

Product 0-6691-P2



Managing the Travel Model Process: Small and Medium-Sized MPOs

Instructor Guide



September 2013
Project 0-6691
Managing the TDM Process:
Developing MPO Institutional Capacity

Managing the Travel Model Process: Small and Medium-Sized MPOs

ABBREVIATIONS

EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan
TCEQ	Texas Commission on Environmental Quality
TDM	Travel Demand Model (or Travel Model or Travel Forecasting Model)
TIP	Transportation Improvement Program
TMA	Transportation Management Area
TPP	TxDOT Transportation Planning and Programming Division
TxDOT	Texas Department of Transportation
UPWP	Unified Planning Work Program

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Course Introduction

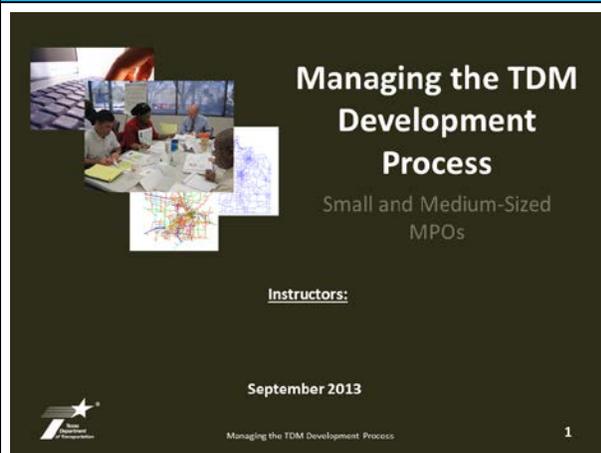
Overview

Lesson Materials

Introduction Total Time: 30 Minutes

Welcome and Introductions

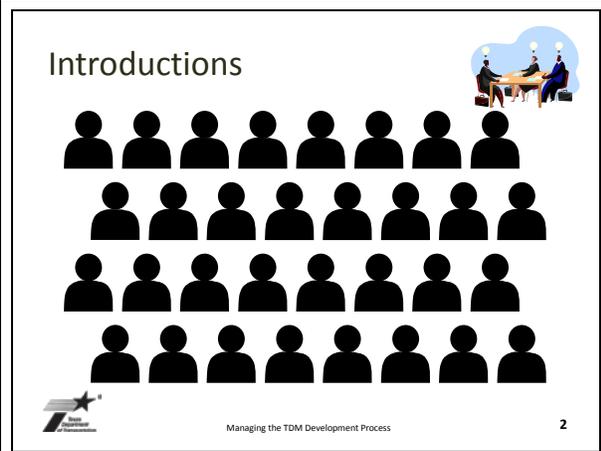
10 Minutes



(This slide should be up on the screen as people arrive for the meeting.)

Instructors, at least two, should self-introduce themselves, include their experience with models and applying models as part of the planning process.

Emphasis of this course is on small and medium-sized MPOs, but much of the content is pertinent to all MPOs. We will also go over what constitutes a small- or medium-sized MPO shortly.

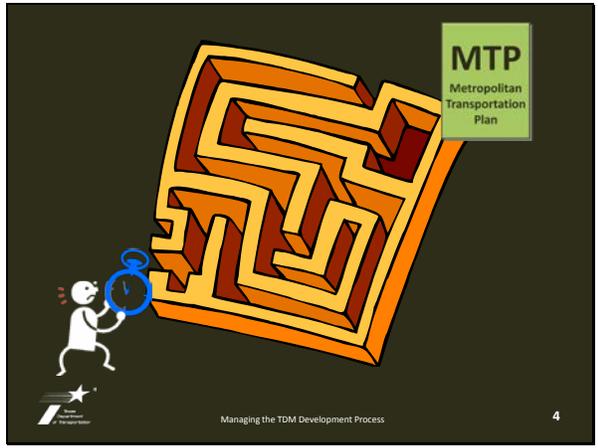
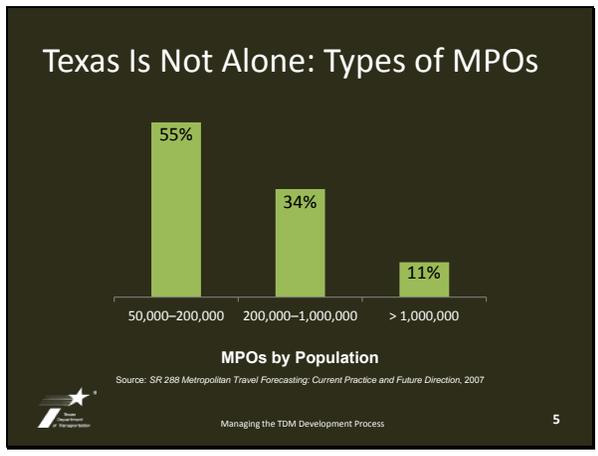


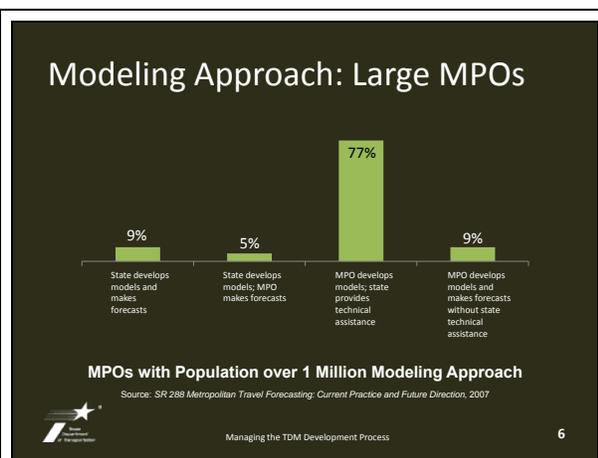
Each attendee introduces himself or herself, tells us which MPO (or agency) he or she works with, and what his or her level of modeling experience is.

