

Benefits of 2D Modeling for Proposed Bank Stabilization

Little Sugar Creek, Mecklenburg County

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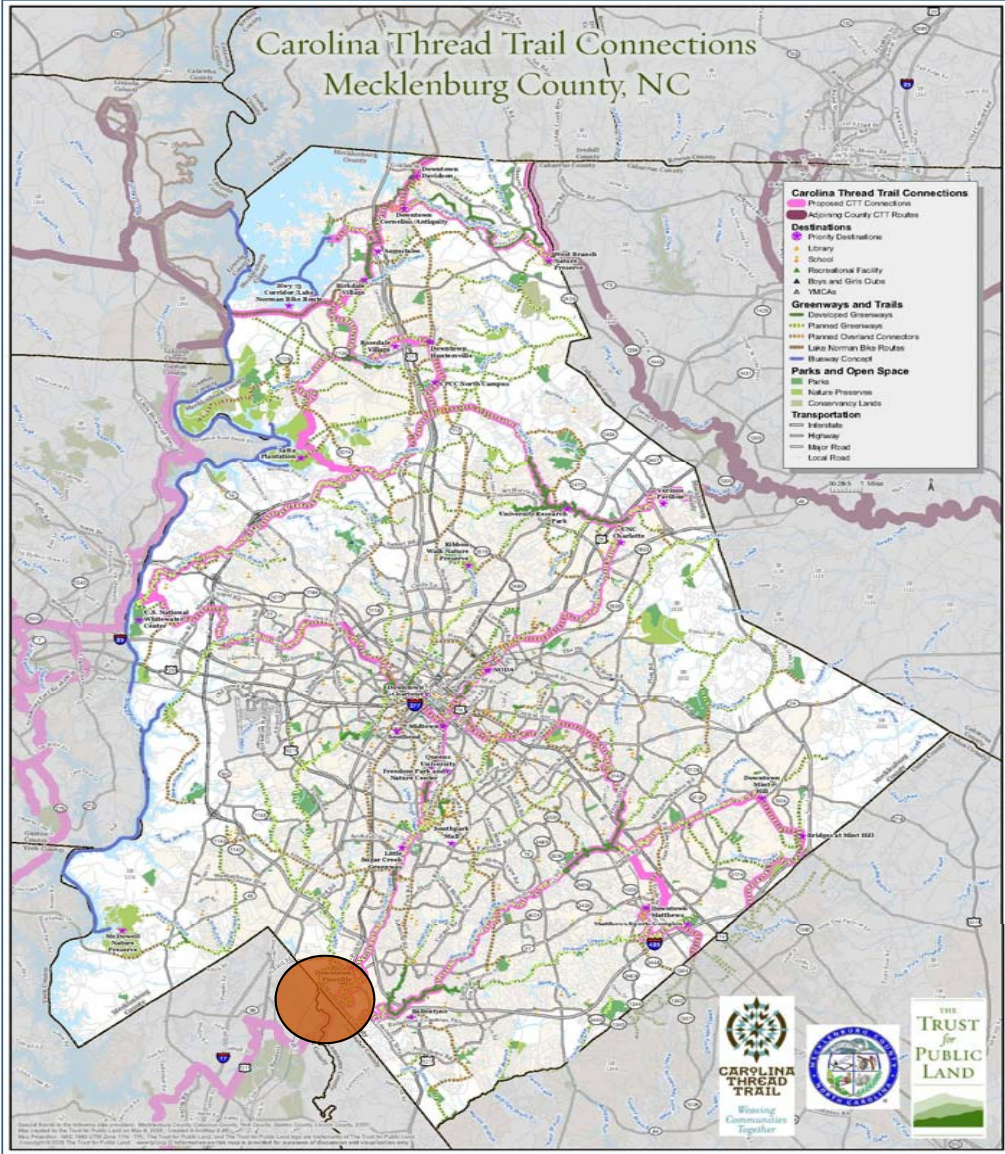
Project Background and Objectives

