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16. Abstract This report summarizes the Year 1 activities under implementation project 5-4160-01, Managed Lanes Handbook Training. The overall objective of the project is to develop a 16-hour workshop covering <i>The Managed Lanes Handbook</i> , and teach the materials at seven locations across the state, including two pilot workshops. <i>The Managed Lanes Handbook</i> was developed for the Texas Department of Transportation (TxDOT) to help the staff make informed planning, design, and operational decisions when considering managed lanes facilities for its jurisdiction. The handbook presents the critical research results obtained over the five years of the related research project, presented in a usable format, providing a clear, concise, and step-wise approach to planning, designing, operating, and enforcing a managed lanes facility. It also refers the user to other pertinent documents that provide additional detailed information on various aspects of managed lanes. The workshop is designed to facilitate statewide use of the handbook with TxDOT and partnering agency staff involved in managed lanes project development and design. Year 1 activities included workshop development, pilot course offerings, and updating of workshop material as appropriate.			
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**MANAGED LANES HANDBOOK TRAINING:
YEAR 1 REPORT OF ACTIVITIES**

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DISCLAIMER

This research was performed in cooperation with the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA). The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of FHWA or TxDOT. This report does not constitute a standard, specification, or regulation. The researcher in charge of the project was Beverly T. Kuhn (Texas P.E. No. 80308).

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TABLE OF CONTENTS

	Page
LIST OF TABLES	viii
CHAPTER 1: Background and History of Project	1
BACKGROUND AND SIGNIFICANCE.....	1
TXDOT IMPLEMENTATION PROJECT 5-4160-01.....	3
CHAPTER 2: Status of Year 1 Tasks	5
TASK 1 – DEVELOP WORKSHOP MATERIAL.....	5
TASK 2 – PLAN AND SCHEDULE PILOT WORKSHOPS	6
TASK 3 – CONDUCT PILOT WORKSHOPS.....	6
TASK 4 – UPDATE WORKSHOP MATERIAL AS APPROPRIATE	10
TASK 5 – DOCUMENT PILOT WORKSHOP ACTIVITIES.....	10
TASK 6 – PLAN AND SCHEDULE FORMAL WORKSHOPS.....	11
TASK 7 – CONDUCT FORMAL WORKSHOPS	11
TASK 8 – UPDATE WORKSHOP MATERIAL AS APPROPRIATE	11
TASK 9 – DOCUMENT FORMAL WORKSHOP ACTIVITIES	11
TASK 10 – PROVIDE TXDOT WITH WORKSHOP MATERIAL.....	11

LIST OF TABLES

	Page
Table 1. Project 5-4160-01 DFW Pilot Workshop Materials – Evaluation Results.	7
Table 2. Project 5-4160-01 DFW Pilot Workshop Evaluation Results.	8
Table 3. Project 5-4160-01 Houston Pilot Workshop Materials – Evaluation Results.	9
Table 4. Project 5-4160-01 Houston Pilot Workshop Evaluation Results.....	9

CHAPTER 1: BACKGROUND AND HISTORY OF PROJECT

BACKGROUND AND SIGNIFICANCE

The highway system in the United States is a critical component of American life. It provides extensive and flexible personal mobility to American citizens and efficient freight movement to support the domestic economy. However, a variety of factors are interfering with this system's ability to provide these services. The growth of vehicle miles traveled continues at an accelerated rate, to the extent that it outpaces the growth in the number of lane miles across the country. Additionally, congestion in urban areas is increasing and occurs during longer parts of the day and delays more travelers every year. These trends are especially evident in Texas where increasing population growth has led to an increase in congestion in all major urban areas. This population growth has placed enormous demands on the already burdened transportation infrastructure, particularly the freeway systems.

There is a certain realization that the construction of sufficient freeway lane capacity to provide free-flow conditions during peak travel periods cannot be accomplished in developed urban areas due to cost, land consumption, neighborhood impacts, environmental concerns, and other factors. Like other transportation agencies nationwide, TxDOT is searching for methods to better manage traffic flow, mitigate the adverse effects of congestion, and thus improve the efficiency of existing and proposed networks.