(optional)
Ask additional question what they hope to get out of the course.

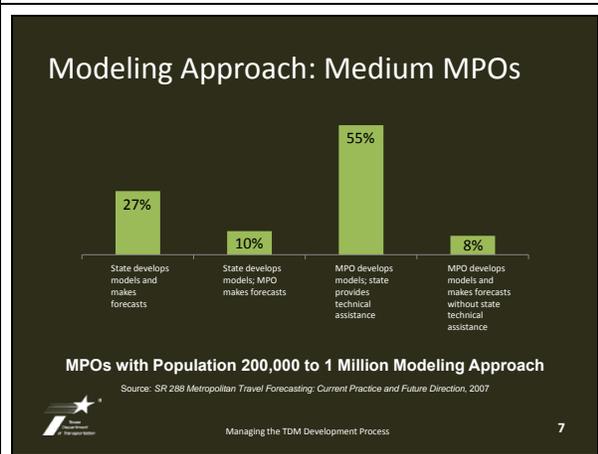
<p>What Is an MPO? TMA?</p> <ul style="list-style-type: none"> ▪ A Metropolitan Planning Organization (MPO) is designated for urbanized areas with population over 50,000. ▪ A Transportation Management Area (TMA) is an MPO with population over 200,000.  <p>Managing the TDM Development Process 3</p>	<p>(post introductions) Let's get started, then.</p> <p>Likely everyone here knows what an MPO is, but let's refresh, especially because the MPO versus TMA designation is relevant in later lessons. MPO: (read from slide) TMA: (read from slide)</p> <p>QUESTION: Who is with a TMA here? MPO? (trick question: includes TMAs)</p>
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Study Background

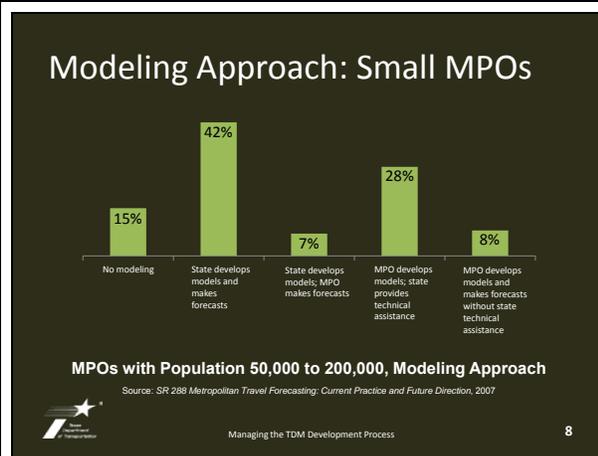
5 Minutes									
	<p>Research of MPOs nationwide, as well as here in Texas, has demonstrated that travel modeling is one of the aspects that MPO directors find most complicated for applying and supporting their Metropolitan Transportation Plan.</p>								
<p>Texas Is Not Alone: Types of MPOs</p>  <table border="1"> <caption>MPOs by Population</caption> <thead> <tr> <th>Population Range</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>50,000–200,000</td> <td>55%</td> </tr> <tr> <td>200,000–1,000,000</td> <td>34%</td> </tr> <tr> <td>> 1,000,000</td> <td>11%</td> </tr> </tbody> </table>	Population Range	Percentage	50,000–200,000	55%	200,000–1,000,000	34%	> 1,000,000	11%	<p>A recent study of MPOs nationwide documented that the number of MPOs in the “small” (50–200,000 population) and “medium” size (200,000–1 million population) categories represent a substantial number of the total MPOs nationwide.</p>
Population Range	Percentage								
50,000–200,000	55%								
200,000–1,000,000	34%								
> 1,000,000	11%								



For the **largest** MPOs (>1 million), all of these MPOs are conducting some sort of travel demand model. The % of these MPOs that have some sort of collaboration between MPOs and state on modeling is 91%, but a full 77% of MPOs are developing the models with the state only providing technical assistance.



For the **medium**-sized MPOs (200,000–1 million) the % of these MPOs that have some sort of collaboration between MPOs and state on modeling increases to 92%, but about half, 55%, are in the category where the MPOs are developing the models and the state is only providing technical assistance.



Of the **smallest** MPOs (50–200,000), For 42% the modeling is done completely by the DOT. 7% are in the category that the DOT develops the models and the MPO makes the forecasts. 28% are in the category of developing their own models with state assistance. Thus, a full 77% of these smallest MPOs have some sort of collaboration between MPOs and state on modeling. **QUESTION: For anyone from an MPO here, small, medium, or large, what model approach category do you think your MPO is in?**

<p>MPOs' General Issues with Models</p> <p>Managing the TDM Development Process 9</p>	<p>These are our findings of the general issues MPOs face with regard to travel modeling. Even the largest MPOs have issues in these areas, and each MPO has unique challenges. Today and over time, these challenges change, for example in response to changes in staffing, funding, policy board involvement, and local transportation needs and projects. Later in the course, we will discuss this slide as a group and identify our own unique challenges as individual MPOs.</p>
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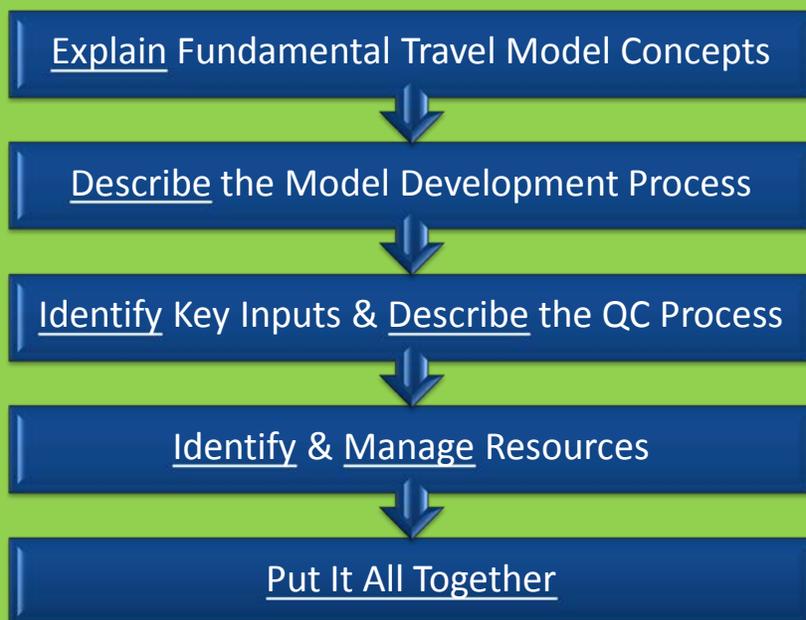
Course Focus and Premise

