500.00	\$2,500
Total				\$12,725
Mobilization (5%)	1.00	LS		\$636
Contingencies (10%)	1.00	LS		\$1,273
Total + Mobilization and Contingencies				\$14,634

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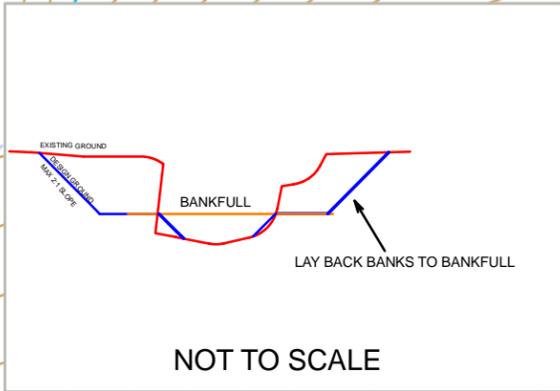
Table 19.4
SITE 18 ALTERNATIVE 3

Pay Item Description	Estimated Quantity	Unit	Unit Bid Price	Bid Amount
Excavation	300.00	CY	15.00	\$4,500
Site Preparation and Planting	0.13	Ac	7500.00	\$975
Silt Fence	600.00	LF	3.75	\$2,250
Bio -D Blocks for Bank Stabilization	75.00	LF	20.00	\$1,500
Construction Safety Fence	700.00	LF	2.50	\$1,750
Construction Entrance	1.00	Ea	2500.00	\$2,500
Total				\$13,475
Mobilization (5%)	1.00	LS		\$674
Contingencies (10%)	1.00	LS		\$1,348
Total + Mobilization and Contingencies				\$15,496



Tanyard Branch

CONCEPTUAL CROSS SECTION



ALTERNATIVE 2:
LAY BACK BANKS WITH BANKFULL BENCH
AND VEGETATE WITH LOW GROWING GRASS

ALTERNATIVE 1:
LAY BRUSH MATTING ON BOTH BANKS
AND REVEGETATE WITH LOW-GROWING GRASS

ALTERNATIVE 3:
LAY BACK BANKS AND MODIFY
PROFILE AND GEOMETRY

ALTERNATIVE 2 AND 3:
ADD DISSIPATION POOL AT HEAD OF PROJECT

GOMAINS AVE

HILL ST

BROAD ST

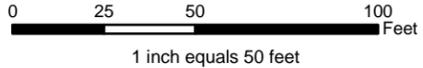
BYNUM ST

Legend

- Stormwater Lines
- Impervious Surfaces
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Stream, unknown flow
- Contours



CONCEPTUAL PLAN VIEW
 BOLIN CREEK WATERSHED
 Geomorphic Analysis and Potential Site
 Identification For
 Stormwater Structures and Retrofits





SITE 19

Tanyard Branch

BROAD ST

CONCEPTUAL CROSS SECTION



NOT TO SCALE

ALTERNATIVE 2:
LAY BACK BANKS WITH BANKFULL BENCH
AND VEGETATE WITH LOW GROWING GRASS

ALTERNATIVE 1:
LAY BRUSH MATTING ON BOTH BANKS
AND REVEGETATE WITH LOW-GROWING GRASS

ALTERNATIVE 3:
LAY BACK BANKS AND MODIFY
PROFILE AND GEOMETRY

ALTERNATIVE 2 AND 3:
ADD DISSIPATION POOL AT HEAD OF PROJECT

GOMAINS AVE

BYNUM ST

HILL ST

Legend

- Stormwater Lines
- Perennial Stream
- Intermittent Stream
- Ephemeral Stream
- Stream, unknown flow



AERIAL PHOTO VIEW

BOLIN CREEK WATERSHED
Geomorphic Analysis and Potential Site
Identification For
Stormwater Structures and Retrofits

