Appendix D: Floodplain Risk Assessment

BRIDGE REPLACEMENT SCOPING TRIP RISK ASSESSMENT FORM

COUNTY: Greenville DATE: 07/19/2019

ROAD #: WRP STREAM CROSSING: East Laurel Creek Trib A

Purpose & Need for the Project:

Woodruff Road Parallel project will provide alternate route to relieve congestion on existing Woodruff Road (SC 146).

I. FEMA Acknowledgement

Is this project located in a regulated FEMA Floodway? [X] Yes [ ] No

Panel Number: 45045C404E Effective Date: 08/18/2014 (See Attached)

II. FEMA Floodmap Investigation

FEMA Flood Profile Sheet Number 54P illustrates the existing 100 year flood:

[ ] Passes under the existing low chord elevation.
[ ] Is in contact with the existing low chord elevation.
[ ] Overtops the existing bridge finished grade elevation.

N/A - There is no existing bridge crossing shown on the profile.

III. No Rise/CLOMR Preliminary Determination

[ ] Preliminary assessment indicates this project may be constructed to meet the "No-Rise" requirements. A detailed hydraulic analysis will be performed to verify this assessment.

Justification:

[✔] Preliminary assessmnet indicates this project may require a CLOMR/LOMR. Impacts will be determined by a detailed hydraulic analysis.

Justification:

BRIDGE REPLACEMENT SCOPING TRIP RISK ASSESSMENT FORM

IV. Preliminary Bridge Assessment

A. Locate Existing Plans

a. Bridge Plans ☐ Yes ☑ No File No. _____ Sheet No. _____ (See Attached)

b. Road Plans ☐ Yes ☑ No File No. _____ Sheet No. _____ (See Attached)

B. Historical Highwater Data

a. USGS Gage ☐ Yes ☑ No Gage No. _____ Results: _____

b. SCDOT/USGS Documented Highwater Elevations ☐ Yes ☑ No Results: _____

c. Existing Plans ☐ Yes ☑ No See Above

V. Field Review

A. Existing Bridge

N/A - There is no existing bridge present at this location.

Length: _____ ft. Width: N/A ft. Max. span Length: _____ ft.

Alignment: ☐ Tangent ☐ Curved

Bridge Skewed: ☐ Yes ☐ No Angle: _____

End Abutment Type: _____

Riprap on End Fills: ☐ Yes ☐ No Condition: _____

Superstructure Type: _____

Substructure Type: _____

Utilities Present: ☐ Yes ☐ No

Describe:

Debris Accumulation on Bridge: Percent Blocked Horizontally: _____ %

Percent Blocked Vertically: _____ %

Hydraulic Problems: ☐ Yes ☐ No

Describe:

BRIDGE REPLACEMENT SCOPING TRIP RISK ASSESSMENT FORM

V. Field Review (cont.)

N/A - There is no existing bridge present at this location.

B. Hydraulic Features

a. Scour Present: ☐ Yes ☐ No Location: _____

b. Distance from F.G. to Normal Water Elevation: _____ ft.
c. Distance from Low Steel to Normal Water Elev.: _____ ft.
d. Distance from F.G. to High Water Elevation: _____ ft.
e. Distance from Low Steel to High Water Elev.: _____ ft.

f. Channel Banks Stable: ☐ Yes ☐ No
Describe:

g. Soil Type: _____

h. Exposed Rock: ☐ Yes ☐ No Location: _____

i. Give Description and Location of any structures or other property that could be damaged due to additional backwater.

C. Existing Roadway Geometry

a. Can the existing roadway be closed for an On-Alignment Bridge Replacement
☐ Yes ☑ No
Describe:

If "yes", does the existing vertical and horizontal curves meet the proposed design speed criteria?

If "No", will the proposed bridge be:
☐ Staged Constructed
☑ Replaced on New Alignment

