Kimley-Horn
and Associates, Inc.

September 27, 2013

PO Box 33068
Raleigh, North Carolina
27636-3068

Dwight Bassett
Economic Development Officer
Town of Chapel Hill
405 Martin Luther King Jr Blvd
Chapel Hill, NC 27514-5705

Subject: **Booker Creek Slough Analysis**
Ephesus Church Road/Fordham Boulevard
Small Area Plan (SAP), Phase 3
Town of Chapel Hill, North Carolina

Dear Mr. Bassett:

We have completed the evaluation of Booker Creek slough alternatives and their viability for providing flood relief for properties within the Small Area Plan. In general, sloughs (also known as floodplain bypass channels) can reduce velocities and shear stresses in the primary channels that they parallel and can potentially provide flood relief. Our evaluation included the analysis of floodplain sloughs to be located adjacent to Booker Creek and upstream and downstream of Willow Drive (see Figure 1). This analysis demonstrated that the construction of such sloughs would not reduce flooding within the SAP.

During this study, two analysis scenarios were prepared. Scenario 1 included two slough reaches; an approximately 300-foot long slough reach located in the right floodplain of Booker Creek and beginning approximately 500 feet upstream of Willow Drive, and an approximately 900-foot slough reach located in the left floodplain of Booker Creek and beginning approximately 100 feet downstream of Willow Drive. Both slough reaches had a 30-foot base width and 3:1 side slopes as shown in the hydraulic modeling cross-sections (Figure 2). The sloughs had an average bottom elevation which was approximately two feet above the invert of the Booker Creek channel. The sloughs were analyzed under 10- and 100-year storm conditions, and for both conditions the sloughs demonstrated negligible improvement in terms of flood reduction within the SAP (Tables 1 and 2).

Scenario 2 was based on Scenario 1, but the base width of the sloughs was increased to 100 feet. (See hydraulic modeling cross sections in Figure 3). The sloughs were analyzed under 10- and 100-year storm conditions, and for both conditions the sloughs demonstrated negligible improvement in terms of flood reduction within the SAP (Tables 1 and 2).

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Table 1: Water Surface Elevation (feet) - 10-year Storm Event

Node	Existing Conditions	Scenario 1		Scenario 2	
		30-foot Base Width Sloughs	**Scenario 1 minus Existing**	100-foot Base Width Sloughs	**Scenario 2 minus Existing**
5024	257.993	257.993	**0.000**	257.991	**-0.002**
3500	253.980	253.970	**-0.010**	253.888	**-0.092**
2957	252.603	252.369	**-0.234**	252.003	**-0.600**

Table 2: Water Surface Elevation (feet) - 100-year Storm Event

Node	Existing Conditions	Scenario 1		Scenario 2	
		30-foot Base Width Sloughs	**Scenario 1 minus Existing**	100-foot Base Width Sloughs	**Scenario 2 minus Existing**
5024	261.447	261.444	**-0.003**	261.441	**-0.006**
3500	255.089	254.941	**-0.148**	254.720	**-0.369**
2957	253.897	253.699	**-0.198**	253.403	**-0.494**

The study results demonstrate that constructing sloughs along Booker Creek and downstream of the SAP would not reduce flooding within the SAP. The magnitude of flow being carried by Booker Creek, and the diminishing stream gradient of Booker Creek as it flows toward the confluence with Bolin Creek limit the potential for the application of sloughs in reducing flooding within the SAP.

If you have any questions, or comments, please contact me by phone at (919) 653-5845 or by email at tom.gray@kimley-horn.com.

Regards,

KIMLEY-HORN AND ASSOCIATES, INC.

Tom Gray, PE, CFM

CC: File

Legend

- Data Analysis Locations
- Hydraulic Modeling Cross-Sections
- Booker Creek
- Analyzed Slough Reaches