Managed lanes are one method that is being used successfully across the country and in Texas to better manage traffic flow. The theory behind managed lanes is to set aside certain freeway lanes and to use a variety of operating strategies to move traffic more efficiently in those lanes. As a result, managed lanes provide travelers with an alternative to traveling on congested freeways. Using managed lanes can allow a transportation agency to leverage existing capacity and move both people and goods in the most efficient manner possible. The managed lanes concept is a tool that is available to the transportation community and may be used as part of a comprehensive plan to achieve regional goals.

The term "managed lanes" has different meanings to different agencies. In some agencies, the term is commonly thought of as high-occupancy vehicle (HOV) lanes while in others it might refer to high-occupancy toll (HOT) lanes. Still other agencies may use an even broader definition which may include HOV lanes, value priced lanes (including HOT lanes), and exclusive or special

use lanes (such as express, bus-only, or truck-only lanes). TxDOT uses the following as a definition for managed lanes as determined by the 0-4160 Project Monitoring Committee in 2000:

“A managed lane facility is one that increases freeway efficiency by packaging various operational and design actions. Lane management operations may be adjusted at any time to better match regional goals.”

The definition is very general, and yet it reflects the complexity and flexibility of the managed lanes concept. The definition allows each district across the state to determine what “managed lanes” means for their jurisdiction. Thus, it respects the needs of the community without requiring the application of a specific strategy that does not meet those needs. Moreover, it encourages flexibility, realizing that the needs of a region may change over time, thereby requiring a different managed lanes operational strategy.

TxDOT Project 0-4160, Operating Freeways with Managed Lanes, achieved its objectives of (1) investigating the complex and interrelated issues surrounding the safe and efficient operation of managed lanes using various operating strategies, and (2) developing guidelines to help the Texas Department of Transportation (TxDOT) make informed planning, design, and operational decisions when considering these facilities for its jurisdiction. These guidelines are incorporated into the *Managed Lanes Handbook*. The handbook includes all of the research results from Project 0-4160 in a usable format, providing a clear, concise, and step-wise approach to planning, designing, operating, and enforcing a managed lanes facility. It also refers the user to other pertinent documents that provide additional detailed information on various aspects of managed lanes. Accompanying the *Managed Lanes Handbook* is a user-friendly preliminary screening tool.

The research area and development of managed lanes projects across the United States is rapidly evolving. In addition to Project 0-4160, additional TxDOT research is producing results that enhance the information available in the *Managed Lanes Handbook*, including but not limited to Project 0-4898, Criteria for Adapting HOV Lanes to HOT Lanes. Additionally, numerous managed lanes facilities will go online this year, including I-394 in Minneapolis and I-25 in Denver. The operational experiences from these facilities combined with current research indicate the wealth of knowledge that can be shared with practitioners across Texas.

TXDOT IMPLEMENTATION PROJECT 5-4160-01

It is important that TxDOT continue to remain at the forefront of managed lanes research in Texas and the United States. The *Managed Lanes Handbook* compiles the research results of Project 0-4160 into one easy-to-use resource and provides a clear, concise, and step-wise approach to planning, designing, operating, and enforcing managed lanes, and refers the user to other pertinent documents that provide additional information on various aspects of managed lanes. Furthermore, the user-friendly preliminary screening tool provided with the handbook can assist TxDOT in identifying managed lanes strategy options very early in the conceptual planning process. Agencies across the country have seen the value in this research, and it represents the strong leadership role TxDOT plays in this emerging congestion management issue in the country.

The research benefits provided to TxDOT through the handbook are numerous, the primary one being time savings to TxDOT in developing more than a dozen currently planned managed lanes projects by providing a screening tool and a single go-to document for project development guidance. Furthermore, the research provides a cost-savings to TxDOT by having outreach documents readily available for use in public meetings related to managed lanes projects. Given these and other potential benefits, the development of a training workshop will facilitate the use of the handbook across the state and ensure the comprehensive and appropriate use of its resources to develop managed lanes projects in Texas.