<p>5 Minutes</p>	
<p>Not All Texas MPOs Have a Modeler, but All Texas MPOs Have a Director</p> <p>Managing the TDM Development Process 10</p>	<p>Why the focus on the MPO director for this course? An MPO Director must understand the process to manage the process. MPO Director: Sets Staff Priorities Communicates to Both Board and Technical Staff Anecdotally, Texas MPO Directors Have Greater Longevity than Staff Where there is an MPO Planning manager or Modeling Manager, of course, that person would be a target of this training, too.</p>
<p>Course Premise</p> <p>Managing the TDM Development Process 11</p>	<p>This pyramid presents the “Course Premise”: “Know the Tools” – this course provides Texas MPO directors training on concepts, tools, and data available to manage and support their models “Work the Tools” - MPO directors will apply the tools appropriate for their unique MPO situation “Advance the Tools” – all of the tools are being provided in electronic format so that the MPOs can adapt the tools to their situation and share them</p>

Course Learning Objectives and Approach

10 Minutes

Learning Objectives



Managing the TDM Development Process

12

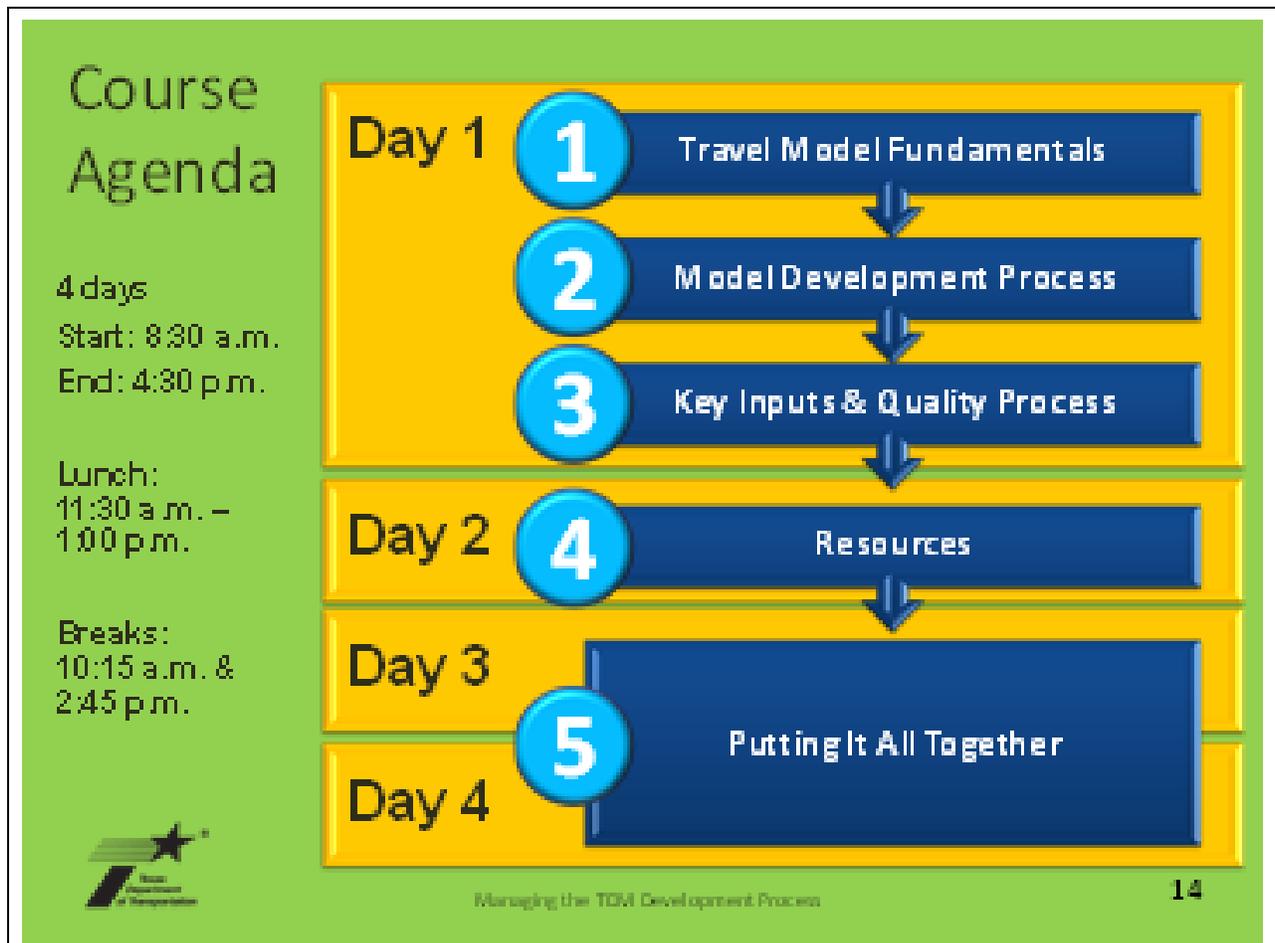
At the end of this training course, participants will be able to:
(read and click through them).

