Kansas Department of Transportation

TECHNICAL SUMMARY

Guidelines for Replacement of Deficient Bridges with Low-Water Stream Crossings in the Rural Midwest

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Introduction

This report provides guidance to public officials and engineers considering the replacement of a deficient or obsolete bridge with a low-water stream crossing (LWSC). An LWSC is a structure that is occasionally overtopped by floodwaters and is likely to be impassable for a few hours or days in a normal year. LWSC structures include unvented fords, vented fords, low-water culverts, low-water bottomless culverts, and low-water bridges. LWSCs are sometimes constructed to keep very low-volume roads open where the cost of a normal bridge cannot be justified. The lower initial cost of an LWSC must be balanced against maintenance requirements and safety considerations.

Example of a Vented Ford in Kiowa County, Kansas

Project Description

Site assessment guidelines consider traffic, access, roadway, stream, and regulatory issues. LWSC options can be limited by conditions on federal and state-issued permits, particularly those concerning threatened and endangered species and historic resources, and by local floodplain regulations. Key design considerations are presented for LWSCs in general and for unvented fords, vented fords, and low-water bridges in particular. These considerations include roadway design issues, stream hydrology, aquatic organism passage at low flows, and debris passage and scour and erosion protection at high flows.

Project Results

Nine recent LWSC projects in Kansas are examined in detail. The structures include an unvented ford, a hybrid-type ford, three vented fords, a low-water box culvert, a low-water bottomless culvert, and two low-water bridges. Eight of the projects are completed and one has been delayed by regulatory issues. Each case study includes a description of the structure and relevant information on the crossing history; road and traffic characteristics; stream characteristics and hydrology; governmental permits and regulatory issues; project costs; and maintenance requirements and performance to date.

Project Information

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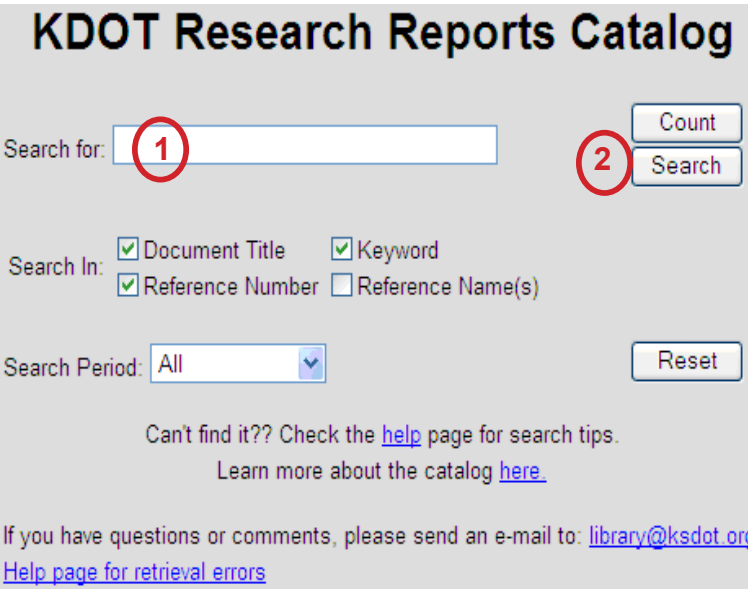

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