

Final Drainage Design Report



**Federal Highway Administration
Central Federal Lands Highway Division
KS FLAP KIN 50(1)
Cheney Reservoir Access**

**Prepared by
HDR Engineering, Inc.
06/21/2022**

KS FLAP KIN 50(1)
Cheney Reservoir Access
Central Federal Lands Highway Division

**Final
Drainage
Design
Report**

1. Introduction

Project Description

This report summarizes the hydrologic and hydraulic approach for the KS FLAP KIN 50(1) Cheney Reservoir Access project. The site is located along RS 607 (NE 50th Street) through Cheney State Park on the south side of Cheney Reservoir, approximately 25 miles west of Wichita, KS. See Site Map in Appendix A.

Proposed work includes full depth reclamation, new asphalt concrete pavement, signing, striping and a culvert extension.

Project Location

RS 607, also known as NE 50th Street, is a county road running along the south side of the Cheney Reservoir Dam. The section of RS 607 included in this project begins at the intersection of RS 607 and RS 1428 (NE 150th Avenue). The project goes East for 2.1 miles and ends at the Kingman County line, also known as NE 170th Avenue.

RS 607 is located in FEMA Flood Insurance Rate Map (FIRM), number 2005890003B for Kingman County, with an effective date of February 1, 1990, see Appendix A for reference. The project crosses Zone A Floodplain in two locations. No additional mapping has been completed for the project since the new roadway closely matches the existing conditions and lies at the edge of the floodplain. These factors make it unlikely that the work being completed in the Zone A areas would cause a measurable rise in the floodplain. The floodplain administrator for Kingman County was contacted to see confirm that a floodplain permit would not be needed. The Floodplain Administrator confirmed our assumptions and agreed that no floodplain permit would be required. All decisions have been documented for reference.

Design Criteria

As discussed above, there will be minimal proposed drainage work. All design features will be replaced or extended in kind and NOT designed to meet the Federal Highways Administration (FHWA) "Project Development and Design Manual" (PDDM), Chapter 7, which has been summarized in Table 1 below. Kingman County, KS does not have its own established drainage criteria.

Table 1 Hydrology and Hydraulic Criteria

Criteria	
Design Feature	PDDM Criteria
Peak Flow Methods	Rational Method
Design Storm Frequency	Design: 10-yr Check: 100-yr
Roadway Spread	

Required Clear Width	Limit the spread to half of one travel lane for gutter flow, both on-grade and in roadway sags.
Allowable depth	Flow depth at the curb should not exceed the curb height or the allowable spread for the design discharge.
Pavement Drainage	
Storm Drain Pipe	Min size: 15" Min Slope: 0.5%
Inlet	Clogging factor: 50% for grate inlets in sag or sump
Culverts	
Capacity Design and Stability	Design: 25-yr Check: 100-yr
Headwater	New culverts: not be greater than the bottom of the aggregate base layer for the roadway pavement structure at the local roadway low point Existing: not be greater than the shoulder hinge point at the local roadway low point
Minimum Size	24" or equivalent for cross road culverts 18" for parallel culverts in ditches and channels
Pipe Material	RCP: Class II, Metal 0.064"
Outlet Protection	Riprap
Roadside Ditches	
Return Frequency	10-yr storm event
Slope	Min: 0.5%
Side Slopes	N/A
Ditch Stability	Permanent lining must be suitable for the 10-yr flood event. Use HEC-15 for design - Vegetation - Turf reinforcements - Riprap - Gabions - Concrete liner

2. Hydrology

The hydraulic design excludes hydrologic analysis and computations. General drainage patterns for the site are larger basins draining west and northwest across the site towards Cheney Reservoir located directly north of the site.

3. Hydraulics

Culverts

The site in its current condition has four stormwater cross culverts and thirteen driveway culverts parallel to the road under connecting driveways. The roadway improvements are largely contained within the limits of the existing pavement and will not impact existing structures apart from one culvert, identified below. See the 95% plans for existing and proposed culverts and Table 2 for a summary table of existing culverts below.

Table 2. Culvert Summary Table

STA	Material / Size	Type	Impacted?
14+06.09	CMP / 36"	Cross Culvert	No
25+51.85	Metal / 12"	Driveway Culvert	No
31+55.76	CMP / 18"	Driveway Culvert	No
35+29.26	CMP / 30"	Driveway Culvert	No
37+11.36	Metal / 12"	Driveway Culvert	No
40+36.81	CMP / 36"	Driveway Culvert	No
42+58.39	CMP / 18"	Driveway Culvert	No
45+59.11	RCP/ 7' BOX	Cross Culvert	No
50+35.47	Metal / 24"	Driveway Culvert	No
51+68.38	CMP / 24"	Driveway Culvert	No
52+55.51	CBC	Cross Culvert	No
54+01.57	CMP / 18"	Driveway Culvert	No
55+23.04	Steel / 18"	Driveway Culvert	No
57+45.54	Steel / 14"	Driveway Culvert	No
62+29.88	Steel / 18"	Driveway Culvert	No
64+81.26	CMP / 24"	Driveway Culvert	No
67+02.60	CMP / 18"	Driveway Culvert	No
97+00.00	CMP/ 24"	Cross Culvert	YES

Along the project corridor there are vegetated roadside ditches. These ditches appear to be mowed and maintained to convey water to the existing culverts throughout the project. The intent of the proposed design is to maintain the existing ditches in their current condition.

The condition of the existing drainage pipes on site was assessed at the 30% Field Review Meeting on October 13, 2021. All of the pipes appeared to be in good condition.

4. Proposed Design

Culverts

As the existing culverts are in good condition, they will be cleaned and protected in place during construction. Additionally, the culvert at 97+00 will be extended by about 10 ft on the north side instead of being replaced as proposed in the 30% design due to roadway widening in this area.

Water Quality and Erosion Control

The limits of disturbance for the project are approximately 10 acres. The project's construction stormwater discharges will be covered under the Kansas Department of Health and Environment (KDHE) National Pollutant Discharge Elimination System (NPDES) stormwater permit Stormwater Runoff from Construction Activities General Permit S-MCST-1703-1. Proposed stabilization BMP's for the site include erosion control and post construction TSS control, during and after construction to prevent sediment from entering adjacent bodies of water or wetland areas. Proposed BMP's include:

- Fiber rolls along perimeter of disturbed area
- Silt Fence along sensitive areas including wetlands and bodies of water
- Inlet and outlet protection at culverts

Under KDHE guidelines there will be no need for permanent water quality or detention since the project lies outside of the Wichita Municipal Separate Storm Sewer System (MS4) limits. Best management practices and erosion control are included in the 95% design and will be further documented in the Stormwater Pollution Prevention Plan (SWPPP).

5. Conclusion

The conclusions and recommendations in this report are based on the conditions of the project site and the associated watershed at the time of this study. Any modifications to the site, man-made or natural, could alter the analysis, findings, and recommendations contained herein and could invalidate the analysis, findings, and recommendations. Site conditions, completion of upstream or downstream projects, upstream or downstream land use changes, climate changes, vegetation changes, maintenance practice changes, or other factors may change over time. Additional analysis or updates may be required in the future as a result of these changes.

6. References

Federal Lands Highway Division, "Project Development and Design Manual", Chapter 7
Hydrology and Hydraulics, December 2012.

Appendix A

Maps and Supporting Documents

Site Map