After the incredible success of the original project, TxDOT decided to proceed with an implementation project to provide a wider opportunity for disseminating the information across the state. The implementation project originated in October 2006 and ends August 2008. The work tasks across the project timeframe include:

- [Task 1](#) – Develop workshop materials,
- [Task 2](#) – Plan and schedule pilot workshops,
- [Task 3](#) – Conduct pilot workshops,
- [Task 4](#) – Update workshop material as appropriate,
- [Task 5](#) – Document pilot workshop activities,
- [Task 6](#) – Plan and schedule formal workshops,
- [Task 7](#) – Conduct formal workshops,
- [Task 8](#) – Update workshop material as appropriate,

- [Task 9](#) – Document formal workshop activities, and
- [Task 10](#) – Provide TxDOT with workshop material.

Tasks 1-5 were scheduled for FY07 and are covered in this report. Tasks 6-10 are scheduled for FY08.

CHAPTER 2: STATUS OF YEAR 1 TASKS

TASK 1 – DEVELOP WORKSHOP MATERIAL

The objective of Task 1 of the implementation project was to develop materials for the workshop, based on the *Managed Lanes Handbook*, which would allow workshop attendees to get the maximum benefit out of the research presented in the products. The material was suitable to be presented in a two-day workshop on its own in its entirety, by specific section(s), or combined with other training opportunities. The materials included the following:

- workshop presentations,
- attendee binders,
- instructor binder,
- workshop evaluation forms, and
- attendee CD-ROM.

The philosophy for developing the workshop materials was to prepare limited paper-copy documents, relying instead on a CD-ROM to provide all pertinent materials, including the *Managed Lanes Handbook*, the preliminary screening tool, related support documents, the workshop PowerPoint presentation, and any other materials deemed critical by the Implementation Director (ID), Implementation Advisors (IAs), and project team.

The following is a list of the modules initially developed for the workshop. Each one maps to a chapter in the *Managed Lanes Handbook*, along with an additional module designed to discuss the Managed Lanes Preliminary Screening Tool.

- Module 1 (Guide to the Managed Lanes Handbook)
- Module 2 (Introduction to Managed Lanes)
- Module 3 (Planning Managed Lanes Facilities)
- Module 4 (Legislative Issues)
- Module 5 (Public Outreach)
- Module 6 (Funding and Financing Managed Lanes)
- Module 7 (Managed Lanes Weaving, Ramp, and Design Issues)
- Module 8 (Traveler Information and Traffic Control Devices for Managed Lanes)
- Module 9 (Enforcement Issues for Managed Lanes)
- Module 10 (Incident Management for Managed Lanes)

- Module 11 (Interim Use of Managed Lanes)
- Module 12 (Staffing and Training for Managed Lanes)
- Module 13 (Monitoring and Evaluating Managed Lanes Facility Performance)
- Module 14 (Interoperability Issues on Managed Lanes Facilities)
- Module 15 (Preliminary Screening Tool)
- Module 16 (Critical Issues and Key Resources)

Additionally, the following *Managed Lanes Handbook* chapters have been revised and will replace the older version from 2005 after TxDOT approval.

- Chapter 3 – Critical Issues and Key Resources
- Chapter 4 – Planning Managed Lanes Facilities
- Chapter 5 – Legislative Issues

TASK 2 – PLAN AND SCHEDULE PILOT WORKSHOPS

The initial step in scheduling formal workshops was to obtain approval from TxDOT's Human Resources Division to present this workshop as an official offering. The implementation team completed TxDOT paperwork to request a training course, which was processed through TxDOT Training, Quality, and Development. The implementation team received approval to teach the course, and TxDOT assigned IPR Code IPR0003 to the course. In accordance with the implementation contract, TxDOT is responsible for securing facilities, promoting the workshop, and inviting participants to all workshops.

The Dallas-Fort Worth (DFW) and Houston regions were selected as locations for the two pilot workshops. The implementation team believed that attendees from these regions could provide a critical assessment of the workshop materials given that HOV facilities are operational in both regions, and that managed lanes facilities are on the near-term horizon in each location as well.

