

Submitted By: Philip Sandel, P.E. Date: 08 / 22 / 14 Recommended: D. Kevin Ulmer, P.E. Date: 08 / 22 / 14  
Engineer of Record

To: Brad Reynolds, P.E.  
Program / Project Manager

**BASIS OF DESIGN EXCEPTION**

- ☒ Request for Approval of Design Exceptions to AASHTO Guidelines  
☒ Request for Approval of Design Exceptions from Standard SCDOT Procedures

**PROJECT CHARACTERISTICS**

County: Cherokee Rd. / Route: S-41 (Beech St.) Const. Pin: 40205 BR01  
From: S-167 (13th St.) To: S-633 (Goldmine Springs Rd.)  
Length: 0.10 miles MPO / COG Appalachian COG  
Work Type: Replace bridge over Peoples Creek  
Functional Classification: Urban Collector

Group Designation: ( 1 ☐ / 2 ☐ / 3 ☐ / 4 ☐ ) (if applicable)

Type of Terrain: (Level ☐ / Rolling ☒ / Mountainous ☐ )

Design Speed: 35 (mph)

<u>2012</u>	<u>ADT</u>	<u>3000</u>
<u>2032</u>	<u>ADT</u>	<u>4200</u>

TRUCKS 5 %

**CRASH ANALYSIS**

(Attach additional sheets with accident history data)

**TOTAL PROJECT ESTIMATE (\$)** \$1,942,000.00

**CHECK APPROPRIATE BOX(ES) FOR DESIGN EXCEPTION(S)**

- |  |  |  |
|--|--|--|
| <input checked="" type="checkbox"/> Design Speed | <input type="checkbox"/> Maximum Grade       | <input type="checkbox"/> Travel Lane Width       |
| <input type="checkbox"/> Horizontal Alignment    | <input type="checkbox"/> Vertical Clearance  | <input type="checkbox"/> Shoulder Width          |
| <input type="checkbox"/> Minimum Radii           | <input type="checkbox"/> Bridge Width        | <input type="checkbox"/> Horizontal Clearances   |
| <input type="checkbox"/> Vertical Alignment      | <input type="checkbox"/> Structural Capacity | <input type="checkbox"/> Stopping Sight Distance |
| <input type="checkbox"/> Level SSD K-Values      | <input type="checkbox"/> Superelevation Rate |  |
|  | <input type="checkbox"/> Cross Slope         |  |
|  | <input type="checkbox"/> Travel Lanes        |  |
|  | <input type="checkbox"/> Shoulders           |  |

**DESCRIBE ELEMENT(S) FOR DESIGN EXCEPTION(S)**

(Attach additional Sheets as needed) Based on the geometry of the existing network of streets and the location of utilities and substations, the maximum design speed that could be designed for the curve at the NW end of the new bridge structure is 25 mph. The minimum design speed for an Urban Collector functional classification is 30 mph. The existing horizontal curve has a radius of 220 feet. In order to meet the minimum design speed for this roadway classification a radius of 275 feet is required.  
See attached plan sheets for reference.

### JUSTIFICATION FOR DESIGN EXCEPTION(S)

(Attach additional Sheets as needed) As seen in the attached crash summary, very few crashes have occurred within the project limits (10) over the last 3 yrs. Even fewer have occurred on the curve with the substandard design speed (2 crashes - see Stack #7). While a simple comparison using the number of crashes for this short section of roadway may be elevated, 5 of the crashes occurred at night and 3 were the result of DUI. Also, further analysis from the Traffic Engineering Office has revealed that this intersection is improperly signed as a curve with 25 mph regulatory advisories. (see attached)

### DESCRIBE STEPS TO ELIMINATE DESIGN EXCEPTION(S), INCLUDE COST

(Attach additional Sheets as needed) To increase the design speed of the curve, the curve radius would have to be increased. This increase would push impacts onto a utility substation at the intersection of S-41/S-167 (relocation of substation \$250,000 not incl. R/W). Another way to increase the design speed of the curve would involve a shift in the alignment of the new bridge. (see attach.)

### HOW WILL FUTURE CONSTRUCTION IMPACT DESIGN EXCEPTION(S)?

(Attach additional Sheets as needed) Future design and construction will still need to address this design issue.

