HEADWATERS ENGINEERING

MEMORANDUM

TO: Paul Ray
Planning Director

FROM: Andrew Bick, PE, CFM

DATE: January 12, 2024

RE: Preliminary Flooding Evaluation
Proposed Ecusta Trailhead Park at Allison Creek
Brevard, NC

This memo presents findings from our preliminary flooding evaluation of the proposed crossing replacement over Allison Creek and park elements at the proposed Ecusta trailhead park. The bridge and park site are located in the special flood hazard area (SFHA) of Allison Creek and the City of Brevard flood damage prevention ordinance requires advance study of development within SFHAs in order to determine if adverse flooding impacts could be expected.

Modeling

We gathered the effective computer model for Allison Creek, along with floodplain and cross section shapefiles, from the NC FRIS website. When run in HEC-RAS (v 5.0.7), effective model results match Flood Insurance Study (FIS) 1-percent flood and floodway elevations and floodway widths within acceptable limits.

We used 2019 aerial imagery and 2016-17 bare earth LiDAR data to update the effective model and reflect current conditions more accurately, including the presence of a timber greenway bridge that we understand was constructed in 2015. The existing conditions model also reflects a prominent berm on both banks of the creek for a roughly 330-linear-foot reach upstream of the greenway bridge. Modeling indicates that existing conditions flood and floodway elevations are within about 0.3 foot of effective values.

In order to serve the proposed park and trailhead, the existing bridge will need to be replaced with a vehicular crossing. We assumed a width of 24 feet and considered both clear span bridges and concrete box culverts. In addition to several parking spaces, the park plan includes a restroom building (roughly 20 feet by 30 feet) and exercise equipment.

Findings

We modeled proposed crossing options and park elements, and our preliminary findings are summarized below.

1. As indicated in Figure 1 below, the entire site is below the 1-percent flood elevation by 1 foot or more.
2. Construction a new crossing that would pass the 1-percent flood without overtopping would require a large amount of fill at the approaches and would likely cause adverse flooding impacts and require a complex floodplain permitting effort such as a Conditional Letter of Map Revision (CLOMR).
3. One crossing option that appears to work for a "no-rise" is a 10-foot-wide by 5-foot-tall box culvert, buried 1 foot below the stream bed elevation (for compliance with state water quality rules). The culvert itself appears to pass much of the 1-percent flood, but the approaches would overtop at a 10-percent flood. If an overtopping crossing is selected, we recommend posting signage at the park indicating closures during flood events and installing a gate at the entrance to prevent entry.
4. A 16-foot clear span bridge appears to cause slight rises, but we have not performed detailed analyses on a specific bridge design because structural dimensions have not been defined.
5. The US Army Corps of Engineers would require a permit application for a box culvert but not a clear span bridge.
6. Elevated park elements such as the proposed restroom and exercise equipment can likely be constructed toward the eastern edge of the cleared area without causing adverse flooding impacts. The attached workmap shows an "ineffective flow area" that is modeled as being flooded but not actively conveying flow downstream. We recommend that elevated park elements (and/or fill) be placed in this area in order to avoid adverse flooding impacts.

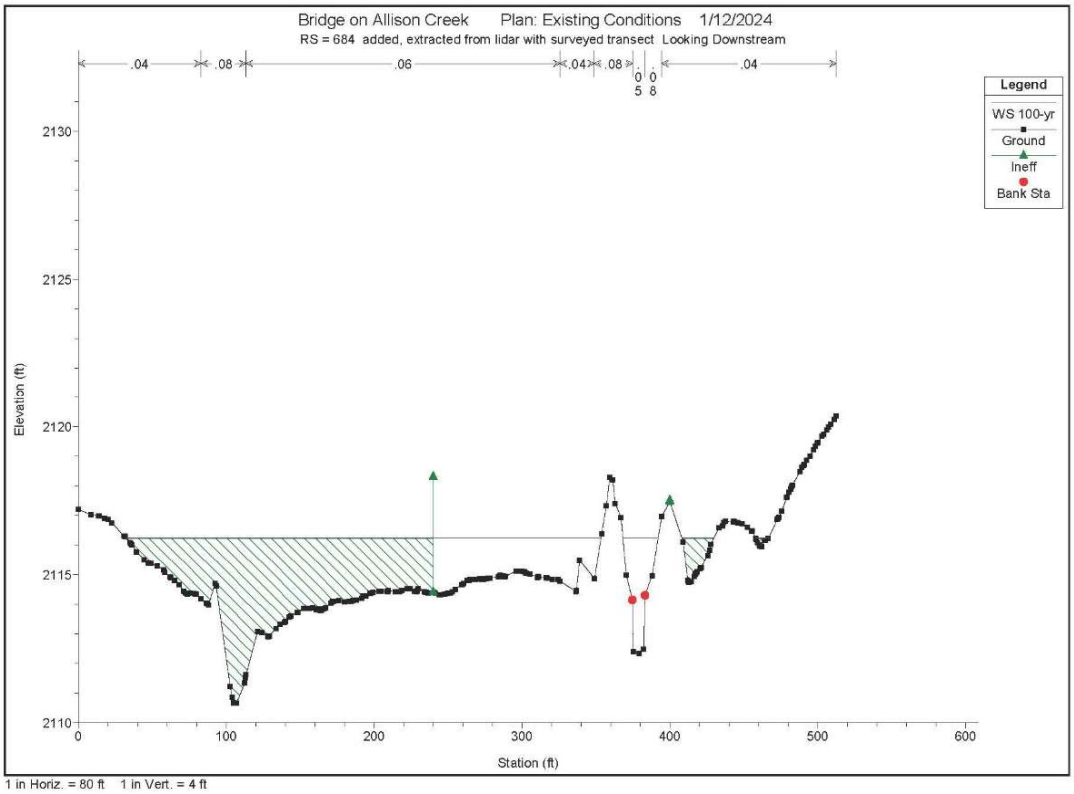


Figure 1. 1% Flood at Cross Section Upstream of Bridge

We trust that this memo will help with project planning. We are prepared to complete further analyses of a selected crossing and park configuration. In the meantime, if you have any questions or need additional information, please call me at 828.606.0306.

Attachment:

Workmap



MAPPING NOTES:
1. AERIAL IMAGERY DATED 2019 FROM NC ONEMAP WEBSITE.
2. 1' CONTOURS GENERATED FROM 2016-17 BARE EARTH LIDAR.

1127 (011)

982

ALLISON CREEK

761 (008)

684

614

562

308 (003)

156

INEFFECTIVE FLOW AREA, SUITABLE FOR ELEVATED STRUCTURES OR FILL PLACEMENT

20' X 30' RESTROOM

PROPOSED REPLACEMENT CROSSING

ALLISON ROAD

LEGEND

- FIS CROSS SECTION
- ADDED CROSS SECTION
- FLOODWAY
- 1% FLOODPLAIN
- 0.2% FLOODPLAIN

N

0' 100' 200' 300'

A							
B							
C							
					DESCRIPTION	DATE	APP.

REVISIONS

NOT FOR CONSTRUCTION

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FLOODING EVALUATION
PROP. TRAILHEAD PARK
ALLISON CREEK
BREVARD, NC

DATE: JAN. 2024

SCALE: AS SHOWN

WORKMAP

SHEET 1 OF 1