TASK 3 – CONDUCT PILOT WORKSHOPS

The first pilot workshop was conducted on July 23-25, 2007, in Arlington, Texas, at the North Central Texas Council of Government (NCTCOG) offices. Attendees of the Dallas-Fort Worth workshop were staff from the Dallas and Fort Worth TxDOT districts along with personnel from Dallas Area Rapid Transit (DART) and NCTCOG. The 15 participants in the

Dallas-Fort Worth pilot workshop evaluated workshop materials on a scale of “Very Good” to “Very Poor.” [Table 1](#) shows the results of these evaluations. The scores highlight the success of the project materials.

Table 1. Project 5-4160-01 DFW Pilot Workshop Materials – Evaluation Results.

Module	Percent					Percent Good or Better
	Very Good	Good	Average	Poor	Very Poor	
1 – Guide to the Managed Lanes Handbook	Did Not Evaluate					
2 – Introduction to Managed Lanes	71	29	0	0	0	100
3 – Planning Managed Lanes Facilities	29	71	0	0	0	100
4 – Legislative Issues	36	57	7	0	0	93
5 – Public Outreach	64	36	0	0	0	100
6 – Funding and Financing Managed Lanes	36	50	14	0	0	86
7 – Managed Lanes Weaving, Ramp, and Design Issues	43	29	29	0	0	71
8 – Decision-Making Needs and Traffic Control Devices	69	31	0	0	0	100
9 – Enforcement Issues for Managed Lanes	46	46	8	0	0	92
10 – Incident Management for Managed Lanes	54	46	0	0	0	100
11 – Interim Use of Managed Lanes	23	62	15	0	0	85
12 – Staffing and Training for Managed Lanes	23	23	54	0	0	46
13 – Monitoring and Evaluating Managed Lanes Facility Performance	36	43	21	0	0	79
14 – Interoperability Issues on Managed Lanes Facilities	43	43	14	0	0	86
15 – Preliminary Screening Tool	43	43	14	0	0	86
16 – Critical Issues and Key Resources	64	29	7	0	0	93

In addition to the evaluation of the workshop materials, Dallas-Fort Worth participants provided feedback and evaluation on the course itself. [Table 2](#) shows the results of this overall evaluation and showcases the success of the pilot workshop in achieving the stated objectives. The target audience of the workshop was broad-based to any TxDOT employee or partner agency involved in managed lanes projects. Based on analysis of the provided written comments, the participants who answered “Somewhat” for level of difficulty and overall quality of the materials felt that some of the material was repetitive and that additional real-world examples were needed. As a result of these comments, Module 15 was combined into Module 3,

and modules were improved to provide additional examples and to remove some redundant information.

Table 2. Project 5-4160-01 DFW Pilot Workshop Evaluation Results.

Workshop Content	Percent		
	Yes	Somewhat	No
1. Did the workshop meet your expectations?	93	7	0
2. Did the workshop description match the subject matter presented?	100	0	0
3. Were the workshop objectives met?	100	0	0
4. Was the workshop presented at the correct level of difficulty?	57	43	0
5. Was the information presented in an informative manner?	93	7	0
6. Was the overall quality and usefulness of the materials appropriately geared to providing that information?	64	36	0
7. Do you feel that the time spent on this course was beneficial?	100	0	0

The second pilot workshop was conducted on August 28-30, 2007, in Houston, Texas, at the TxDOT district office. Attendees were from the Houston, Beaumont, and Bryan TxDOT districts along with staff from the Houston-Galveston Area Council, Harris County Metropolitan Transit Authority, and the Harris County Toll Road Authority. [Table 3](#) shows the results of these evaluations. The scores highlight the success of the project materials and areas where additional information or resources may be warranted to improve the applicability of the workshop.

Table 3. Project 5-4160-01 Houston Pilot Workshop Materials – Evaluation Results.