### RECORD OF DECISION

☒ For

☐ Against

☒ For

☐ Against

☒ Approved

☐ Denied

D. F. Ulmer 9/5/2014  
(Regional Design Manager/  
Program Manager / DEA) Date

Anthony J. [Signature] 9/10/2014  
(Regional Production Engineer) Date

Matthew D. [Signature] 9/10/14  
(Director of Preconstruction) Date

☐ Concur

N/A

/ /

FHWA (NHS Routes > \$50 million & All Interstate)

cc:  
Director of Preconstruction  
FHWA  
Preconstruction Support Engineer  
Regional Production Group Engineer  
District Engineering Administrator  
Director of Traffic Engineering

**JUSTIFICATION FOR DESIGN EXCEPTION(S) (CONT.)**

Using the departments current standards for signing, since this "curve" will only support a 25 mph design speed it should then be signed as a TURN condition rather than a curve.

In addition to changing the signage along S-41 at the curve in question, other mitigation strategies that are being included are the use of rumble strips, additional 2' wide paved shoulders, and the installation/upgrade of the guardrail along S-41.

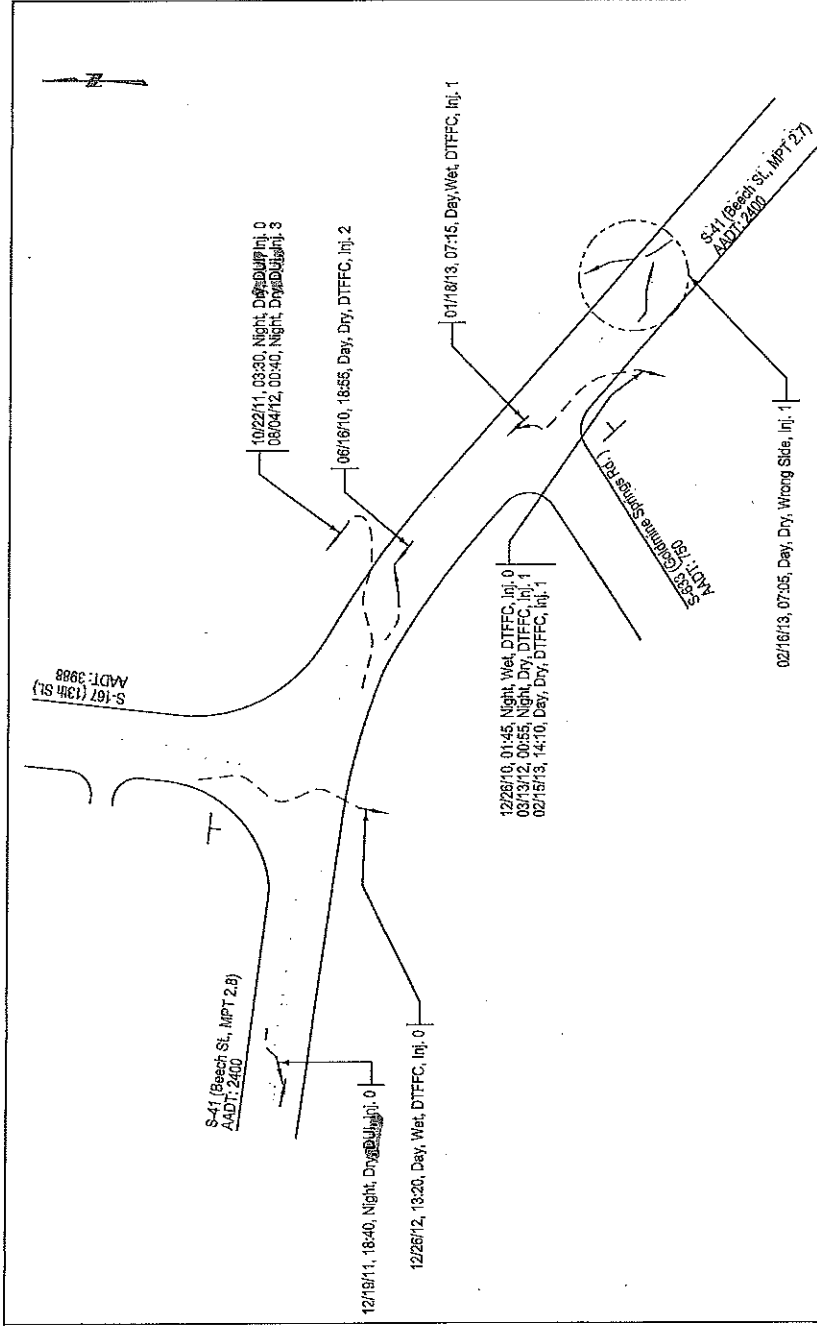
**DESCRIBE STEPS TO ELIMINATE DESIGN EXCEPTION(S), INCLUDE COST (CONT.)**

The shift in alignment of the structure away from the substation has several impacts that made this option not feasible. First, the shift resulted in negative impacts to the intersection of SC-41 and Goldmine Springs Road causing an awkward stop condition where the driver is forced to look back over their shoulder (to the left and down/across the bridge) to check for oncoming traffic. The only way to correct this is by realigning Goldmine Springs Road which could potentially result in the taking of a home. This shift also increases the skew angle between the new structure and the creek resulting in a longer bridge. Any option that involves a change in the existing alignment of the structure has the potential to adversely impact many utilities – both overhead and underground. See chart below for a breakdown of estimated costs associated with each option.

**Option 1** - increase radius by shifting roadway towards substation at intersection of 13<sup>th</sup> St. and S-41.

**Option 2** - increase radius by shifting roadway towards transmission tower and extended curve across bridge.

<u>Option</u>	<u>Utility Impacts</u>	<u>Add'l R/W</u>	<u>Add'l Construction</u>	<u>Total</u>
