



Authors: Stephen S. Roop, Leslie E. Olson, David H. Bierling, Jeffery E. Warner, Adam Rinehart, Angela Sandoval, and Theodore Weisner

The Value of Pipelines to the Transportation System of Texas: Summary Report

Pipelines are a major transporter of commodities in the United States. According to the 1997 Commodity Flow Survey, pipelines moved over 22 thousand tons of commodities in the U.S. A modal breakdown indicates that pipelines transported almost a quarter of the commodities moved, second to only trucks with 50 percent.

The total pipeline mileage in Texas approaches 270,000 miles, which represents about 17 percent of the total pipeline mileage in the U.S. and links many segments of the country with energy sources located on the Gulf Coast.

This project was undertaken to assist The Texas Department of Transportation (TxDOT) in its understanding of the scope of the Texas pipeline system, how it interfaces with other transportation modes, and whether the pipeline system can be further integrated in the state's transportation system. Texas Transportation Institute (TTI) and Texas Tech University (TTU) collaborated in this effort, with the assistance of the Railroad Commission of Texas (RRC).

What We Did...

The literature review for this project developed a comprehensive listing of national and Texas state agencies, organizations, and commercial entities involved in collecting and cataloging data regarding Texas pipelines. Also included were national and state entities that currently have a role in pipeline transportation policymaking and rules in Texas. The particular physical, business, and policy issues outlined in published research were identified. An annotated bibliography of pertinent literature sources was presented along with a listing of industry contacts for each area. The literature review included an overview of basic pipeline design parameters and commodity flow information.

The RRC initially provided a geographic information system (GIS) database of the Texas pipeline network to the researchers. The researchers expanded the database by adding state highways, roadway and rail networks, and locations of pipeline facilities that connect

with other transportation modes. On a statewide basis, information for 126 pipeline facilities has been integrated with the GIS database to show facility locations relative to pipeline, road, rail, and waterway networks. The GIS database has been partitioned with the capability of division into individual TxDOT districts. Because some information used to expand the database is from proprietary sources, it is only available for state use and is not available to the general public.

The researchers also developed contacts with an array of pipeline industry experts and resources. These contacts included officials with the U.S. Department of Transportation's Office of Pipeline Safety, pipeline industry suppliers, pipeline company employees, and consultants.

What We Found...

The RRC has attempted a positional accuracy of +/- 500 feet for pipeline locations in the GIS database; however, the spatial accuracy of



the pipeline segments in the database will vary greatly depending upon the data acquisition method or source material. The RRC has made special efforts to increase accuracy to a very high level in areas around rivers and waterways, where the agency has received federal funding to map to a +/- 3 feet level. The hazards associated with dredging, floating debris, construction, or other items or activities creating safety concerns makes understanding the locations of pipelines in river and waterway areas especially important. When completed, this information may be particularly useful to TxDOT in its function as the state sponsor for dredging activities and in obtaining properties for dredged material storage.

While gas pipelines represent over 92 percent of national pipeline mileage and 87 percent of Texas' pipeline mileage, there is relatively little interconnectivity between gas pipelines and other modes of transportation. As illustrated in [Figure 1](#) and described in Report 1858-1, the primary setting for pipeline connections with other modes is at petroleum storage terminals and processing facilities through road, rail, or marine loading racks.

Pipeline Industry Operational and Regulatory Issues

There is little opportunity for alternative product transport in natural gas gathering, transmission, and distribution lines. Product lines are currently configured to handle a wide variety of petroleum products in slugs or batch transmission. However, there are few, if any, allowances for product lines to

readily flow in the opposite direction from which they are designed to flow. In addition, the private and intensely competitive nature of pipeline companies dictates that there is probably little excess capacity for commodity shift. Further, it has been shown that what may appear to be capacity for product storage and throughput based on facility and pipeline capacity is actually not available due to inventory and operational limitations.

State and Federal Pipeline Regulations

The RRC currently has state-level jurisdiction over pipeline safety and operation in Texas. In cases where federal regulations do apply to intrastate pipelines, but allow a certified state agency to enforce the regulations, RRC is also the certified state entity in Texas. Certain aspects of new pipeline construction, existing pipeline operation, or pipeline upgrade and change-of-use plans may be regulated by other agencies such as the Texas General Land Office or Texas Natural Resource Conservation Commission. TxDOT does not currently play a significant role in state regulation of petroleum pipelines. Although TxDOT's mission statement refers to the desire to provide safe, effective, and efficient movement of people and goods in general, the precedent for pipeline regulation in Texas lies with RRC.

Pipeline Industry Perspective

Pipeline companies are confidential in nature and operate in a very competitive business

environment under principles of cost minimization and revenue maximization. Considerations such as minimizing network transmission distances, energy use, and maintenance expenditures, coupled with maximizing tons of commodity transported for the highest price, determine how companies fare in the competitive marketplace of pipeline transmission. The profit motive (and cost minimization) has the effect of optimizing the use of a pipeline network by focusing employees on the detail of the operation and eliminating unnecessary elements, procedures, or practices. Given this reality, there seems to be very little room for an active role by state agencies in day-to-day pipeline operations.