Module	Percent					Percent Good or Better
	Very Good	Good	Average	Poor	Very Poor	
1 – Guide to the Managed Lanes Handbook	Did Not Evaluate					
2 – Introduction to Managed Lanes	58	42	0	0	0	100
3 – Planning Managed Lanes Facilities	55	45	0	0	0	100
4 – Legislative Issues	33	50	17	0	0	83
5 – Public Outreach	27	64	9	0	0	91
6 – Funding and Financing Managed Lanes	36	45	18	0	0	82
7 – Managed Lanes Weaving, Ramp, and Design Issues	64	36	0	0	0	100
8 – Decision-Making Needs and Traffic Control Devices	64	36	0	0	0	100
9 – Enforcement Issues for Managed Lanes	45	45	9	0	0	91
10 – Incident Management for Managed Lanes	27	64	0	9	0	91
11 – Interim Use of Managed Lanes	55	36	0	9	0	91
12 – Staffing and Training for Managed Lanes	18	64	18	0	0	82
13 – Monitoring and Evaluating Managed Lanes Facility Performance	45	45	9	0	0	91
14 – Interoperability Issues on Managed Lanes Facilities	45	55	0	0	0	100
15 – Critical Issues and Key Resources	36	64	0	0	0	100

In addition to the evaluation of the workshop materials, Houston participants also provided feedback and evaluation on the course itself. [Table 4](#) shows the results of this overall evaluation.

Table 4. Project 5-4160-01 Houston Pilot Workshop Evaluation Results.

Workshop Content	Percent		
	Yes	Somewhat	No
1. Did the workshop meet your expectations?	83	17	0
2. Did the workshop description match the subject matter presented?	92	8	0
3. Were the workshop objectives met?	92	8	0
4. Was the workshop presented at the correct level of difficulty?	100	0	0
5. Was the information presented in an informative manner?	92	8	0
6. Was the overall quality and usefulness of the materials appropriately geared to providing that information?	92	8	0
7. Do you feel that the time spent on this course was beneficial?	83	17	0

Participants in both pilot workshops gave positive ratings on the value and applicability of the workshop. In addition to a number of participant recommendations to provide clarity in the materials, an informal discussion was held at the close of the Houston pilot workshop to share ideas on enhancing the presentation for the remaining metropolitan areas, where projects are not as fully developed as they are in Houston or DFW. Some of the key points made by the participants are:

- Serve as facilitators and ask more open-ended questions to encourage local agency consideration/discussion as it relates to the applicability of the concepts to their own projects.
- Begin with an overview of a local project that is proposed with managed lanes, and close with an exercise that allows participants to use concepts presented to enhance that local project.
- Bring in experts from within Texas or outside the state.
- Consider presenting a full case study of Houston, since it started with HOV lanes (in a number of different forms) and now has two managed lanes projects on the horizon – the Katy Tollway and METRO’s HOV-to-HOT conversions.
- Use more visuals, including videos of existing facilities, photos, animations, etc.

TASK 4 – UPDATE WORKSHOP MATERIAL AS APPROPRIATE

The implementation team revised the workshop materials after the DFW workshop in response to participant evaluations and comments. After the Houston workshop, the team has begun working on streamlining the modules even more as well as developing case studies and updating visuals to provide more examples of operational facilities. The team is of the opinion that making these changes will enhance the workshop to the benefit of other districts where managed lanes projects are not as fully developed as they are in DFW and Houston. The materials will be updated in time for the first formal workshop in the next fiscal year.

TASK 5 – DOCUMENT PILOT WORKSHOP ACTIVITIES

This report serves as the documentation of the pilot workshop activities.

TASK 6 – PLAN AND SCHEDULE FORMAL WORKSHOPS

The implementation team, in coordination with the Implementation Director, has tentatively selected the locations for the Year 2 formal workshops. Definite locations include Austin, San Antonio, and El Paso. There is some uncertainty about the 4th and 5th workshops, which may be held in Corpus Christi combined with the valley area and in Waco. The team is in the process of scheduling these workshops to take place over the next year.

TASK 7 – CONDUCT FORMAL WORKSHOPS

Work has not commenced on this task.

TASK 8 – UPDATE WORKSHOP MATERIAL AS APPROPRIATE

Work has not commenced on this task.

TASK 9 – DOCUMENT FORMAL WORKSHOP ACTIVITIES

Work has not commenced on this task.

TASK 10 – PROVIDE TXDOT WITH WORKSHOP MATERIAL

Work has not commenced on this task.