VI. Field Review (cont.)

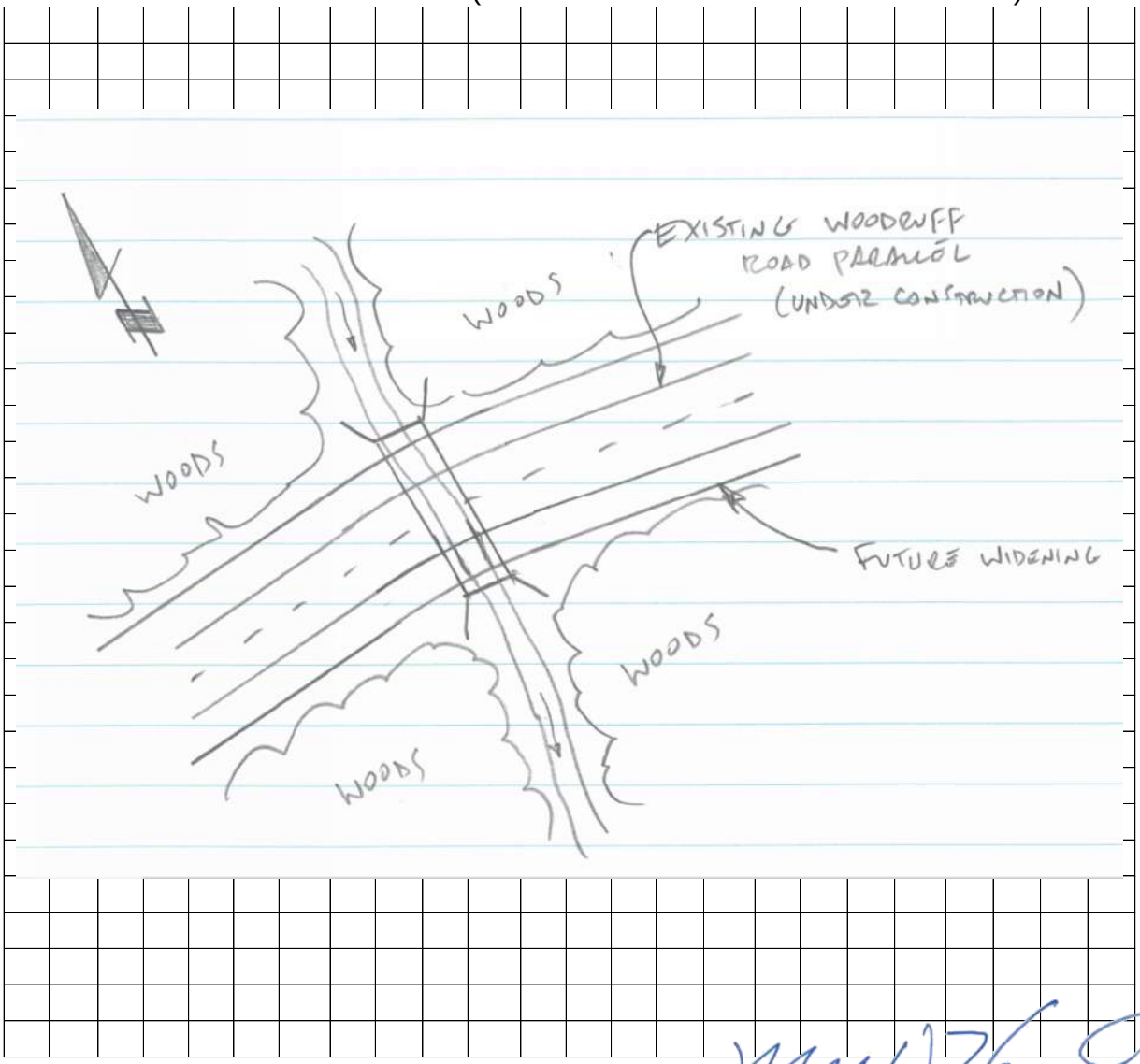
A. Proposed Bridge Recommendation:

Length: N/A ft. Width: N/A ft. Elevation: _____ ft.

Span Arangement: N/A

Notes: The City of Greenville is currently constructing new location roadway at this location, along with a new culvert crossing of East Laurel Creek Tributary A. Road will be widened under WRP project, and new culvert will be lengthened to accommodate the wider roadway.

BRIDGE SITE DIAGRAM: (Show North Arrow and Direction of Flow)



Performed By: Mark W. Hammond

Title: Hydraulic Engineer

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Lambert Conformal Conic State Plane South Carolina FIPS 3900. The **horizontal datum** was NAD83 HARN, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by Greenville County, South Carolina.