Ephesus Church Road/Fordham Boulevard Small Area Plan (SAP), Phase 3

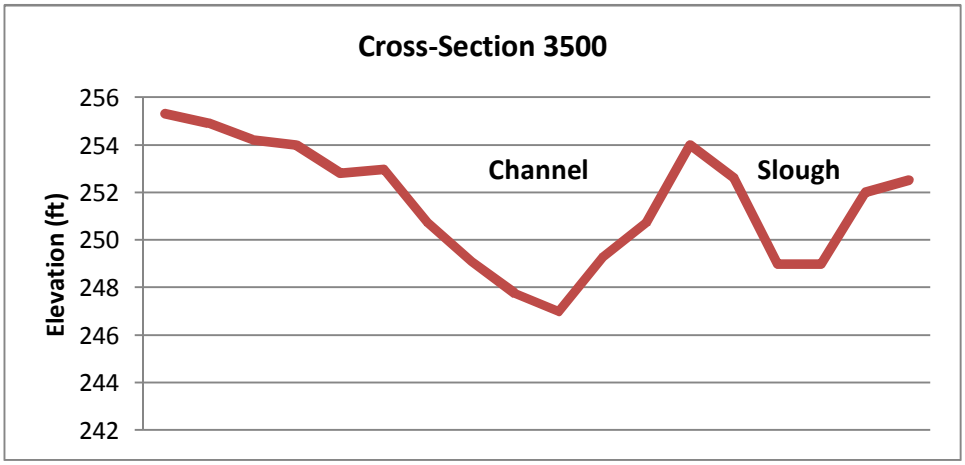
Figure 1
Project Location Map

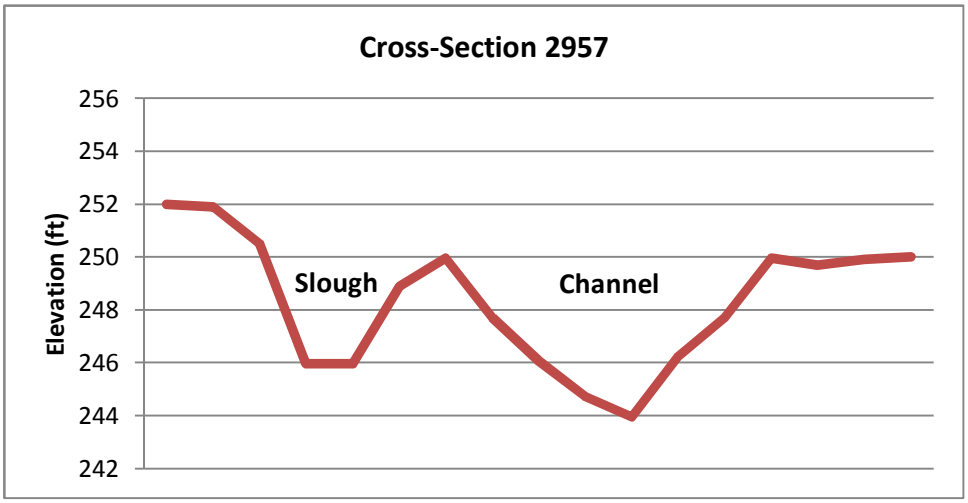
Feet
0 175 350

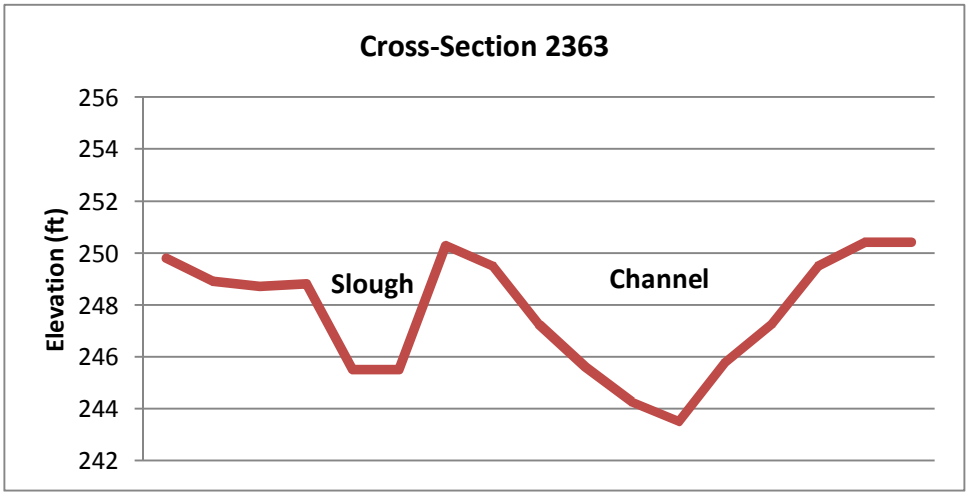
N

Prepared by:
Kimley-Horn and Associates, Inc.