Lessons & Course Materials



The course lessons serve the learning objectives just described (read and click through the lessons).

The course materials are intended to be useful take-away references that MPOs can continue to reference after the course. The course approach thus includes lecture, discussion and small-group activities, a participant handbook, and all of these materials are provided in digital format, as well, so that the MPOs can copy, adapt, and use these materials for their own work and process.



Briefly review the overall approach for the course by days, when the breaks and lunch will be.

<p>Questions?</p>  <p>Managing the TDM Development Process 15</p>	<p>Any questions or comments before we begin with Lesson 1?</p>
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Lesson 1: Travel Model Fundamentals

Learning Objectives

Travel Model Fundamentals



Describe
Purpose

Identify
Uses

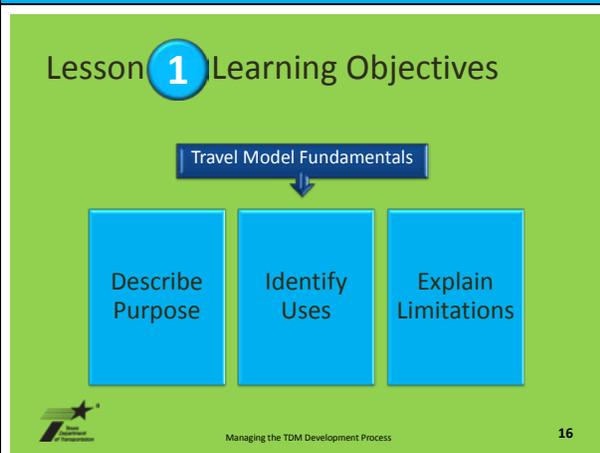
Explain
Limitations

Lesson Materials Follow

Lesson Total Time: 1 hour, 15 Minutes

Topic 1.1 Lesson Learning Objectives

1 Minute



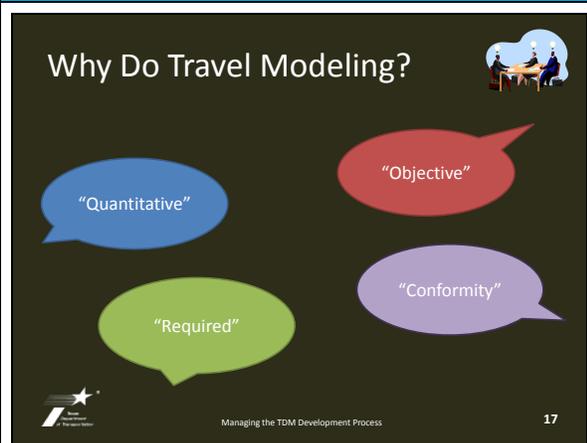
This lesson, more than any other lesson in this course, will sound like an Introduction to Travel Models 101 Course. In this course, we talk about the Purpose and Use of Models. The reasons these concepts are important for MPO Directors and Planning Managers to understand are two-fold:

1. You must know what a travel model can do in order to appropriately apply it as part of the MTP process
2. You must know basic parts of a model before we can discuss the different approaches for updating a model—and then make decisions about what approach to take—covered in later chapters.

Thus, all the other lessons are based upon the concepts presented in this Lesson 1. So, at the end of this lesson, you will be able to: (read from slide)

Topic 1.2 Purpose of Travel Models

4 Minutes



(slide will be blank as you ask this question)
 Why do travel modeling?

Who Does Travel Modeling?

“MPOs”

“DOTs”

“Local Jurisdictions”

“Bond Houses”

“Consultants”

Managing the TDM Development Process 18

(slide will be blank as you ask this question)

Who does Travel Modeling?

But, Seriously, Why?

Managing the TDM Development Process 19

Because transportation projects impact our lives substantially and many projects involve a lot of investment in resources, time, and money.

We use travel models to forecast a complex future to make the best decision we can with what we know today.

We know what traffic is today. What will it be like in 10-, 20-, 30-years?

Travel models consider:

- Through-traffic changes
- Local-traffic changes

2010

Managing the TDM Development Process 20

Here is an example of the type of analysis travel forecasting models do very well.

We know what traffic looks like today.

How would you answer this question:
 What will traffic look like in the near-term, say 10 years?
 What about 20 or 30 years?

Travel models are one way to make these forecasts, using assumptions.

What if Local Area Develops?

- If yellow areas are likely to become residential and the red commercial...
- Travel models forecast traffic considering both local and through traffic changes.



2010

Managing the TDM Development Process 21

Here is another example.

How would you answer this question: How Will Traffic Change Across a Transportation Network with a Demographic Change? Such as the addition of 1,000 new homes.

Where will the traffic go? Which streets will it use?

How Will Traffic Change across Network with a Demographic Change?



1,000 new homes

Travel models are used to forecast traffic changes in a complex world.

Managing the TDM Development Process 22

From the previous example, how far will people from these homes travel in the surrounding urban area?

Or, What Happens in Response to a Capacity Addition or Improvement?



1,000 new homes

Travel models are used to test the impact of different projects.

Managing the TDM Development Process 23

In another example, how will traffic change in these other areas if a project improvement, for example a bridge widening for a highly traveled interstate highway, is made?

Or, How Do We Compare Projects?



Travel model results are one consideration to compare projects.