1	\$250,000	\$50,000	\$150,000	\$450,000
2	\$150,000	\$150,000	\$250,000	\$550,000



TRAFFIC ENGINEERING  
DIVISION  
COLUMBIA, S.C.

TRAFFIC SAFETY PROGRAM

SUBJECT TITLE: Collision Diagram

SPECIFIC LOCATION: S-41 (Beech St., MPT 2.7-2.8)

CITY: Gaffney COUNTY: Cherokee

DRAWN BY: DATE: 02/21/14 SCALE: None

JOB: 02/21/14 PAGE: 1 of 1

VR	12/10	2/27/11	2/27/12	2/27/13	Total
RA	0	0	0	0	0
RE	0	0	0	0	0
SS	0	0	0	0	0
HO	0	0	0	0	0
OC	2	2	3	3	10
HA	0	0	0	0	0
OTH	0	0	0	0	0
Total	2	2	3	3	10

Total = 10  
Length = 0.1  
AADT = 2400  
Years = 2010/13  
CR = 20.538  
SI = 62.785

PDO - 4  
FATAL - 1  
MAJ - 1  
MIN - 3  
WAD - 3  
DRY - 7

LEGEND

RA - Rear End  
RE - Rear End  
SS - Side Slip  
HO - Head On  
OC - Other Collision  
HA - Hit A Vehicle  
OTH - Other

**Crash Summary**  
**S-41 (Beech St.) from MPT 2.7 (South of S-633)**  
**to MPT 2.8 (North of S-167)**  
**Cherokee County**  
**01-01-2010 to 04-30-2013    3    years**  
**Length =    0.10    miles**  
**AADT =    2,400**  
**Functional Class - Urban Collector - 2L**

*Crashes by Injury Class*

Fatality Crashes	0
Injury Crashes	6
PDO Crashes	4

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<b>Total Crashes</b>	<b>10</b>
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*Crashes By Manner of Collision*

Rear End	0
Angle	1
Sideswipe	1
Head On	1
Run Off Road	7
Other	0

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<b>Total Crashes</b>	<b>10</b>
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*Special Contributing Factors*

Animal	0
Bicycle	0
Pedestrian	0

**Crash Summary**  
**S-41 (Beech St.) & S-633 (Goldmine Springs Rd.)**  
**Cherokee County**  
**01-01-2010 to 04-30-2013 3.33 Years**  
**AADT = 2,775**

*Crashes by Injury Class*

Fatality Crashes	0
Injury Crashes	1
PDO Crashes	0
<hr/>	
<b>Total Crashes</b>	<b>1</b>

*Crashes By Manner of Collision*

Rear End	0
Angle	1
Sideswipe	0
Head On	0
Run Off Road	0
Other	0
<hr/>	
<b>Total Crashes</b>	<b>1</b>

*Special Contributing Factors*

Animal	0
Bicycle	0
Pedestrian	0

**Crash Summary**  
**S-41 (Beech St.) & S-167 (13th St.)**  
**Cherokee County**  
**01-01-2010 to 04-30-2013 3.33 Years**  
**AADT = 4,394**