Prepared for:
TOWN OF CHAPEL HILL

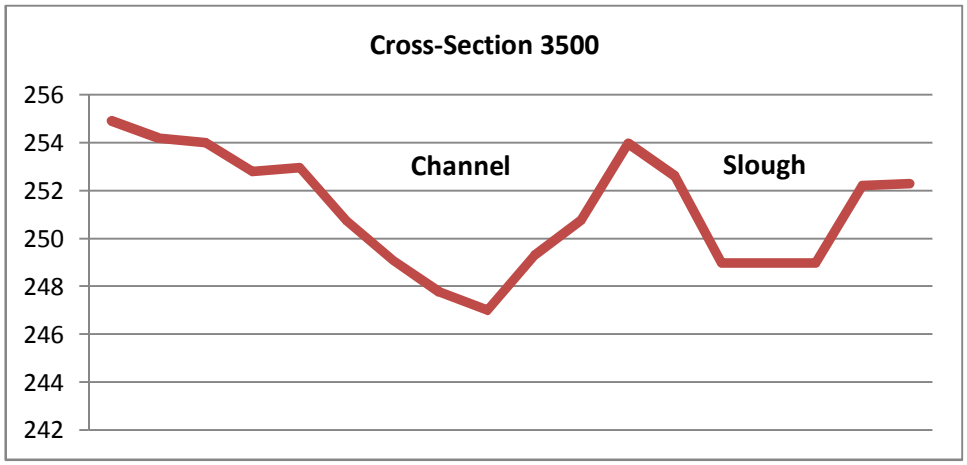


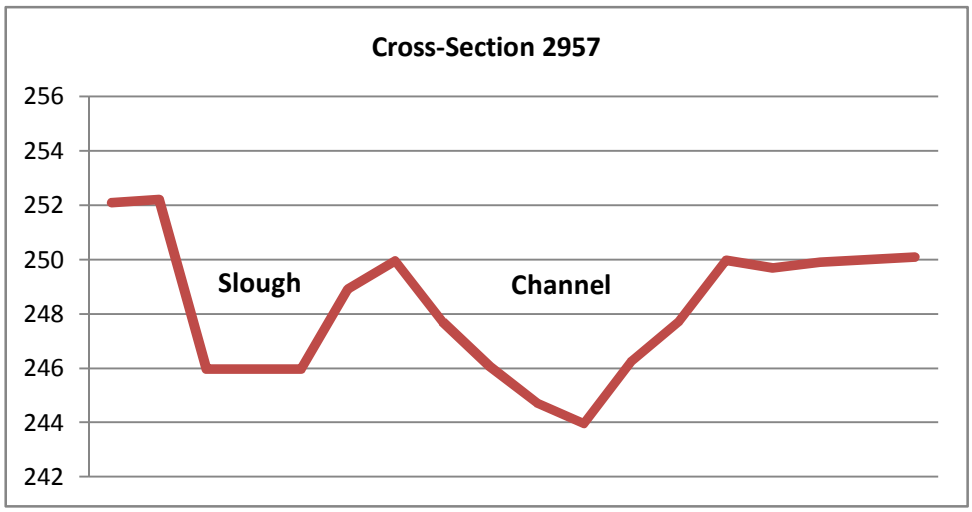


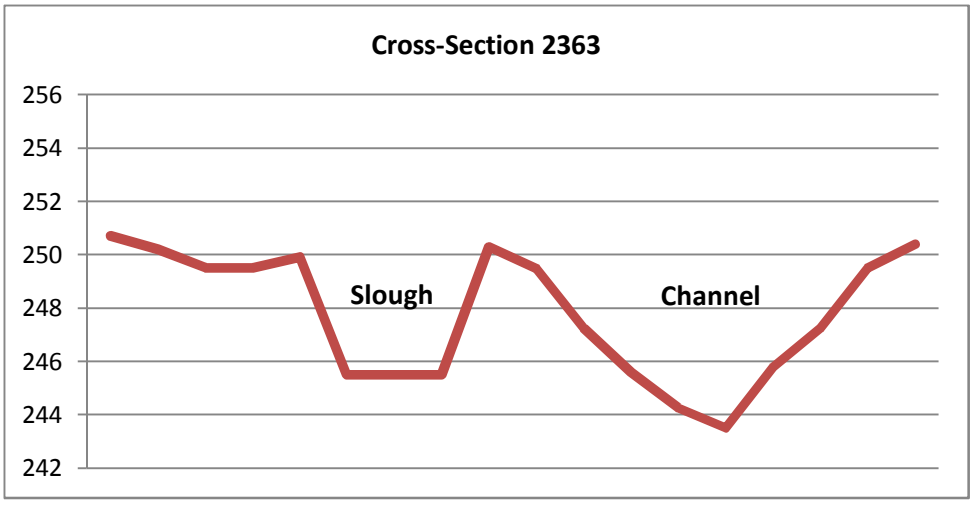


Title: **Scenario 1 - Hydraulic Modeling Cross-Sections**
Project: Ephesus Church Road/Fordham Boulevard Small Area Plan (SAP), Phase 3
Date: September 27, 2013

Figure 2







Title: **Scenario 2 - Hydraulic Modeling Cross-Sections**
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Figure 3