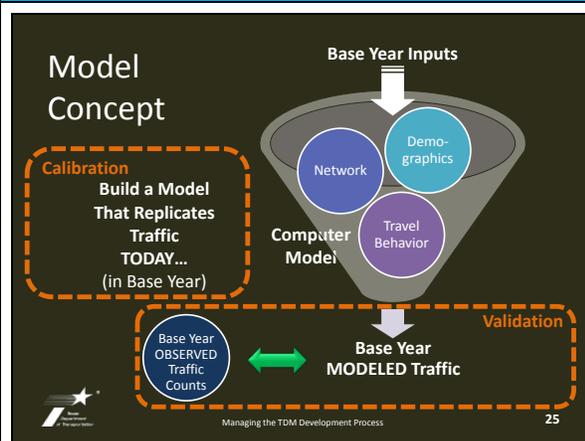
Managing the TDM Development Process 24

And, what comparative measures can we use to evaluate different projects?

These are examples of the types of questions travel forecasting models support.

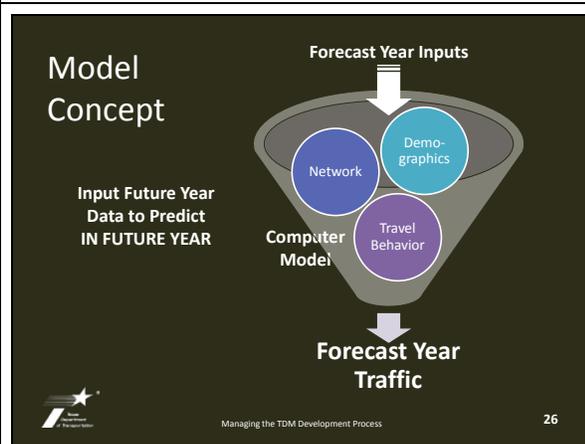
Topic 1.3 “Model” Concept

5 Minutes



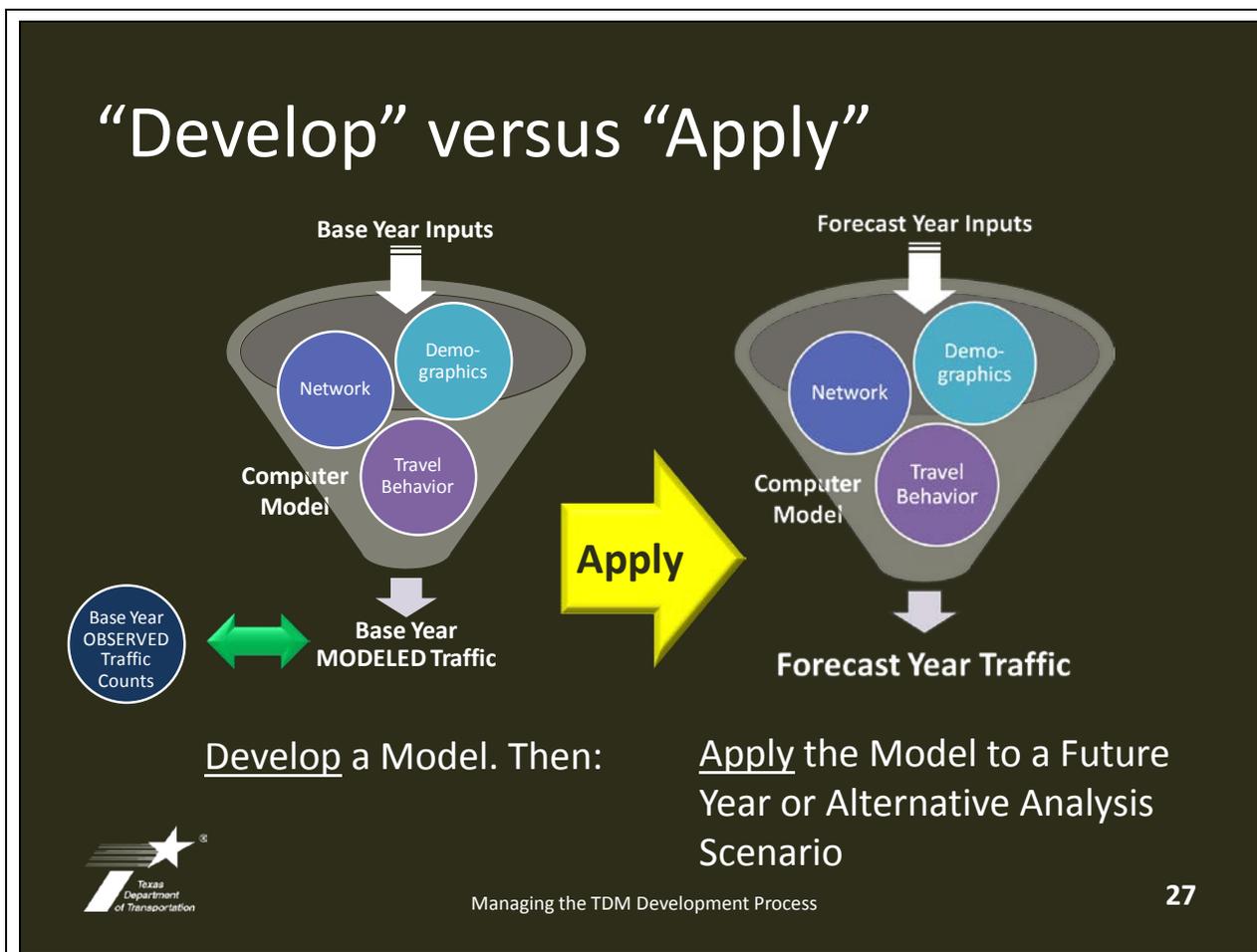
What do we mean when we say “model”? A travel forecasting model is typically (not always) a computer model. In general terms, the model is built to use information we know in the present or near past to replicate traffic we see on streets during the same period. We call this the base year model. The inputs are data that are known to affect travel.