Partners/Projects

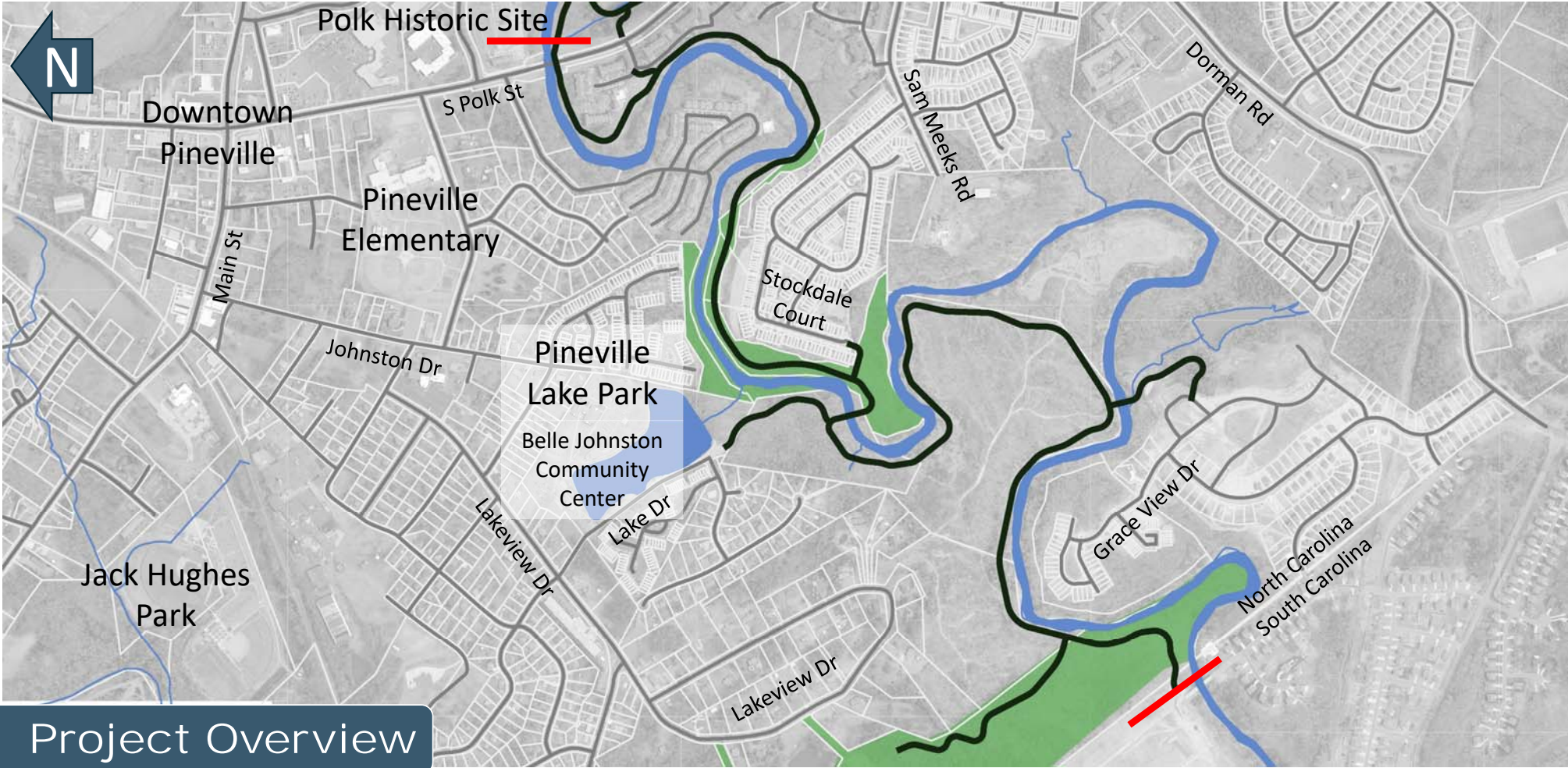
Greenway
(Meck Co.
Park and Rec)