This map reflects more **detailed** and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

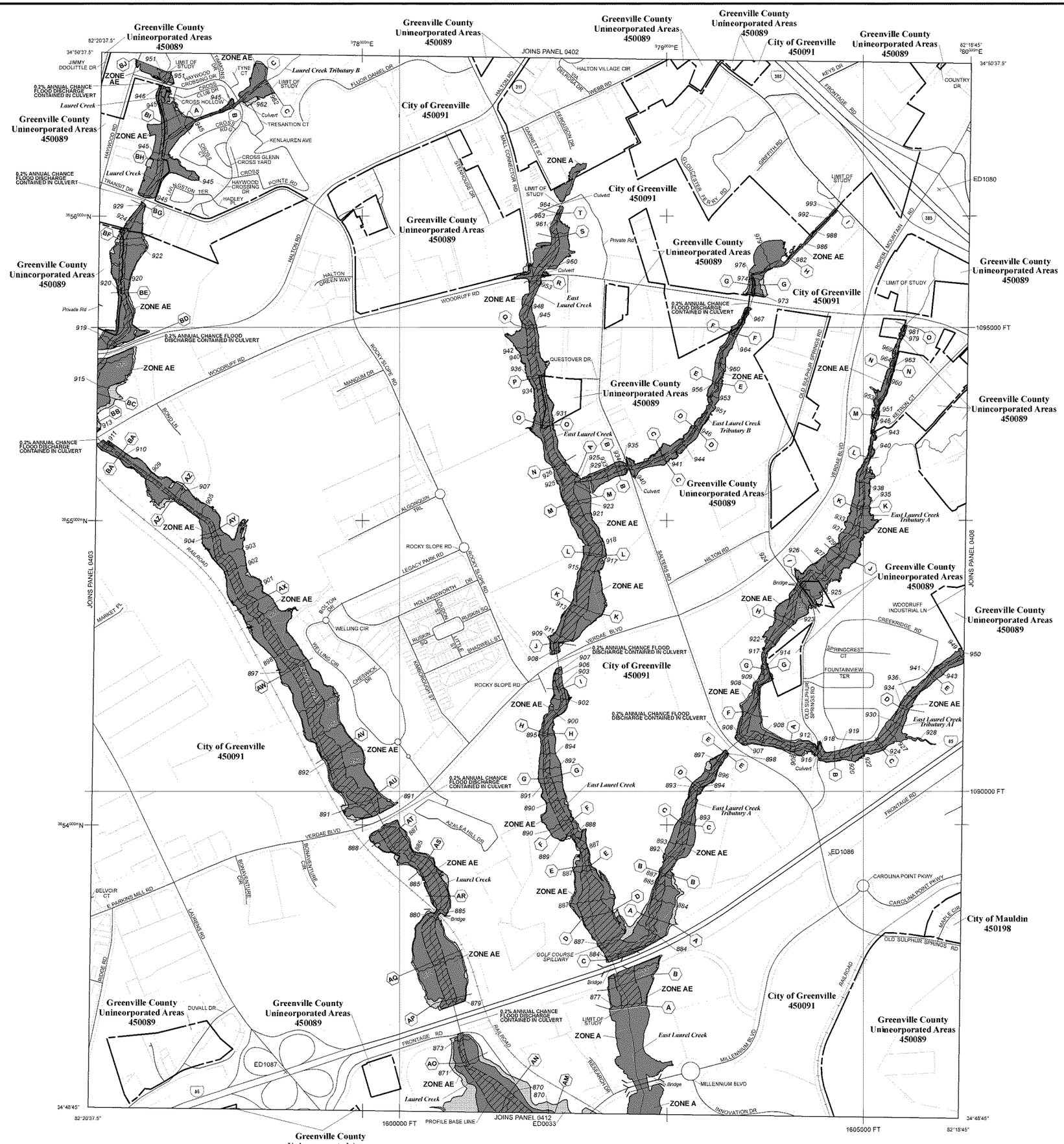
For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange** at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://www.msc.fema.gov/. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

DNR

This digital Flood Insurance Rate Map (FIRM) was produced through a unique cooperative partnership between the State of South Carolina and the Federal Emergency Management Agency (FEMA). The State of South Carolina has implemented a long term approach of floodplain management to decrease the costs associated with flooding. This is demonstrated by the State's commitment to map floodplain areas at the local level. As a part of this effort, the state of South Carolina has joined in a Cooperating Technical State agreement with FEMA to produce and maintain this digital FIRM.

http://www.dnr.state.sc.us/



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 17
- 6000000 FT — 5000-foot grid values: South Carolina State Plane coordinate system (FIPSZONE = 3900), Lambert projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories List on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
December 2, 2004

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
August 18, 2014 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to reflect updated topographic information.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0404E