Let’s pause here and talk briefly about these inputs: What is your understanding of a network? Demographics? Travel behavior? (note surveys) Counts?



To examine the future, we estimate how the inputs that affect travel might change in the future. We then put those inputs into the model and run the model to see what traffic might look like in that future year. We call this the forecast year model.

The model is referred to by either the base or forecast year. For lay persons, the forecast year is most important.



These two phases of the model, developing it and applying it are an important concept for an MPO Director to understand. A single base year model (e.g., a 2005 base year model) can be applied to many different analysis scenarios and different interim and forecast years, as well (2015 forecast year, 2035 forecast year No Build scenario, 2035 forecast year with projects A, B, and C).

Calibration refers to the model approach and parameters and is represented by the cone shape in the graphic to the left. Once the model inputs are developed, calibration is the effort that takes the most time. **Validation** refers to the process of demonstrating that a model appropriately fits observed count data.

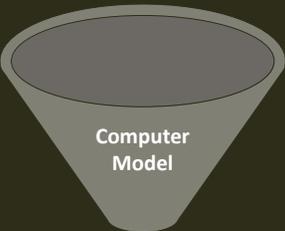
KEY CONCEPTS: “**Develop**” a model = create the model
 “**Apply**” refers to using the model for analysis
 Use the **forecast year** to refer to a travel model when talking to the MPO Policy Board or the public.

Topic 1.4 The “Texas Package”

15 Minutes

Travel Demand Model (TDM) = Texas Package

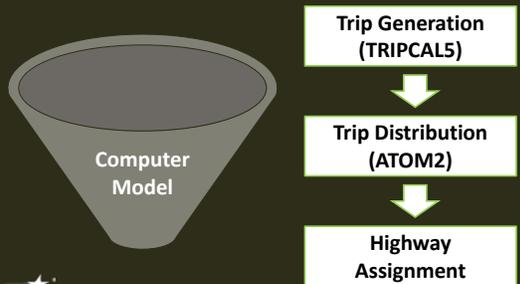
- Developed by TxDOT for small and medium-sized MPOs
- Standardized approach
- Supported by TxDOT TPP



Managing the TDM Development Process 28

The travel forecasting model standard for Texas MPOs under TxDOT purview for model development is called the “Texas Package.” This suite of computer model tools has been in constant development by TxDOT since the 1960s and continues to be maintained and supported by TxDOT-TPP.

The Texas Package Is a Trip-Based Model, Generally 3 Steps



Managing the TDM Development Process 29

The Texas Package is a traditional model, following an approach that is still used by many MPOs nationwide today. It features 3 steps:

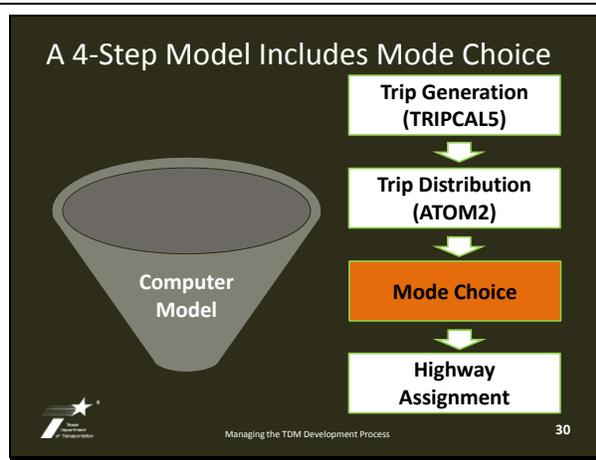
In Trip Generation, the number of trip ends originating and destined for each zone are estimated using zonal population and employment inputs

In Trip Distribution, the trip ends are “matched up,” connecting the trips between zones.

In Highway Assignment, the model determines the routes that each trip makes along the highway network.

(same slide, continued)

Let’s pause for a moment to discuss. First of all, this slide is an simplification of the model; details of what the model does in each step are covered in other courses. However, one observation to make is that this model represents travel behavior as a sequential series of steps – if, where, when, and by what route to travel. In reality, as we know, individuals make their travel decisions considering these aspects together. This is one reason that we describe modeling as a simplified representation of what is happening in the real world.



Two other points to be made about the Texas Package as it is generally applied:

- Pertains to auto behavior only
- For a daily, 24-hour period only

In some cases, primarily in areas where bus or rail transit needs examination, a fourth step is also applied, called **mode choice**.

 **KEY CONCEPT:** The Texas Package is a **traditional, trip-based model, typically with 3 steps**, sometimes 4 steps.

Typical Performance Measures from Texas Package

Managing the TDM Development Process 31

These exhibits are shown on the following pages. Let's take a look at some of the performance measures that the Texas Package can yield. Exhibit 1.a lists performance measures that are typically and easily available from a model run. We are not going to talk about every measure today. Exhibit 1.a Typical Performance Measures from the Texas Package (read a few measures from Exhibit on page 21)

Other Performance Measures from Texas Package

Managing the TDM Development Process 32

Exhibit 1.b lists Other Performance Measures the Texas Package can Yield with Minimal Effort, on page 22)

Other Texas Package Approaches for Specific Analysis Needs



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INSTRUCTOR HANDBOOK Lesson 1: Travel Model Fundamentals

Exhibit 1.c: Other Texas Package Approaches for Specific Analysis Needs

Analysis Need	Texas Package Approach/Writers
Mode Choice	<ul style="list-style-type: none"> • Junior Mode Choice Model
Fall	<ul style="list-style-type: none"> • Methodology available to be implemented as necessary
Freight	<ul style="list-style-type: none"> • Limited Capabilities for specific Model Fall Truck Loads • Methodology available to be implemented as necessary
Peak Hour/Period	<ul style="list-style-type: none"> • Using Journal factors by trip purpose, other specific to other areas from survey, data or previous reports
Feedback	<ul style="list-style-type: none"> • Has been tested as a case study only

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Finally, Exhibit 1.c lists Other Texas Package Approaches for Specific Analysis Needs, on page 23).