Carolina
Thread Trail

Town of
Pineville



Little Sugar Creek Greenway Polk Historic Site to SC

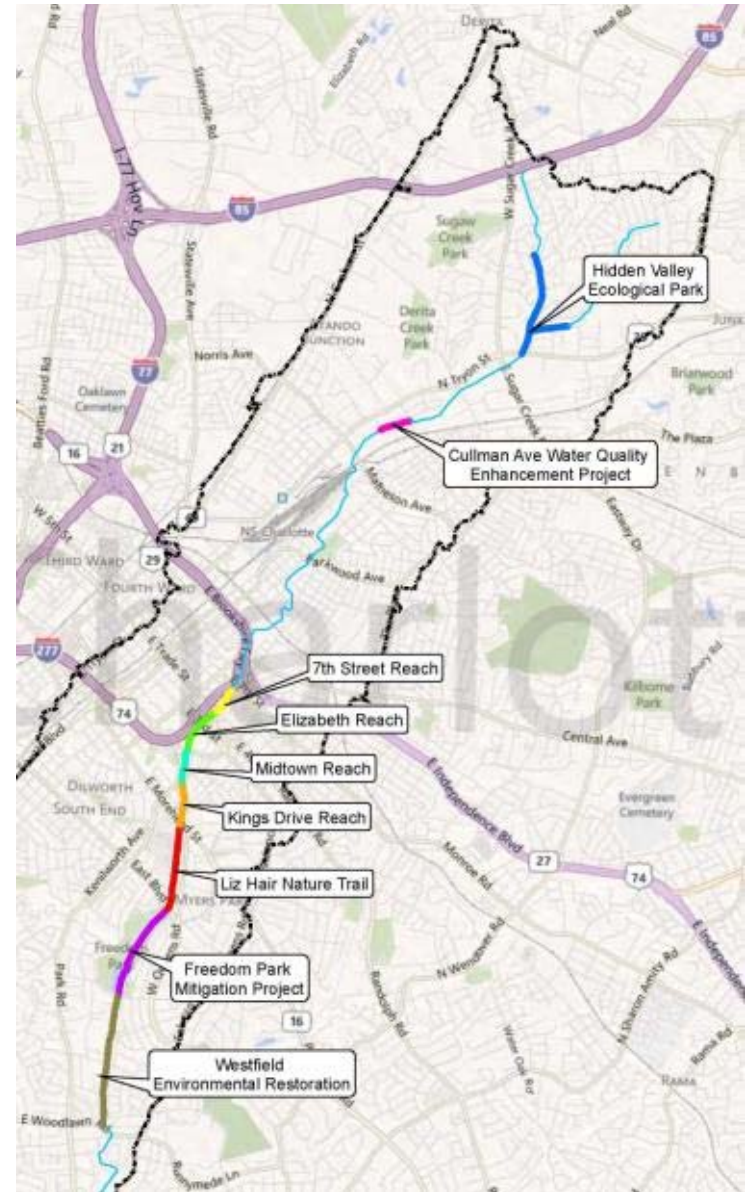


Project Overview

Additional LSC Projects

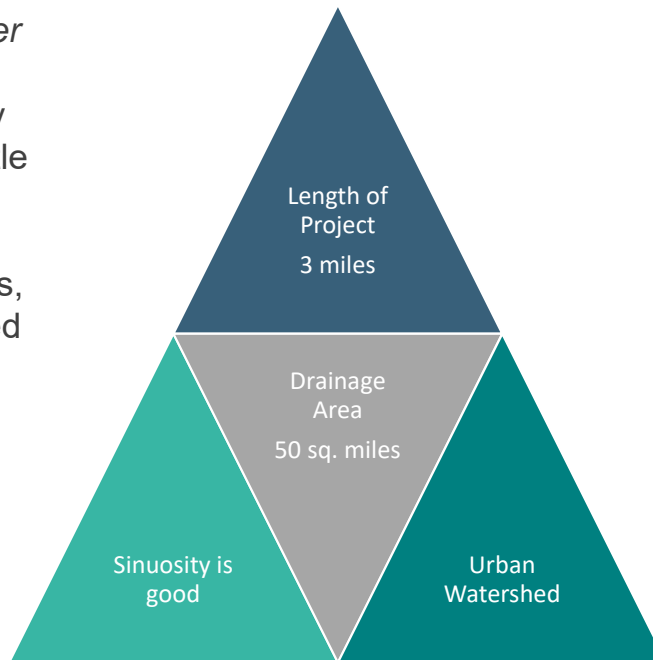
Nine projects constructed in the past 15 years

LSC-Archdale (in construction)



Watershed Characteristics

The Little Sugar Creek Greenway Master Plan identifies this area as an “environmental conservation opportunity area.” Stating, “The last few miles of Little Sugar Creek just before North Carolina/South Carolina Stateline meander through bottomland hardwoods, much of which has remained undisturbed for decades. This area represents the largest undisturbed tract of land along Little Sugar Creek from its source. The stream follows an unconstrained route with steep 30- to 80-foot banks that are vegetated extensively with Mountain Laurel and Rhododendrons.”



Summary of NC Piedmont Regional Curve Data (50 square mile drainage area)

¹ <http://www.bae.ncsu.edu/programs/extension/wqg/sri/regional.htm>

Predicted Value	Rural Curve ₁	Urban Curve ₁
Bankfull Discharge (cubic feet per second)	1,500	3,650
Bankfull Cross-Sectional Area (square feet)	300	760
Bankfull Width (feet)	60	90
Bankfull Mean Depth (feet)	5	9



Streamflow Characteristics

- Due to the size of the drainage area and its urban nature, the flow regime is very dynamic and the hydraulic geometry in these locations does not appear to support this flow diversity (i.e., poor low flow).
- Observed flow went from a few inches to 3+ feet after a rainfall of ~0.7 inches in 24 hours.

Stream Geometry and Feasibility Study Findings

Upper Section (from Polk Historic Site to Belle Johnston)

- This section of the reach is currently aggrading and widening
- The majority of the channel bed throughout the reach is dominated by large transitory sidebars composed of medium to coarse sand
- The riffles and pools are actively filling with sediment. As a result, the habitat is poor throughout the reach



Vertical Banks



Stable Banks

Lower Section (from Belle Johnston to SC)

- Hundreds of tires are located within the channel
- Moderately entrenched with floodplain access throughout
- Bank erosion is limited to the outer meander bends with several experiencing high rates of erosion
- The riffles and pools are actively filling with sediment but are not fully embedded