FIRM

FLOOD INSURANCE RATE MAP

GREENVILLE COUNTY, SOUTH CAROLINA AND INCORPORATED AREAS

PANEL 404 OF 625

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENVILLE COUNTY	450089	0404	E
GREENVILLE, CITY OF	450091	0404	E
MAULDIN, CITY OF	450198	0404	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
45045C0404E

MAP REVISED
AUGUST 18, 2014

Federal Emergency Management Agency

BRIDGE REPLACEMENT SCOPING TRIP RISK ASSESSMENT FORM

COUNTY: Greenville DATE: 07/19/2019

ROAD #: WRP STREAM CROSSING: East Laurel Creek Trib A1

Purpose & Need for the Project:

Woodruff Road Parallel project will provide alternate route to relieve congestion on existing Woodruff Road (SC 146). The project will be constructed on new location.

I. FEMA Acknowledgement

Is this project located in a regulated FEMA Floodway? [X] Yes [ ] No

Panel Number: 45045C408E Effective Date: 08/18/2014 (See Attached)

II. FEMA Floodmap Investigation

FEMA Flood Profile Sheet Number 55P illustrates the existing 100 year flood:

[ ] Passes under the existing low chord elevation.
[ ] Is in contact with the existing low chord elevation.
[ ] Overtops the existing bridge finished grade elevation.

N/A - There is no existing bridge crossing shown on the profile.

III. No Rise/CLOMR Preliminary Determination

[ ] Preliminary assessment indicates this project may be constructed to meet the "No-Rise" requirements. A detailed hydraulic analysis will be performed to verify this assessment.

Justification:

[✔] Preliminary assessmnet indicates this project may require a CLOMR/LOMR. Impacts will be determined by a detailed hydraulic analysis.

Justification: Since the project is new location, a new culvert crossing will likely modify the base flood profile on the upstream side of the culvert.

BRIDGE REPLACEMENT SCOPING TRIP RISK ASSESSMENT FORM

IV. Preliminary Bridge Assessment

A. Locate Existing Plans

a. Bridge Plans ☐ Yes ☑ No File No. _____ Sheet No. _____ (See Attached)

b. Road Plans ☐ Yes ☑ No File No. _____ Sheet No. _____ (See Attached)

B. Historical Highwater Data

a. USGS Gage ☐ Yes ☑ No Gage No. _____ Results: _____

b. SCDOT/USGS Documented Highwater Elevations ☐ Yes ☑ No Results: _____

c. Existing Plans ☐ Yes ☑ No See Above

V. Field Review

N/A - There is no existing bridge present at this location.

A. Existing Bridge

Length: _____ ft. Width: N/A ft. Max. span Length: _____ ft.

Alignment: ☐ Tangent ☐ Curved

Bridge Skewed: ☐ Yes ☐ No Angle: _____

End Abutment Type: _____

Riprap on End Fills: ☐ Yes ☐ No Condition: _____

Superstructure Type: _____

Substructure Type: _____

Utilities Present: ☐ Yes ☐ No

Describe:

Debris Accumulation on Bridge: Percent Blocked Horizontally: _____ %

Percent Blocked Vertically: _____ %

Hydraulic Problems: ☐ Yes ☐ No

Describe:

BRIDGE REPLACEMENT SCOPING TRIP RISK ASSESSMENT FORM

V. Field Review (cont.)

N/A - There is no existing bridge present at this location.

B. Hydraulic Features

a. Scour Present: ☐ Yes ☐ No Location: _____

b. Distance from F.G. to Normal Water Elevation: _____ ft.

c. Distance from Low Steel to Normal Water Elev.: _____ ft.

d. Distance from F.G. to High Water Elevation: _____ ft.

e. Distance from Low Steel to High Water Elev.: _____ ft.

f. Channel Banks Stable: ☐ Yes ☐ No

Describe:

g. Soil Type: _____

h. Exposed Rock: ☐ Yes ☐ No Location: _____

i. Give Description and Location of any structures or other property that could be damaged due to additional backwater.

C. Existing Roadway Geometry

a. Can the existing roadway be closed for an On-Alignment Bridge Replacement

☐ Yes ☑ No

Describe:

If "yes", does the existing vertical and horizontal curves meet the proposed design speed criteria?