KEY CONCEPT: The **Texas Package** is a suite of tools capable of providing a variety of performance measures for traditional roadway projects.

Exhibit 1.a Typical Model Outputs from the Texas Package

Level of Analysis	Measure
System-wide*	<ul style="list-style-type: none"> • Vehicle-miles traveled (VMT) Measure of regional travel – link volume (vehicles) multiplied by link length (miles) and summed for all links • Vehicle-hours traveled (VHT) Measure of regional hours spent traveling – link volume (vehicle) multiplied by link travel time (converted to hours) and summed for all links • Average Trip Length (miles) Average distance traveled per trip – vehicle miles of travel (VMT) divided by total trips Average Trip Length (minutes) Average time traveled per trip – vehicle hours of travel (VHT) converted to minutes and divided by total trips • Trips per Person/per household Average of number of trips made in day person or by members of a household – total trips divided by population or total trips divided by number of households
Link-level*	<ul style="list-style-type: none"> • Volumes (vehicle traffic) Daily vehicles (autos and trucks) traveling the link. • Volume-to-capacity Ratio (v/c) Measure of the amount of capacity in use – volume divided by capacity • Congested speed (mph) Link travel time from assignment based on volume-to-capacity ratio and converted to a speed – link distance (miles) divided by link time (minutes) times 60
Other*	<ul style="list-style-type: none"> • Point-to-point congested travel time (minutes) Measure of travel time from one location in the network to another based on link travel time from assignment. The sum of travel time of links connecting two nodes in the network. • Number of trips exiting and entering a TAZ Measure of travel activity produced by and attracted to a TAZ. Sum of volume on centroid connectors of a TAZ.

* All are 24-Hour (daily) values

Exhibit 1.b Other Model Outputs the Texas Package Can Yield with Minimal Effort

Level of Analysis	Measure
System-wide*	<ul style="list-style-type: none"> • Auto-versus-truck travel measures (VMT, VHT) Regional measures of travel miles and hours by autos and trucks reported separately and obtained from separate assignment of auto and truck trips. Auto/truck link volume multiplied by link length and summed for all links. • External-versus-internal travel (VMT) Regional measure of travel demand by residents of region and visitors reported separately and obtained from separate assignment of internal and external trip demand. External/internal link volume multiplied by link length and summed for all links. • Total System Delay Regional measure of additional time spent traveling as a result of recurring congestion. Regional VHT as described in Exhibit. 1a minus regional VHT from a single iteration assignment.
Link-level*	<ul style="list-style-type: none"> • Select- (also called Critical-) Link Analysis Identification of the TAZ trip demand passing through a specified set of links and component of flows on all links that pass through a specified set of links. • Auto-versus-truck volumes Comparison of auto and truck demand link volumes. Produced from separate assignment of auto and truck demand • Volumes by trip purpose Link volumes separated by the purpose of the trip travelling on the link. Produced from separate assignment of purpose demand. • External-versus-internal volumes Comparison of external and internal demand volumes. Produced from separate assignment of external and internal demand.
Other*	<ul style="list-style-type: none"> • Turning movements at specific intersections Turns from regional traffic assignment at pre-defined reporting network nodes. Provides macroscopic overview of direction of flows at intersections. (NOT FOR OPERATIONAL ANALYSIS!)

* All are 24-Hour (daily) values

Exhibit 1.c Other Texas Package Approaches for Specific Analysis Needs

Analysis Need	Texas Package Approach/Notes
Mode Choice	<ul style="list-style-type: none">• Junior Mode Choice Model
Toll	<ul style="list-style-type: none">• Methodology available to be implemented as necessary
Freight	<ul style="list-style-type: none">• Utilize Statewide Analysis Model for truck flows• Methodology available to be implemented as necessary
Peak Hour/Period	<ul style="list-style-type: none">• Using diurnal factors by trip purpose, either specific to local area from survey data or general values
Feedback	<ul style="list-style-type: none">• Has been tested as a case study only

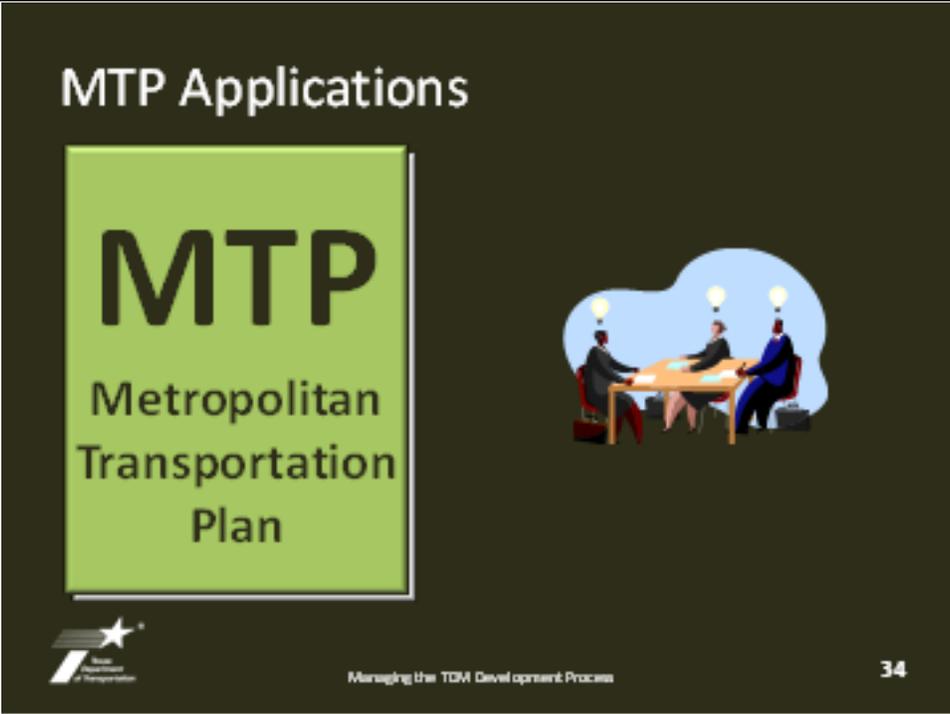
Topic 1.5 Travel Model Uses for MTP Process