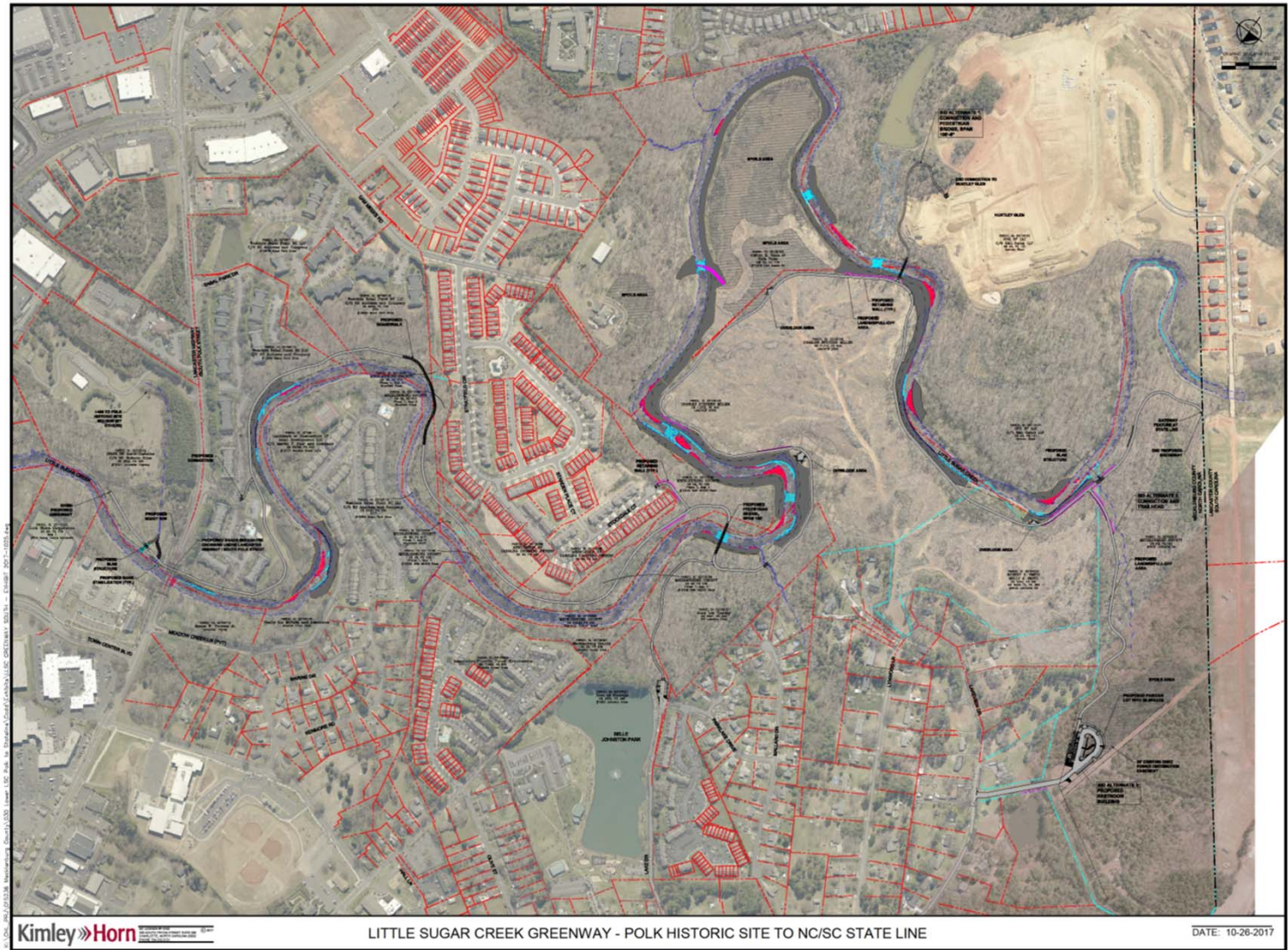
Thousands of Tires



Intact Bottomland Buffer

Project Areas and Goals

- Remove Tires and Trash
- Stabilize the most erosive stream banks
- Low-flow channel shaping in areas where bank work is taking place