If "No", will the proposed bridge be:

☐ Staged Constructed

☑ Replaced on New Alignment

VI. Field Review (cont.)

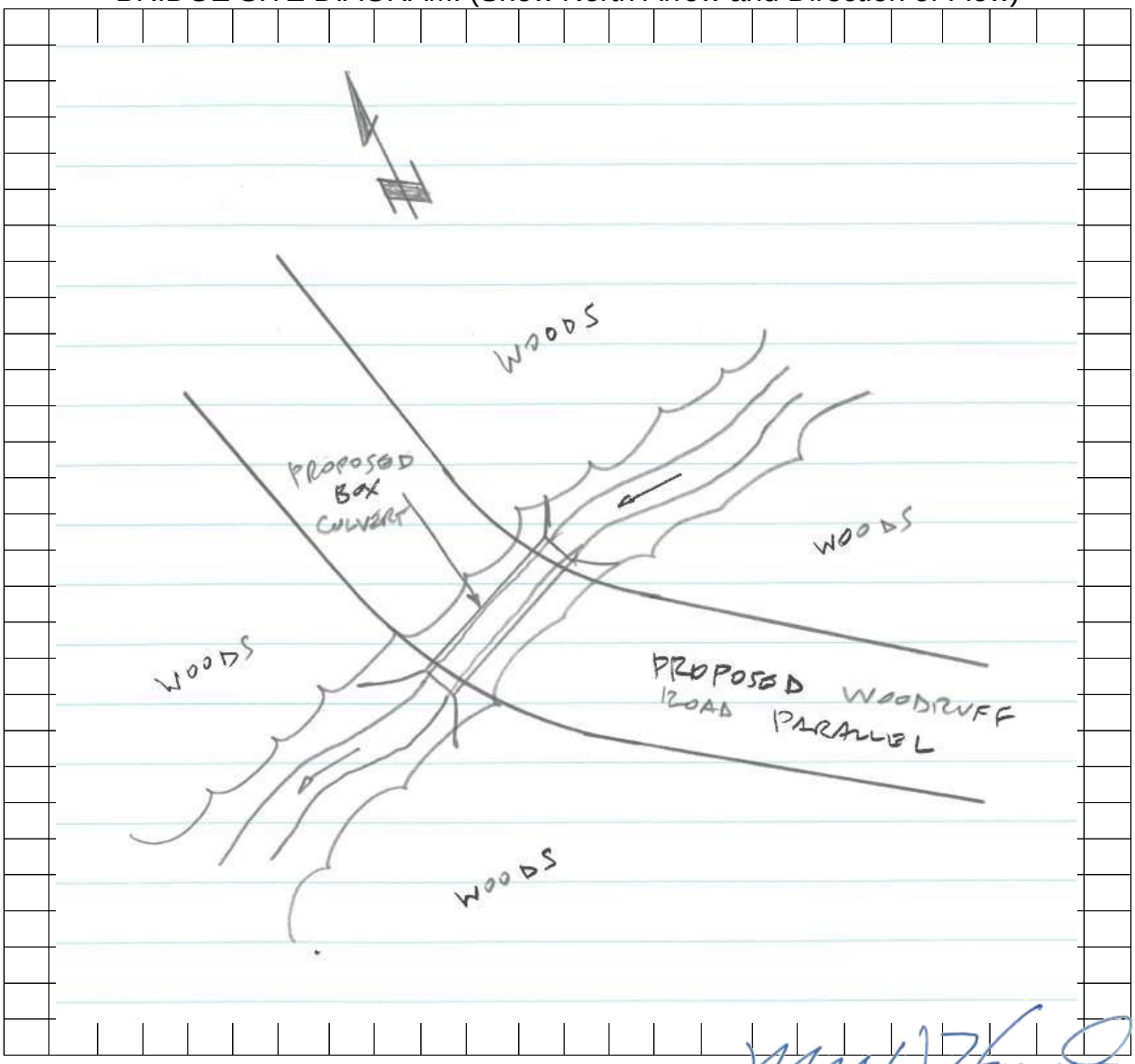
A. Proposed Bridge Recommendation:

Length: N/A ft. Width: N/A ft. Elevation: _____ ft.

Span Arangement: N/A

Notes: Based on preliminary investigation, this crossing will consist of a single 8'x8' RC box culvert.

