North Carolina Department of Transportation

H&H Report Guide for Federal Reimbursement

Hydraulics Unit

Version 1.0

12/1/2021

A H&H report is required to obtain Federal reimbursement for damages due to extreme weather events. The H&H report falls under FEMA's Public Assistance Program and Policy Guide (PAPPG) under that document's Appendix J: Cost-Effective Hazard Mitigation Measures. A report is required before a replacement can be made to ensure the facility's LOS is maintained or improved, there are no adverse impacts to adjacent properties, and that it follows the regulations of the NFIP.

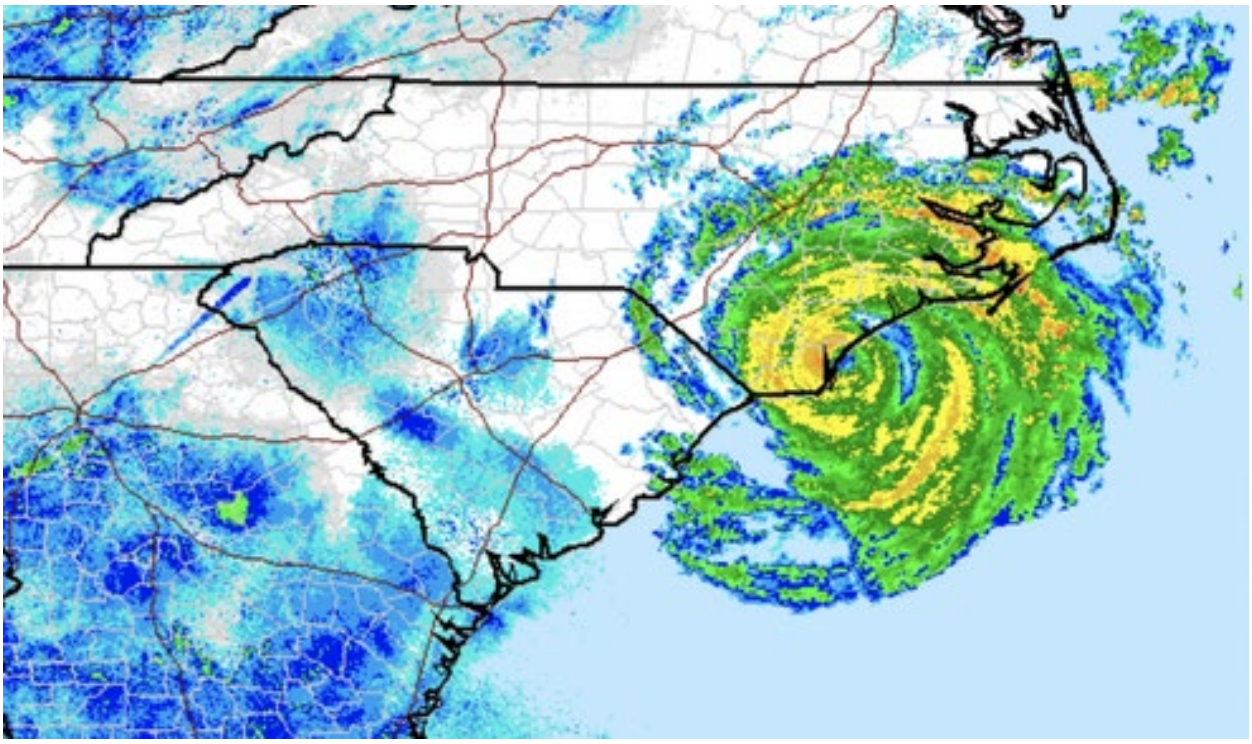
The H&H report consists of the following information (an example can be found on the Hydraulics Website):

- Geographical Information
  - County
  - Road number and Name
  - Latitude and Longitude
  - Nearby Crossing (road location)
  - Topographical Map
  - Note if any downstream structures are present
- Hydrological Information
  - River Basin
  - Drainage Area
  - Hydrology for Discharge Determination
  - Whether or not the site is in a FEMA study
- Hydraulic Calculations using the charts from FHWA's Hydraulic Design of Highway Culverts – Series 5 (HDS-5)
- Existing and proposed inlet and outlet calculations
- Existing and proposed inlet and outlet
- velocities
- Existing and proposed inlet and outlet elevations
- Package
- Signed and sealed by a PE
  - Addressed to the Division Maintenance Engineer
  - Carbon Copy to the Division County or Bridge Maintenance Engineer

The following is an example of the H&H Report Needs for Federal Reimbursement.

