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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Rev. 8/14 | | | Bridge No. | | | | | | | | | | | | |  | | | | | |
| Job No. | | | | | | | | | | | | | | | |  | | | | | |
| Missouri Department of Transportation | | | | | | | | | | | | | | | | | | | | | |
| Bridge Hydraulics and Scour Report | | | | | | | | | | | | | | | | | | | | | |
| Designer | |  | | | | | | | | | | | | | Date |  | | | | | |
| Route | |  | | | | County | | |  | Stream | | |  | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | |
| Purpose of Hydraulic/Scour Study | | | | | | | | | | | | | | | | | | | | | |
| *(Write a brief statement describing project and purpose of hydraulic study)* | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | |
| National Flood Insurance Program Information | | | | | | | | | | | | | | | | | | | | | |
| Has a flood insurance study been performed for the community? *(*[*http://www.fema.gov/cis/MO.pdf*](http://www.fema.gov/cis/MO.pdf)*)* | | | | | | | | | | | | | | | | |  | | | | |
| Is the bridge in a special flood hazard area? *(If yes, a floodplain development permit will be required)* | | | | | | | | | | | | | | | | |  | | | | |
| Is the bridge in a designated floodway? *(If yes, a no-rise certification will be required)* | | | | | | | | | | | | | | | | |  | | | | |
| Has a Flood Insurance Rate Map (FIRM) been published for the area? | | | | | | | | | | | | | | | | |  | | | | |
| What is the flood hazard zone for the site (A, A1, B, C, AE, etc.)? | | | | | | | | | | | | | | | | |  | | | | |
| Base (100-yr) Flood Elevation | | | | | | | (ft), Datum = | | | | Floodway width | | | | | |  | | | | |
| Map panel number | | | | | | |  | | | | Map date | | | | | |  | | | | |
|  | | | | | | | | | | | | | | | | | | | | | |
| **Additional comments on Flood Insurance Study:** | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | |
| Discharge Data | | | | | | | | | | | | | | | | | | | | | |
| **Drainage Area** | | | | | | | | | | | | | |  | | | | | | (mi2) | |
| **Valley Slope** (average slope between points 10% and 85% of valley length upstream) | | | | | | | | | | | | | |  | | | | | | (ft/mi) | |
|  | | | | | | | | | | | | | | | | | | | | | |
| **Method of Analysis** (choose one or more) | | | | | | | | | | | | **Q25** | | **Q50** | | | | **Q100** | **Q500** | | Use |
| USGS regression equations | | | | | | | | | | | |  | |  | | | |  |  | |  |
| - Rural | Publication year = | | | | | | | Region = | | | |  | |  | | | |  |  | |  |
| - Urban | Publication year = | | | | | | | % Impervious = | | | |  | |  | | | |  |  | |  |
| Stream Gage | | | | USGS Station Number = | | | | | | | |  | |  | | | |  |  | |  |
| FEMA Flood Insurance Study | | | | | Community Name = | | | | | | |  | |  | | | |  |  | |  |
| Other = | | | | | | | | | | | |  | |  | | | |  |  | |  |
|  | | | | | | | | | | | | | | | | | | | | | |
| **Comments on Discharge calculations:** *(method chosen and why, expected level of upstream development, etc.)* | | | | | | | | | | | | | | | | | | | | | |