BRIDGE SITE DIAGRAM: (Show North Arrow and Direction of Flow)



Performed By: Mark W. Hammond

Title: Hydraulic Engineer

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Silver Spring, Maryland 20910-3282
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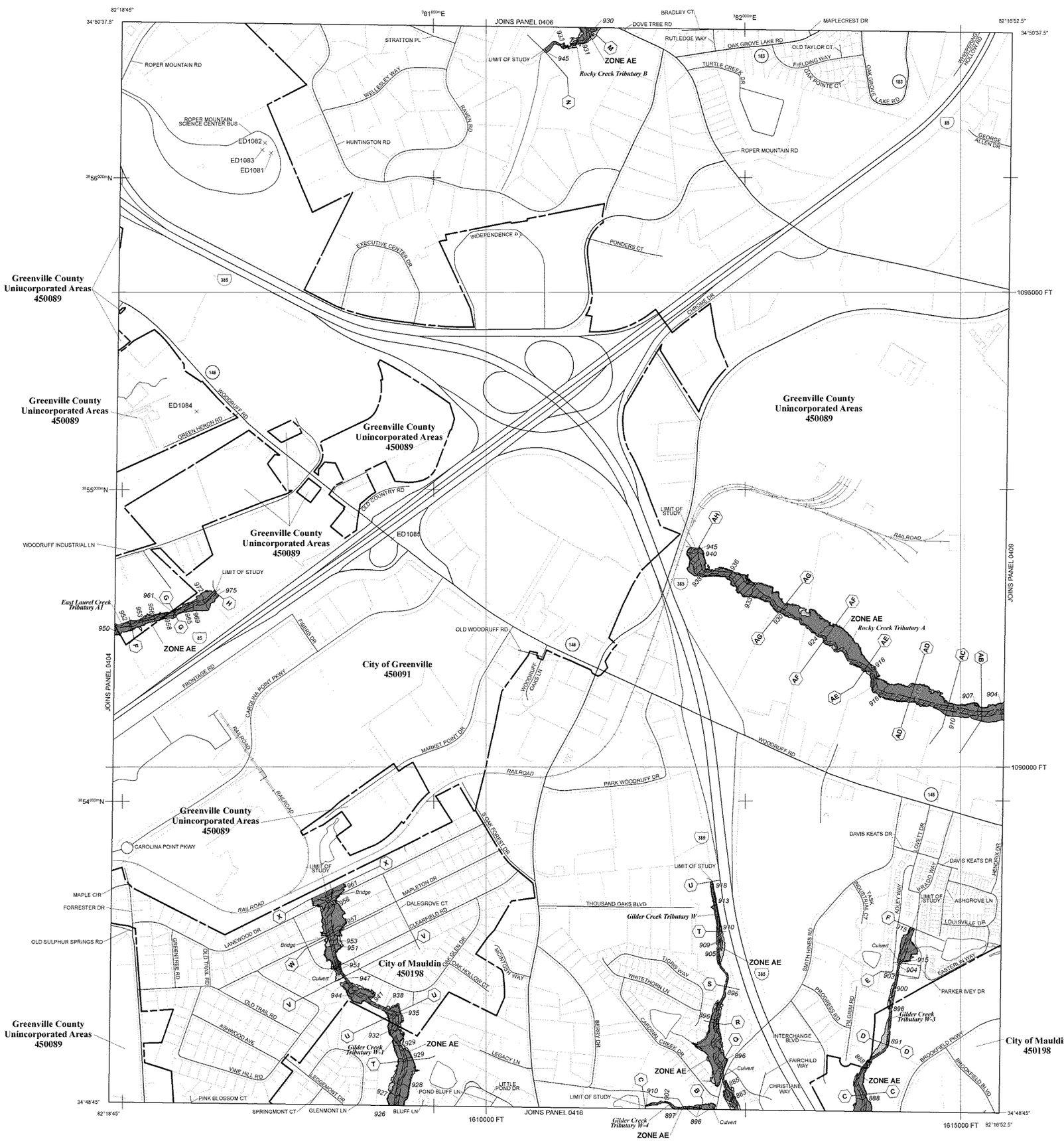
http://www.dnr.state.sc.us/



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988	
A — A	Cross section line
23 — 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE	1000-meter Universal Transverse Mercator grid ticks, zone 17
6000000 FT	5000-foot grid values: South Carolina State Plane coordinate system (FIPSZONE = 3900), Lambert projection
DX5510	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories List on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
December 2, 2004

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
August 18, 2014 - to update corporate limits, to change Base Flood Elevations, to add Base Flood Elevations, to change Special Flood Hazard Areas, to change zone designations, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to reflect updated topographic information.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0408E