*Crashes by Injury Class*

Fatality Crashes	0
Injury Crashes	0
PDO Crashes	1
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<b>Total Crashes</b>	<b>1</b>

*Crashes By Manner of Collision*

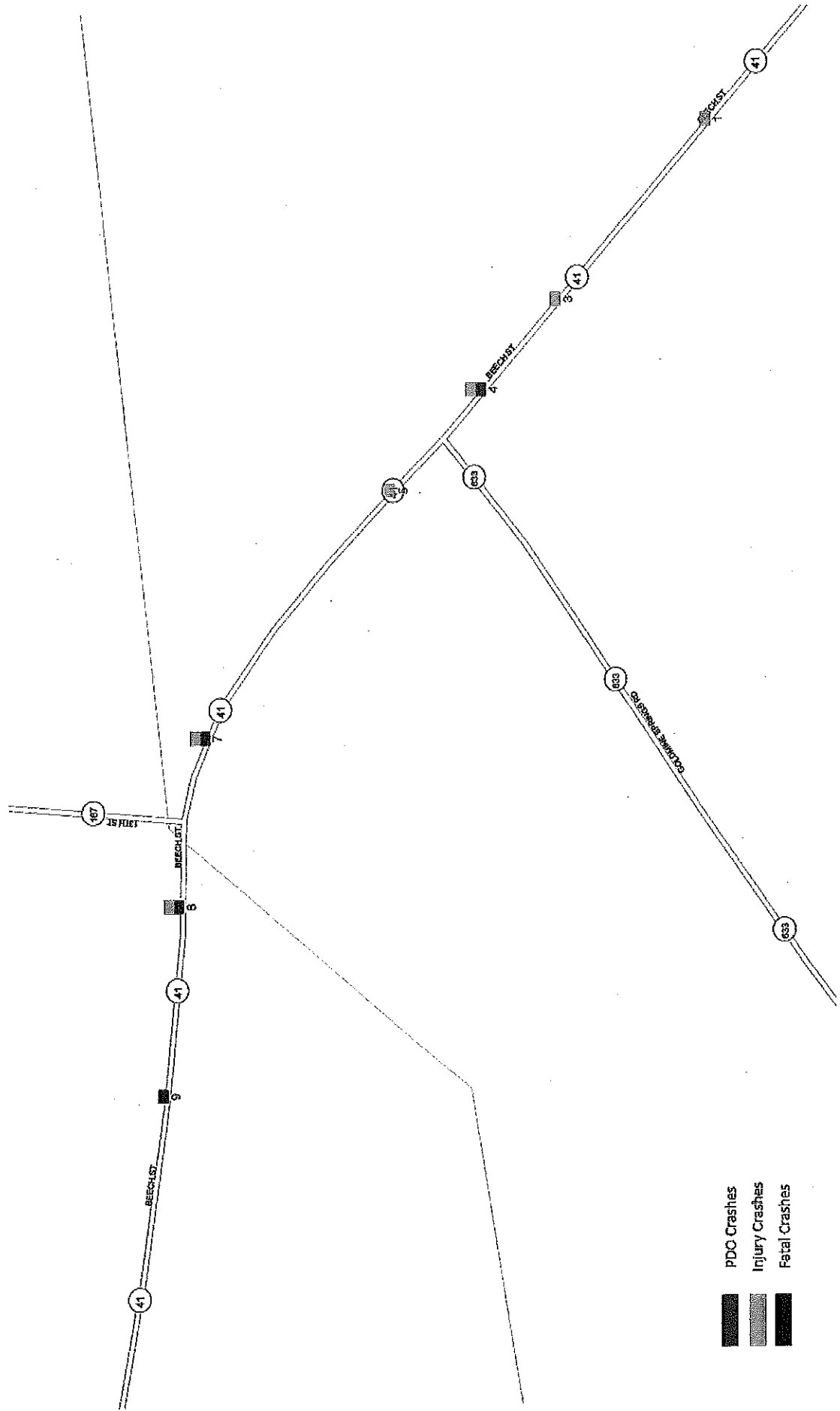
Rear End	0
Angle	0
Sideswipe	0
Head On	0
Run Off Road	1
Other	0
<hr/>	
<b>Total Crashes</b>	<b>1</b>