Hydrologic and Hydraulic Culvert Recommendation Report for Hurricane Florence

September 2018



All Culvert Replacements follow the "NCDOT Guidelines for Drainage Studies and Hydraulic Design 2016". This includes analysis and compliance for all FEMA regulated crossings and coordination with NCFMP (North Carolina Flood Mapping Program)

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Roy Cooper
GOVERNOR

James H. Trogdon, III
SECRETARY

January 17, 2019

COUNTY: Davie

MEMORANDUM TO: John P. Rhyne, PE
Division 9, Division Maintenance Engineer

FROM: Galen Cail, PE
Eastern Operations Manager - Hydraulics Unit

SUBJECT: Emergency Drainage Structure Recommendations
Following Hurricane Florence

NORTH CAROLINA PROFESSIONAL SEAL 022000 ENGINEER GALEN CAIL
DocuSigned by: Galen Cail
06F097D9041 14D5...

Pursuant to request from your staff for pipe size recommendations at sites damaged during Hurricane Florence, the following is offered.

FEMA Site # DF15409.2030011
SR 1496 – 0.11 mi S of SR 1414 (35.95044, -80.54540)
Drainage Area = 2.1 sq. mi.
Existing structure reported as 51" x 41" CMPA & 82" x 42" CMPA

Recommended pipe size is 2 @ 72" Pipe w/HW

Alternative 1: 1 @ 137" x 87" CMPA w/HW

Alternative 2: NA

These recommendations are made from an office only. Specific site conditions or limitations may dictate the use of alternate structures. If such conditions are noted, please contact this office for further analysis.

Cc: J. Mark Cook, PE - Division 9, Staff Maintenance Engineer
Charles R. White - Division 9, Bridge Superintendent