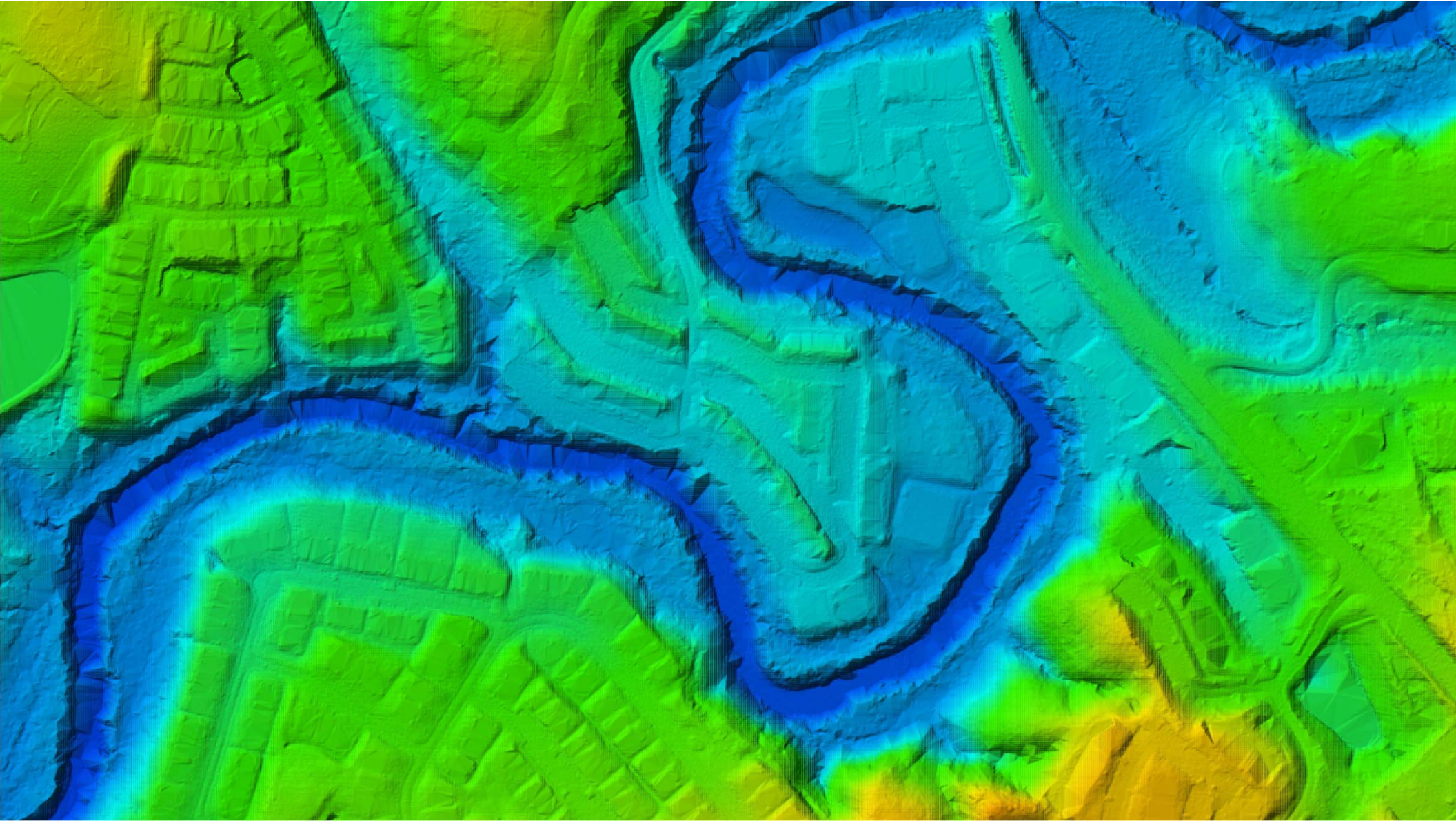


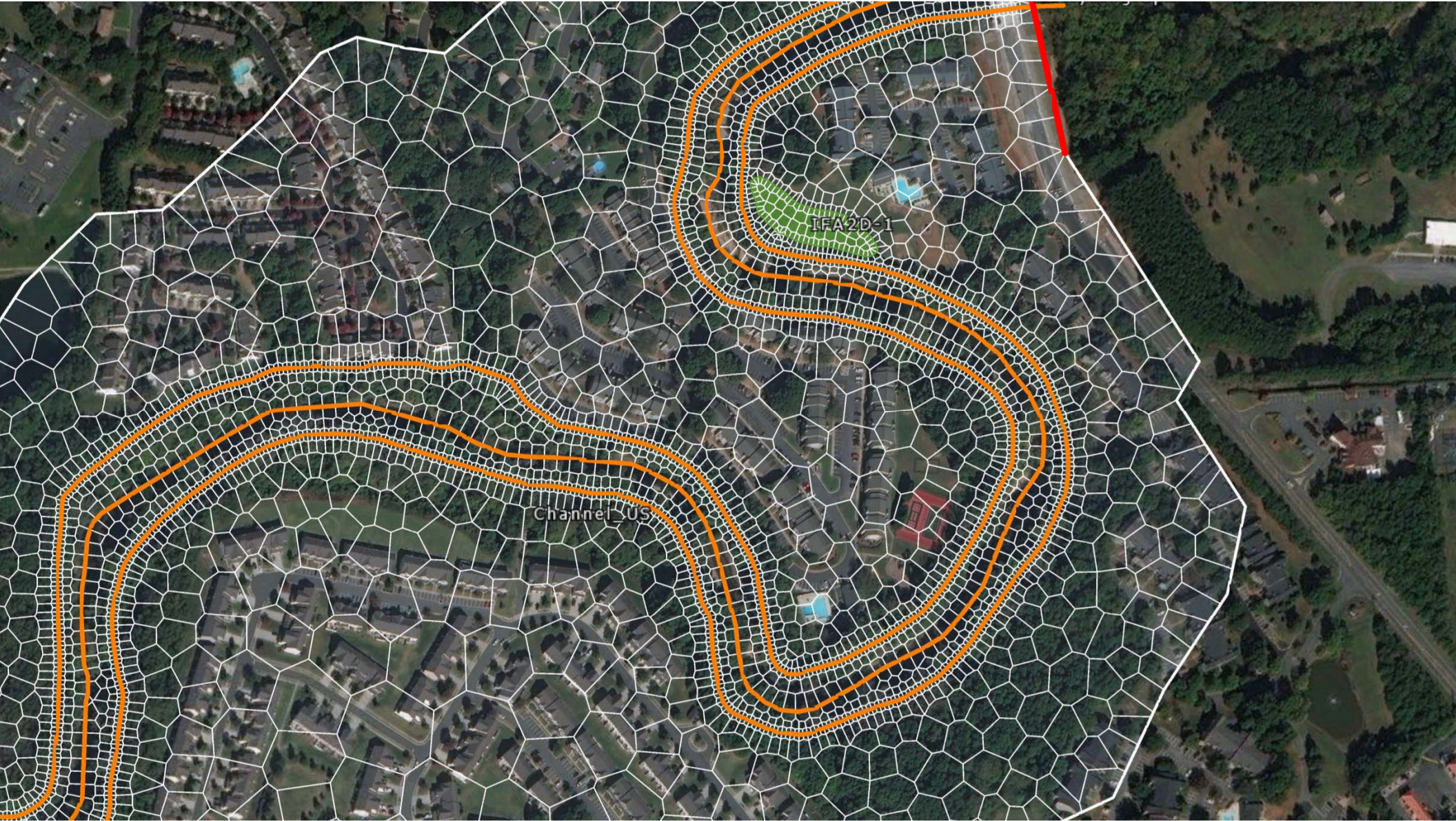


Model Development and Results





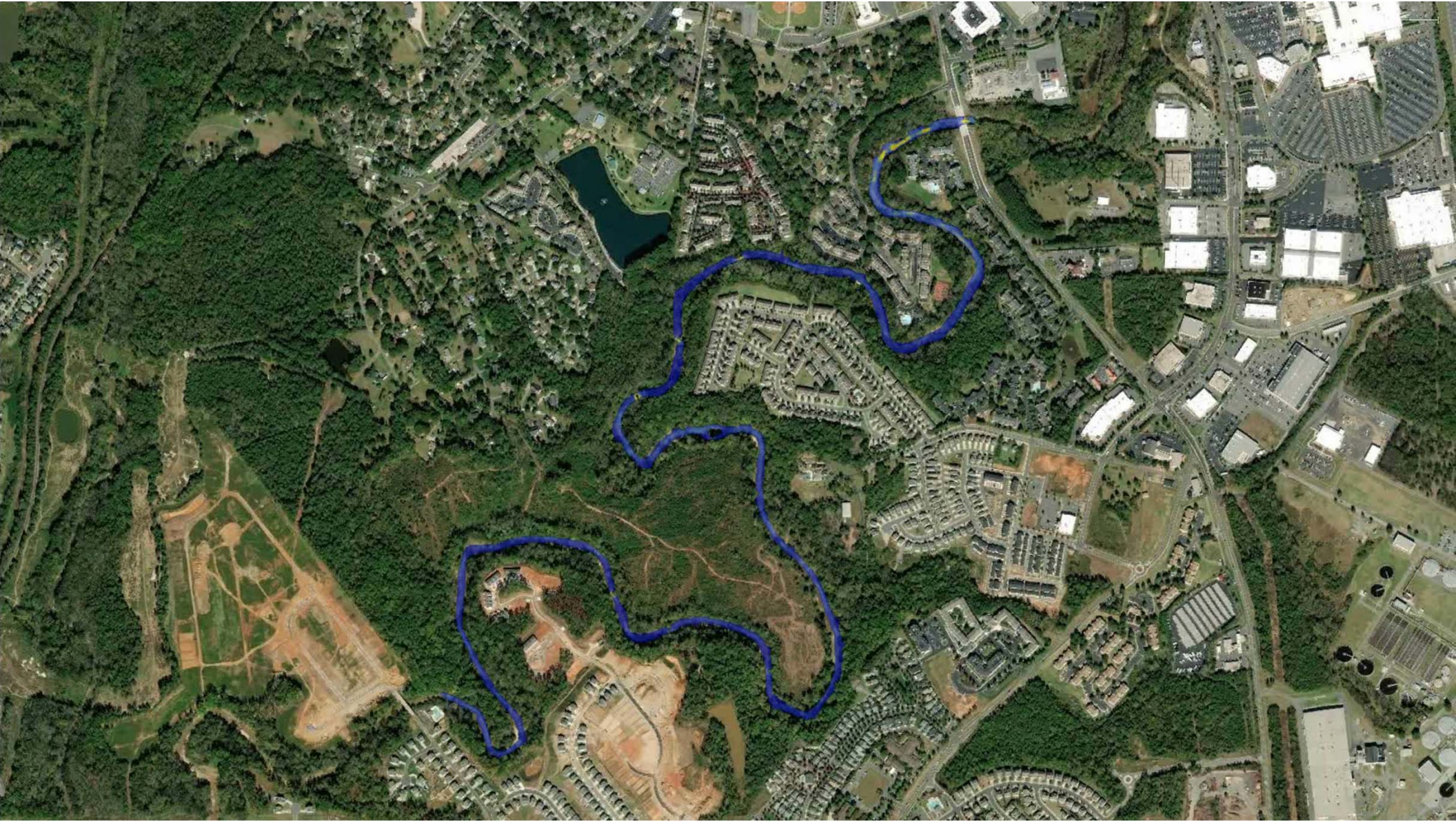




IFA 2D-1

Channel US











Lessons Learned



Lessons Learned

- 2D modeling isn't perfect
- The model must be evaluated with an understanding of project goals
- Detailed model input results in detailed model output







Bank Protection Methods



Bank Protection Methods

- Bank Grading and Planting
- Toe Wood
- Rock Vane
- Rock Toe
- Shape Low Flow Channel
- Redi-Rock Retaining Wall







Questions?