*Special Contributing Factors*

Animal	0
Bicycle	0
Pedestrian	0

\*One ROR crash where the driver couldn't stop at the stop sign due to wet roadway

Cherokee County - S-41 (Beech St.) from MPT 2.7 (South of S-633) to MPT 2.8 (North of S-167)





## Section Crashes

### **MPT 2.700 to 2.710 ( Stack #1 )**

**Total Crashes: 1    Light: 1    Dark: 0    Dry: 1    Wet: 0    Fatalities: 0    Injuries: 1    PDO: 0**

13508753    DAYLIGHT    DRY    INJ1    NOT COLLISION W/MOTOR VEHICLE

### **MPT 2.720 to 2.730 ( Stack #3 )**

**Total Crashes: 1    Light: 1    Dark: 0    Dry: 1    Wet: 0    Fatalities: 0    Injuries: 1    PDO: 0**

13509986    DAYLIGHT    DRY    INJ1

### **MPT 2.730 to 2.740 ( Stack #4 )**

**Total Crashes: 2    Light: 0    Dark: 2    Dry: 1    Wet: 1    Fatalities: 0    Injuries: 1    PDO: 1**

10148997    DARK (NO LIGHTS)    SNOW    INJ0    NOT COLLISION W/MOTOR VEHICLE  
12513626    DARK (NO LIGHTS)    DRY    INJ1    NOT COLLISION W/MOTOR VEHICLE

### **MPT 2.740 to 2.750 ( Stack #5 )**

**Total Crashes: 1    Light: 1    Dark: 0    Dry: 0    Wet: 1    Fatalities: 0    Injuries: 1    PDO: 0**

13502589    DAYLIGHT    WET    INJ1    ANGLE 2

### **MPT 2.760 to 2.770 ( Stack #7 )**

**Total Crashes: 2    Light: 0    Dark: 2    Dry: 2    Wet: 0    Fatalities: 0    Injuries: 1    PDO: 1**

11571032    DARK (NO LIGHTS)    DRY    INJ0    NOT COLLISION W/MOTOR VEHICLE  
12551926    DARK (NO LIGHTS)    DRY    INJ3    NOT COLLISION W/MOTOR VEHICLE

### **MPT 2.770 to 2.780 ( Stack #8 )**

**Total Crashes: 2    Light: 2    Dark: 0    Dry: 1    Wet: 1    Fatalities: 0    Injuries: 1    PDO: 1**

10064629    DAYLIGHT    DRY    INJ2    HEAD ON  
12603153    DAYLIGHT    WET    INJ0    NOT COLLISION W/MOTOR VEHICLE

### **MPT 2.780 to 2.790 ( Stack #9 )**

**Total Crashes: 1    Light: 0    Dark: 1    Dry: 1    Wet: 0    Fatalities: 0    Injuries: 0    PDO: 1**

11589586    DARK (NO LIGHTS)    DRY    INJ0    SIDESWIPE OPPOSITE DIRECTION

## Ulmer, Kevin

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**From:** Ikerd, Stephen R - FHWA  
**Sent:** Thursday, September 11, 2014 10:59 AM  
**To:** Ulmer, Kevin  
**Cc:** Fallaw, Tony; Fisher, Carolyn - FHWA  
**Subject:** RE: Design exception, S-41 Bridge over Peoples Creek, Cherokee County

Kevin—FHWA review/approval is not necessary.

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**From:** Ulmer, Kevin [<mailto:UlmerDK@scdot.org>]  
**Sent:** Wednesday, September 10, 2014 2:09 PM  
**To:** Ikerd, Stephen (FHWA)  
**Cc:** Fallaw, Tony  
**Subject:** Design exception, S-41 Bridge over Peoples Creek, Cherokee County

Steve,

I have an exception for design speed on a secondary route bridge replacement project. We have a curve at one end of the bridge that will only support a design speed of 25 mph. The road is classified as an urban collector and AASHTO 2001 indicates "a minimum design speed of 30 mph or higher **SHOULD** be used for urban collector streets, depending on available right-of-way, terrain, adjacent development, likely pedestrian presence, and other site controls." (page 434, para. 5)

SCDOT has justified and approved the design exception based on adjacent development as well as the mitigation strategies we intend to employ. Based on our previous conversations concerning the use of "should" vs. "shall" in the design standards, do you need/want to have FHWA review and approve as well?

### ***D. Kevin Ulmer, P.E.***

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