Project Summary

Texas Department of Transportation

0-6671: Synthesis of Hydrologic and Hydraulic Impacts

Background

As development occurs, the movement of rainwater through a watershed is altered, possibly causing increased erosion, flooding, or other adverse impacts. This study investigates how the various state departments of transportation (DOTs) and TxDOT districts define and mitigate adverse hydrologic and hydraulic impacts, so that the best practices might emerge and be documented.

What the Researchers Did

A link to a survey was e-mailed to the District Hydraulic Engineer (DHE) of each district. Twenty-three of the 25 DHEs responded. The DHEs were also interviewed in person to gain greater understanding. For 17 of the 25 districts, the interview was conducted at the district office, while for the remaining eight, it was conducted over the telephone and/or through e-mails. In a few of the districts, maintenance personnel were also interviewed.

Local Floodplain Administrators (FPAs) were interviewed to assess the working relationship between the FPAs and TxDOT.

A link to a state DOT survey was e-mailed to the head hydraulics engineer of each of 49 state DOTs, 35 of whom responded.

A literature review of litigation, standard practices (as suggested by Federal Highway Administration and other established institutions), and emerging practices (as suggested by a review of journals) was conducted to aid in survey development.

What They Found

Exactly what constitutes an adverse impact varies among communities and states. Furthermore, the term “adverse” is not necessarily used by the entity to refer to impacts which it nonetheless considers negative or unacceptable.

Most DOTs (25 of 35) have written guidance that distinguishes between acceptable and unacceptable flooding of adjacent property due to a DOT project. Few DOTs have limiting threshold to define adverse impacts, but rather depend on a weighing of costs versus benefits for a particular site.

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Designers are guided to minimize damages and, if damages are expected to result, designers are to present documentation to justify the damage. The lack of a rigid threshold does not necessarily lessen the design effort or the cost of the project for these DOTs.

Mitigation is more common for FEMA floodplains than for areas not associated with a FEMA floodplain, for water surface impacts, increases in discharge, and loss of floodplain storage. Most of the 35 DOTs "Rarely" or "Never" prepare a Conditional Letter of Map Revision/Letter of Map Revision (CLOMR/LOMR) when the project *reduces* water surface elevations, suggesting that a decrease in water surface elevation is generally not well-established as an adverse impact in most states. This is in contrast to an *increase* in water surface elevation in the FEMA floodplain.

Only 10 of the 35 DOTs "Never" apply for floodplain permits from the localFPA. Responses by those DOTs who "Never" apply for permits yet answer "Yes" to indicate that they have a procedure for coordinating with the local FPA are of special interest to TxDOT. One such response indicates that local FPAs are simply notified of any activities, while another response indicates that they are "contacted at the initiation of the project, and consulted for their knowledge of the project, and for recommendations."

There is not substantial variation in modeling software among TxDOT districts. For example, most districts rely heavily upon regression equations because of time and complications associated with a unit hydrograph method such as HEC-HMS. Model validation (i.e., checking the reasonableness of model results) practices among TxDOT districts are similar to those of other DOTs. The "High Water Data" sheet developed by one TxDOT district is the most useful tool for gathering data for model validation.

Noteworthy structural elements of mitigation found among the districts include staggered barrel culverts; articulated concrete blocks; a special entrance weir to mimic overtopping of the existing road to negate impacts that would be due to a proposed change in the road profile; and others.

What This Means

Hydrologic and hydraulic impacts are not uniformly defined among the states, local communities, and TxDOT Districts contacted for this synthesis project. The information generated by this study could be used by a panel of experts at TxDOT to standardize the mitigation of impacts, and to provide definitions to be uniformly used by all districts.

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