Mailing Address:
DEPARTMENT OF TRANSPORTATION
HYDRAULICS UNIT
1590 MAIL SERVICE CENTER
RALEIGH, NC 27699-1590

Telephone: (919) 707-6700
Fax: (919) 250-4108
Customer Service: 1-877-368-4968

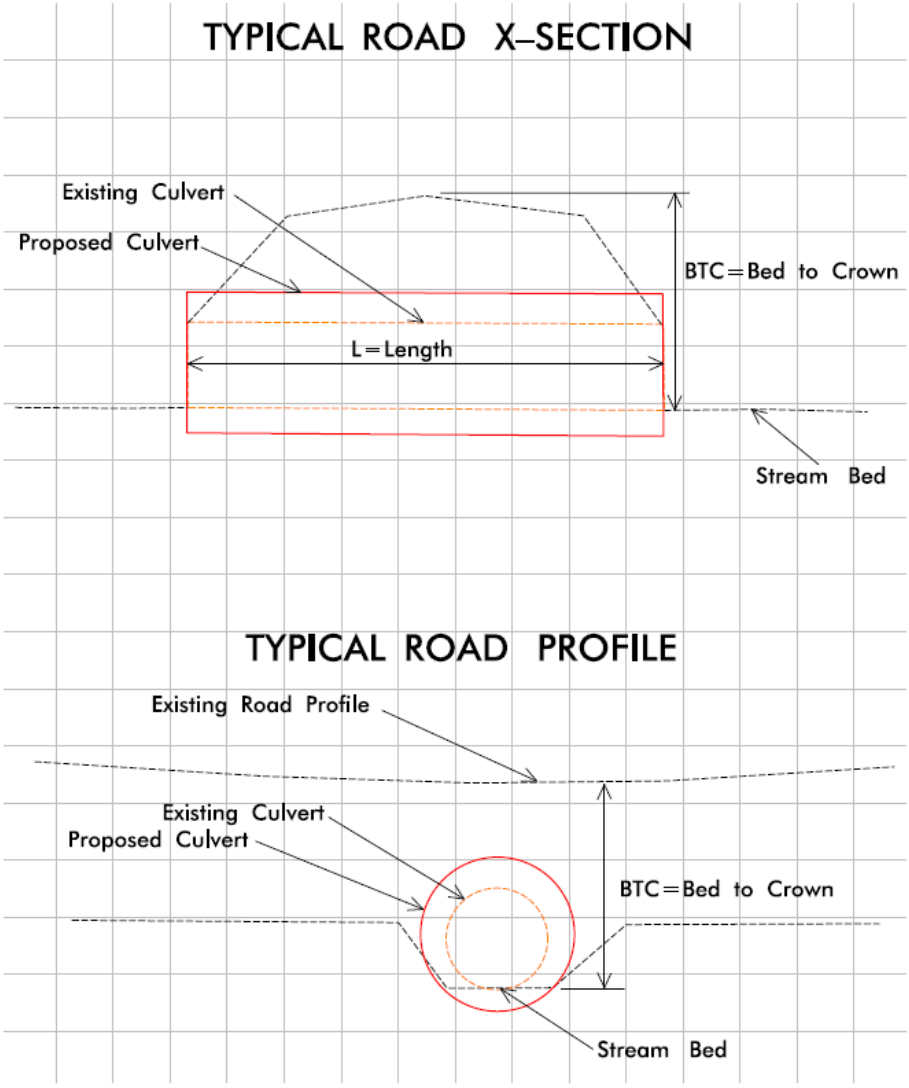
Website: www.ncdot.gov

Location:
1020 BIRCH RIDGE DRIVE
RALEIGH, NC 27610

Hurricane Florence– September 2018
County: Davie
Basin: Yadkin-Pee Dee

Narrative:

Structure replacement due to Hurricane Florence. Analysis for culverts in accordance with "NCDOT Guidelines for Drainage Studies and Hydraulic Design 2016". Proposed alternates may be provided to consider specific site constraints or limitations. Site constraints may include stream width, minimum culvert cover, utility conflicts and/or roadway overtopping. Some recommendations may not provide the desired Level of Service (LOS) for the facility due to these constraints. In these cases, the recommended structure(s) will either maintain or improve the existing LOS. Alternates also provided to give Divisions additional options considering culvert inventory and availability. Watershed drainage areas were determined using USGS quad maps.



Design Parameters and Analysis:

-Desired design criteria to provide HW/D for facility design year of 1.2 or less while maintaining existing road grade. Typically, 25 Yr design for state roads and 50 Yr design for NC, US and Interstate routes. If desired design criteria of proposed culvert(s) could not be installed without affecting road grade then facility level of service improvement was used as design criteria. FEMA 100 Yr discharge also analyzed if culvert is located in a regulated FEMA Flood Study.

Hydrology → USGS Rural Equations 2009 (1.0 sq miles and above rural watershed)
100 Yr FEMA Discharge
Hydraulics → Analyzed using Federal Highway Administration HDS-5
Frequency Analyzed → Improved Yr LOS, 100 Yr FEMA
FEMA → Dutchman Tributary 4, Limited Detailed Study
Voutlet → Full Flow Outlet Velocity of Existing and Proposed Culverts Per Continuity Equation (V=Q/A)

Design Assumptions:

-Existing and proposed culvert slopes and lengths are the same. Existing culvert(s) analyzed not buried. At jurisdictional crossings proposed culvert(s) analyzed buried 20% of diameter up to 1' for aquatic fish passage.
-Culverts slopes assumed 0.0%

Conclusion:

The culvert at this location is in place to allow water to flow from one side of the road to the other. The upstream and downstream flow is the same for both existing and proposed culverts. Roadway grades/overtopping elevations will be maintained. The replacement culvert will improve upstream conditions and provide improved LOS due to increase in area/conveyance of the structure. The replacement culvert will decrease outlet velocities due to increase in area/conveyance of the structure. Even though the new culvert will allow more water to pass, using the provided hydraulic analysis for proposed and existing culverts and per engineering hydraulic judgement, the same flow and tailwater depth is anticipated downstream for both existing and proposed conditions and there will be no adverse impacts downstream of the culvert. There are structures downstream of the crossing. Outlet and inlet channels will be armored, as needed based on site conditions, typically with either Class I or Class II rip rap.

COUNTY: Davie PREPARED BY: WGC CHECKED BY: WGC

FROM: Nick Hanes RECEIVED: 09/27/18 QUAD MAP: Mocksville

ROUTE: SR 1496 Angell Rd

LOCATION: 35.95044 / -80.54540 -- 0.1 mi S of JCT SR 1414

EXISTING SIZE/COVER: 1 @ 51" x 41" CMPA & 1 @ 82" x 42" CMPA; BTC= 9'; L=50' **assumed**

DRAINAGE AREA: 2.1 sq mi. -- USGS Quad Map

DISCHARGE: **Q5= 470 cfs --** 2009 USGS Rural Region 1
FEMA DISCHARGE: **Q100= 1182 cfs**

FEMA ID (WBS#): DF15409.2030011

RECOMMENDATION:

	Ke	HW/D	HW DEPTH	dc	(dc+D)/2	H	Lso	HW DEPTH	Voutlet (ft/s)
Existing 51" x 41" CMPA & 82" x 42" CMPA Q5	0.9	4.0	14.0 OT	3.4	3.5	9.8	0	13.3 OT	15.5
FEMA Q100	0.9	5.0	35.6 OT	3.5	3.5	60.0	0	63.5 OT	38.9
2 @ 72" CMP w/ HW Q5	0.5	1.4	7.5	4.3	4.9	3.4	0	8.3	9.3
FEMA Q100	0.5	5.0	27.2 OT	5.4	5.5	21.8	0	27.3 OT	23.5
1 @ 137" x 87" CMPA w/ HW Q5	0.5	1.0	6.6	2.4	4.4	2.0	0	6.4	8.2
FEMA Q100	0.5	3.3	20.6 OT	6.3	6.3	12.3	0	18.6 OT	20.7

COMMENTS:

Dutchman Creek Tributary 4 Limited Detailed Study

Proposed culverts assumed w/ headwall analyzed buried 1'

Existing 51" x 41" & 82" x 41" area = 30.4 sq ft
2 @ 72" area buried 1' = 50.4 sq ft
1 @ 137" x 87" area buried 1' = 57.1 sq ft

Existing LOS/100 Yr Overtop? YES/YES
Proposed LOS/100 Yr Overtop? NO/YES

BTC=Bed to Crown=Height from top of road to stream bed.
L=Pipe Length
IA=Impervious Area=USGS Urban Equation parameter
OT=Overtop=Indicates that existing road overtops in analyzed event


FRIS
Map Theme
Search
County: Davie
DFIRM:
Places:
Streams:
Address:
Coordinates: Lat - Lon (Decimal Degrees)
Latitude-Northing-Y: 35.95044
Longitude-Easting-X: -80.54540
Who Am I : Advanced
Effective
Flood Information
Click the map to view information
Map Location
Flood Zone: AE
Flood Source: Dutchman Creek Tributary 4
Base Flood Elevation: 684.2 ft More
County: Davie
Political Area: Davie County
CID: 370308
Panel: 5840 Download
Map Number: 3710584000J
Panel Effective Date: 9/17/2008
Latitude: 35.95044
Longitude: -80.5454
Risk Information
Financial Vulnerability
Flood Insurance
FIS Reports
Engineering Models
Map Export
Data Export