FIRM

FLOOD INSURANCE RATE MAP

GREENVILLE COUNTY, SOUTH CAROLINA AND INCORPORATED AREAS

PANEL 408 OF 625

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GREENVILLE COUNTY	450089	0408	E
GREENVILLE, CITY OF	450091	0406	E
MAULDIN, CITY OF	450198	0408	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
45045C0408E

MAP REVISED
AUGUST 18, 2014

Federal Emergency Management Agency

South Carolina Department of Transportation
Location and Hydraulic Design of Encroachments on Floodplains Checklist

23 CFR 650, this regulation shall apply to all encroachments and to all actions which affect base floodplains, except for repairs made with emergency funds. Note: These studies shall be summarized in the environmental review documents prepared pursuant to 23 CFR 771.

I. PROJECT DESCRIPTION

The proposed project would provide an alternate parallel route to Woodruff Road from Verdae Boulevard to Smith Hines Road, while improving numerous intersections and access points along Woodruff Road.

A. Narrative Describing Purpose and Need for Project
   a. Relevant Project History:
   b. General Project Description and Nature of Work (attach Location and Project Map):
   c. Major Issues and Concerns:

The purpose of the project is to improve operational efficiency and alleviate traffic congestion on Woodruff Road to improve mobility in the busy commercial area between I-385 and Roper Mountain Road/Verdae Boulevard.

B. Are there any floodplain(s) regulated by FEMA located in the project area?
   Yes☒ No☐

C. Will the placing of fill occur within a 100-year floodplain?
   Yes☒ No☐

D. Will the existing profile grade be raised within the floodplain?

The proposed project will utilize existing grade at one crossing and will result in a new roadway/structure at another crossing. It is anticipated that this will require extension of an existing culvert and construction of a new structure.

E. If applicable, please discuss the practicability of alternatives to any longitudinal encroachments.

The project is not expected to result in longitudinal encroachments into floodplains, as the two crossings are perpendicular to the floodplains.

F. Please include a discussion of the following: commensurate with the significance of the risk or environmental impact for all alternatives containing encroachments and those actions which would support base floodplain development:

a. What are the risks associated with implementation of the action?

The project has the potential to impact the base flood elevation on the upstream side of the new crossing. Detailed hydraulic studies will be conducted to determine the appropriate structure size and type to minimize these impacts. This analysis will be coordinated with FEMA and the local floodplain coordinator, including Conditional Letter Of Map Revision/Letter Of Map Revision (CLOMR/LOMR) as necessary.

b. What are the impacts on the natural and beneficial floodplain values?

The proposed project would result in approximately 0.80 acre of direct floodplain impacts through the placement of fill material and construction of the proposed roadway improvements. Improvements include the extension of an existing culvert and construction of a new culvert to unnamed tributaries – East Laurel Creek Tributary A and A-1.

c. What measures were used to minimize floodplain impacts associated with the action?

The proposed crossings would be designed to accommodate the required conveyance and not impact any existing residential or commercial structures. In addition, the length of impacts would be minimized to only what is required to accommodate the proposed roadway. A final detailed hydraulic analysis would be conducted during final design development and would be performed in accordance with *SCDOT Requirements for Hydraulic Design Studies*.

d. Were any measures used to restore and preserve the natural and beneficial floodplain values impacted by the action?

The project will be designed and constructed to minimize impacts to floodplains through maintaining conveyance and water surface elevations up and downstream of the crossings. The associated fill material placed within the floodplain areas are expected to have minimal impact on the overall function and value of the floodplains. The area of fill material will be minimized to the extent practicable through design considerations (side slopes, walls, etc.)

G. Please discuss the practicability of alternatives to any significant encroachments or any support of incompatible floodplain development.

Extensive alternative analysis was conducted with project development. Some of the alternatives considered avoided impact but did not meet the purpose and need or provide adequate improvement. The crossings could not be avoided by the preferred alternative due to other constraints considering roadway design, land use, existing developments, existing infrastructure, and other geographic constraints.

H. Were local, state, and federal water resources and floodplain management agencies consulted to determine if the proposed highway action is consistent with existing watershed and floodplain management programs and to obtain current information on development and proposed actions in the affected? Please include agency documentation.

FEMA and the local floodplain manager will be consulted at the time of final design to ensure all local floodplain regulations are met.

3/30/2020

SCDOT Hydraulic Engineer Date