It is the pipeline industry's consensus that ample oversight is provided under the current regulatory environment and additional government interaction is not particularly desirable. However, discussions with industry principals indicate that there would be industry support for a publicly funded university-based consortium dedicated to research pertaining to pipeline safety and operations. Such a consortium could serve to accelerate the rate at which technological innovation is introduced to the pipeline transportation industry by directly engaging top researchers and scientists from a variety of engineering disciplines in pipeline safety issues. It could catalog and communicate key industry needs and goals to researchers, who would then seek to apply the latest advances in safety technologies to pipeline needs





Figure 1. Pipeline Interconnectivity with Other Transport Modes (TTI photo)

in order to enhance system integrity, improve system reliability, and elevate system safety.

The Researchers Recommend...

Utilization of pipelines might be enhanced by minimizing the restrictions placed on pipeline companies only to the point of ensuring efficient competition. However, this reduced restriction must be balanced with the other side of the business model – the premise that pipeline companies will comply with environmental and public welfare regulations only as necessary. Unless otherwise provided for by internal or external forces, competitive forces may unintentionally compromise safety, thus creating a role for regulatory oversight of pipeline safety and operations at the state and federal levels. Therefore, a careful assessment of the effectiveness of pipeline safety regulations relative to public and environmental well-being is critical. With regard to maintaining safe and effective operations of Texas’ pipelines, those

agencies with industry expertise and regulatory authority over pipelines and pipeline companies should be sure that adequate resources are allocated to allow for consistent and comprehensive regulatory enforcement as defined by state and federal rules and legislation.

Integral to its goals to provide safe, effective, and efficient movement of people and goods, it is critical that TxDOT consider the impact that pipelines have on other transport modes and work with pipeline companies and other state agencies to maintain effective and safe operation of pipeline networks. TxDOT may be able to play some role in coordinating pipelines’ interactions with other transportation modes in Texas, in conjunction with the RRC or other agencies.

The following actions have been identified as areas for potential involvement by TxDOT in pipeline transportation:

- monitor the impact of trucks on state roadways near wells and terminals,
- assist RRC in assessing modification of private well

- systems to mitigate truck traffic,
- assist RRC in the development of an accurate GIS-based pipeline and facilities location database,
- while primarily an industry responsibility, TxDOT can assist with investigations into the potential for commodities shift with a change in technological and business practices, and
- plan for pipeline integration with multi-use freight transportation corridors.



For More Details . . .

The research is documented in [Report 1858-1, *The Value of Pipelines to the Transportation System of Texas: Year One Report*](#), and [Report 1858-2, *The Value of Pipelines to the Transportation System of Texas: Year Two Report*](#).

Research Supervisor: Stephen S. Roop, TTI, s-roop@ttimail.tamu.edu, (979) 845-5817.

Key Researchers: Leslie E. Olson, TTI, l-olson@ttimail.tamu.edu, (979) 845-5817;
David H. Bierling, TTI, d-bierling@ttimail.tamu.edu, (979) 845-5817;
Jeffrey E. Warner, TTI, j-warner@ttimail.tamu.edu, (979) 845-5817;
Adam Rinehart, TTI, a-rinehart@ttimail.tamu.edu, (979) 845-5817;
Angela Sandoval, TTU, asandova@ttacs.ttu.edu, (806) 795-7018;
Theodore Weisner, TTU, Ted.Wiesner@coe.ttu.edu, (806) 742-3543

TxDOT Project Director: Raul Cantu, Jr., P.E., rcantu@mailgw.dot.state.tx.us, (512) 416-2344

To obtain copies of the reports, contact Dolores Hott, Texas Transportation Institute, Information & Technology Exchange Center, (979) 845-4853, or e-mail d-hott@tamu.edu. See our on-line catalog at <http://tti.tamu.edu>.

TxDOT Implementation Status April 2002

Three products were developed in this project. The implementation status of each follows:

Product 1: Inventory of the Texas pipeline system, including connections to other transportation modes, in ArcInfo GIS format.

Status: Submitted on CD. Catalogued connections to other modes. Provided to Railroad Commission. Will share with other agencies.

Product 2: Meeting of resource experts in association with the annual PetroExpo convention in March.

Status: Complete. AIChE Houston PetroExpo held in April 01. List of resource experts developed. Paper T5a05 presented at 5th Bi-annual Process Plant Safety Symposium April 01.

Product 3: Recommendations for new roles and responsibilities for TxDOT and other state agencies regarding pipelines.

Status: Submitted. Documented United States Department of Transportation (USDOT), Federal Energy Regulation Commission and Texas Railroad Commission roles. Report 1858-2 includes TxDOT roles and recommendations on the Gulf Intracoastal Waterway. Will become part of the pipeline chapter in the statewide plan.

YOUR INVOLVEMENT IS WELCOME . . .

Disclaimer

This project was conducted in cooperation with the Texas Department of Transportation (TxDOT) and the U.S. Department of Transportation, Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the FHWA or TxDOT. This report does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. Trade names were used solely for information and not for product endorsement. The researcher in charge of this project was Stephen S. Roop.