



# Project Summary

Texas Department of Transportation

## 0-5200: Transport Spill Containment for Texas Highways

### *Background*

The overall goal of the project was to collect information regarding roadway hazardous material spill incidents associated with transportation on Texas highways, including the types and volumes of hazardous materials released. The focus was on both transported materials (those carried as cargo) and loss of vehicular fluids (fuel, lubricants, etc.). The results from this study were used to develop design guidelines and parameters to reduce the risk of exposure to travelers and individuals responsible for spill cleanup as well as reduce or eliminate the potential for spilled materials to migrate to receiving waters.

### *What the Researchers Did*

Through the use of literature reviews and interviews, the researchers assessed hazardous spill containment strategies employed by other states. Based on a review of Texas historical spill records, “hot spot” spill sites were determined — these sites might benefit from permanent or non-permanent spill containment devices. Lastly, design guidance was developed for containment of hazardous materials spills based on the following considerations: the maximum load of materials transported by Texas carriers, regulatory tolerance of accident-related spills, the range of hydrologic characteristics expected at potential spill sites, and designs for existing structures versus designs that may be incorporated in new roadway projects.

### *What They Found*

Spill “hotspots” were identified in or near Austin, Beaumont, Dallas-Fort Worth, Houston, and San Antonio. However, Austin was considered an area that might benefit from spill containment structures because of the ecologically sensitive environment and its location above the Edwards Aquifer.

A subset of the 2002–2006 spill records was extracted to analyze the potential relation between rainfall events and hazardous materials spill incidents. The database was broken into geographical regions so that rainfall records could be associated with spill sites. Six Texas counties (Harris, Jefferson, Travis, Bexar, Orange, and Tarrant Counties) were selected for further analysis.

### *Research Performed by:*

Center for Multidisciplinary Research  
in Transportation (TechMRT),  
Texas Tech University

### **Research Supervisor:**

Audra Morse

**Project Completed:** 8-31-09

Researchers found there was no statistically-significant (or reasonable level of significance) difference between the proportions of spills occurring on wet days and dry days. Upon comparison of the raw proportions, there was a slightly smaller likelihood of a spill on a dry day in comparison to the probability of a spill event on a wet day. However, given the sample size, the differences were not statistically significant (less than a 5% level). That is, there is not a striking difference between the occurrence of a spill on a wet day or dry day.

For permanent spill containment, a detention basin is recommended. To size the basin considering a spill, spill materials were separated into two groups: those with a specific gravity,  $S_g$ , less than one and those with a specific gravity exceeding one. Those materials less dense than water were termed “lights” and those materials more dense than water were termed “heavies.” A separate group comprising oils (“oils”) were broken out as well. The spill volumes associated with each group, and with the entire group of liquid spills, was used to examine the distribution of spill volumes by group. The volume of material spilled associated with percentiles of 50-, 66.7-, 83.3-, 90-, 95-, and 99-percent were estimated using R (R Development Core Team, 2006). When taken as an entire group, 95 percent of the spills observed during the period of record (2002-2006) were 2,500 gallons or less and 99 percent of the spills were about 20,000 gallons or less. Therefore, a design volume for spill traps of 10,000–20,000 gallons seems reasonable. For non-permanent treatment structures for hazardous spill treatment, Stormceptors are recommended.

## What This Means

Detention basin design procedures vary around the state and from municipality to municipality. However, the work herein provides a procedure for designing detention basins to include hazardous spill volumes. Additionally, the hotspot analysis provides anecdotal evidence of areas with a higher propensity for hazardous material spills. Although the traffic database was not available until the end of this work, others could compare the hazardous spill incidences to traffic crash records to determine the conditions leading to the spill as rainfall does not appear to cause hazardous spill incidences.

### *For More Information:*

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