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| --- | --- | --- | --- | --- | --- |
| **Observed Extreme High Water** | | | | | |
| Elevation =       (ft), Datum = | | Location = | | | Date = |
| **Comments on Observed Extreme High Water:** *(discharge, if known, etc.)* | | | | | |
| **Discuss flow conditions in reach and describe existing conditions that may influence hydraulic behavior in reach:** | | | | | |
|  | | | | | |
| **Streambed Slope** | | | | | |
| Streambed Slope |  | | (ft/ft) | | |
|  | | | | | |
| Water Surface Profile Model | | | | | |
| Model used: | | | | | |
| River Analysis System (HEC-RAS), Ver. | | | | Other = | |
|  | | | | | |
| Which cross sections were used in the model and why? | | | | | |
| Describe the channel/overbank conditions and the roughness coefficients chosen: | | | | | |
| **Describe existing and proposed bridges and methods used to model them:** *(Bridge loss method, pier loss coefficients, etc.)* | | | | | |
|  | | | | | |
| Filenames | | | | | |
| Describe files used in water surface profile model: *(HEC-RAS project and plan descriptions, WSPRO filenames and descriptions, etc.)* | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Water Surface Profile Model Results | | | | | | | | | | | |
|  | Existing Conditions | | | | | | Proposed Conditions | | | | |
| Frequency | **Q****25** | **Q50** | **Q100** | **Q500** | **QOT** | | Q25 | **Q50** | **Q100** | **Q500** | **QOT** |
| High Water Surface Elev. (ft) |  |  |  |  |  | |  |  |  |  |  |
| Backwater (ft) |  |  |  |  |  | |  |  |  |  |  |
| VAVE channel  thru bridge (fps) |  |  |  |  |  | |  |  |  |  |  |
| VAVE thru bridge opening (fps) |  |  |  |  |  | |  |  |  |  |  |
| Freeboard (ft) |  |  |  |  |  | |  |  |  |  |  |
| % Flow over roadway (%) |  |  |  |  |  | |  |  |  |  |  |
| Overtopping (OT) frequency =  High Water Surface Elev. measured at  Backwater measured at | | | | | | VAVE = average velocity  VAVE channel = average velocity in channel | | | | | |
|  | | | | | | | | | | | |
| **Additional comments on water surface profile model Results:** *(backwater, velocities, unusual conditions, model errors, etc. )* | | | | | | | | | | | |

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| **Scour Calculations** | | | | | | | | | | | | |
| **General Information:** *(Describe soil conditions in streambed and overbanks)* | | | | | | | | | | | | |
| **Comments on Contraction Scour calculations:** | | | | | | | | | | | | |
| **Comments on Pier Scour calculations:** *(Do calculations account for the expected footing, was drift considered in determining pier width, etc?)* | | | | | | | | | | | | |
| **Comments on Abutment Scour calculations:** | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Calculated Scour Depths** | | | | | | | | | | | | |
|  | | | | | Scour Design Flood\* | | **Scour Check Flood\*\*** | | | | \*Minimum of Scour Design Flood (Interstate = 200-yr, all other routes = 100-yr) and Overtopping Flood.  \*\* Minimum of Scour Check Flood (500-yr) and Overtopping Flood. | |
| Frequency | | | | |  | |  | | | |
| Contraction Scour | | | | |  | |  | | | |
| Pier Scour – Piers | | | | |  | |  | | | |
| Pier Scour – Piers | | | | |  | |  | | | |
| Pier Scour – Piers | | | | |  | |  | | | |
| Left Abutment Scour | | | | |  | |  | | | |
| Right Abutment Scour | | | | |  | |  | | | |
| *Left and Right as viewed looking downstream.* | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| Scour Protection Measures | | | | | | | | | | | | |
| What measures are required to protect against scour? | | | | | | | | | | | | |
| **Additional comments on scour calculations and/or scour protection:** | | | | | | | | | | | | |
| **General Information** | | | | | | | | | | | | |
| **Are there any improvements/buildings/crops/livestock that might be affected by alterations to the floodplain?** *(Include description and estimated value)* | | | | | | | | | | | | |
| **Special Considerations:** *(Describe any other special conditions or considerations which affect this project)* | | | | | | | | | | | | |
|  | | | | | | | | | | | | |
| **Bridge Layout Summary** | | | | | | | | | | | | |
| Span Layout | |  | | | | | | | | | | |
| Loading |  | | | Roadway Width | |  | | Skew |  | Alignment | |  |
| Fill exception: Sta. | | |  | | | | To Sta. | |  | | | |
|  | | | | | | | | | | | | |
| **Design Exceptions:** *(Provide an explanation of any design exceptions requested and approved for this project)* | | | | | | | | | | | | |

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| **Hydraulic Analysis Summary** |

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| Hydrologic Data |
| Drainage Area =       mi2 |
| **Roadway Design** |
| Design Frequency =      years  Design Discharge =      cfs  Design High Water (DHW) Elev. =  Design Elev. (1’ below shoulder) = |
| **Backwater/Base Flood Data (100-year)** |
| High Water Elev. =  Base Flood Discharge =      cfs  Estimated Backwater =      ft  Average Velocity thru Opening =      ft/s |
| Freeboard (50-year) |
| Freeboard Discharge =      cfs  Approach High Water Elev. =  Freeboard =      ft |
| Roadway Overtopping |
| Overtopping Flood Discharge =      cfs  Overtopping Flood Frequency =      years |