10 Minutes

Activity 1.1 Potential Uses for Travel Models in MTP Development Process

Given the performance measures just presented in the handbook, and the information you have about what travel models can do, let's work as small groups at each table to brainstorm potential uses for travel models as part of the development process for a long-range metropolitan transportation plan process. You can take notes on this page.

Take 5 minutes at your table; then we will share with the larger group.



MTP Applications

MTP
Metropolitan
Transportation
Plan

Managing the TDM Development Process

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Answers should include: scenario-planning, comparisons with and without specific projects, air-quality conformity scenarios

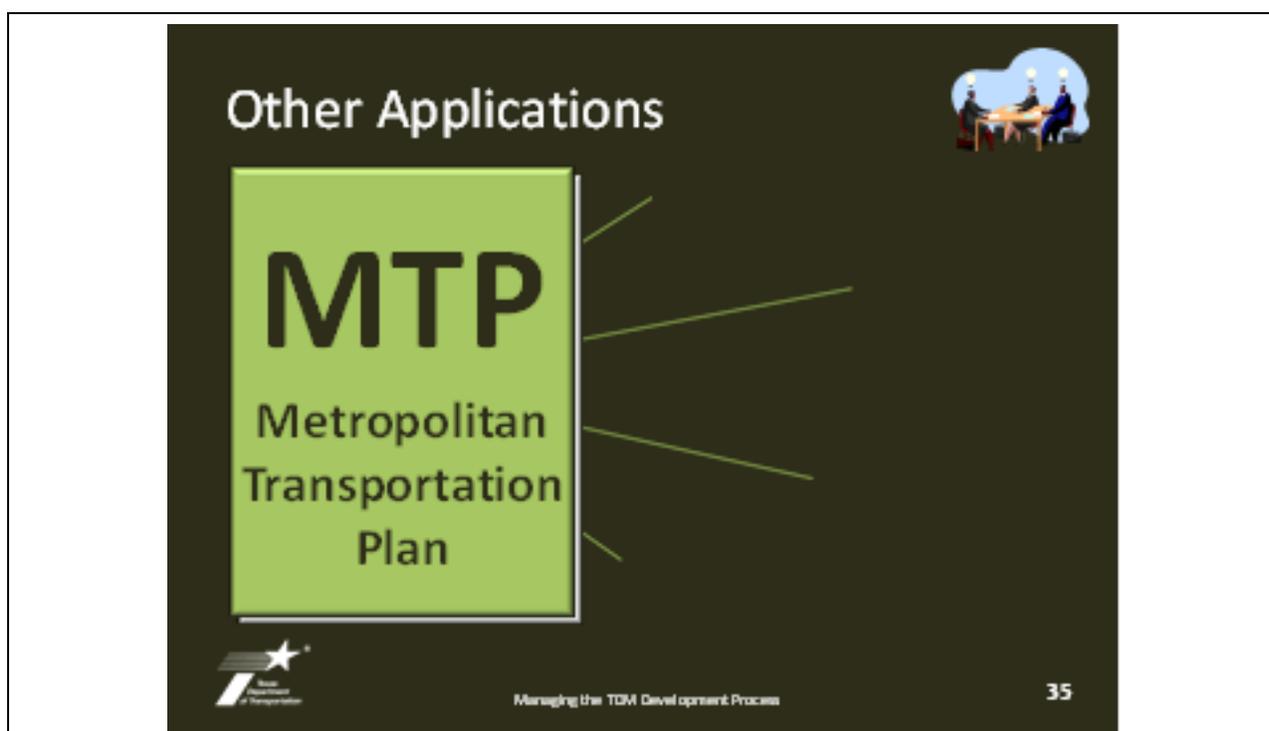
Instructor: stepping back, what does going through the exercise of developing the model and inputs do for the MPOs? It gives **structure to the planning process**.

Topic 1.6 Travel Model Uses Other Than the MTP

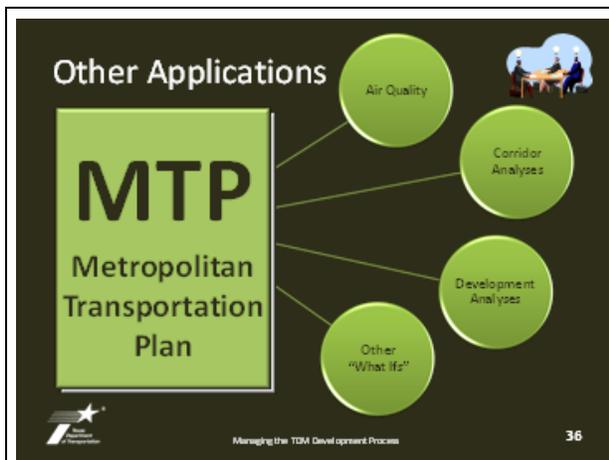
5 Minutes

Activity 1.2 Other Potential Uses for Travel Models

As a group (and without peeking at the next slide), let's discuss this question: What other uses might the travel model be good for besides the MTP?



(As a large group, ask this question...answers on next slide)



(Instructor...here are some answers on the slide).



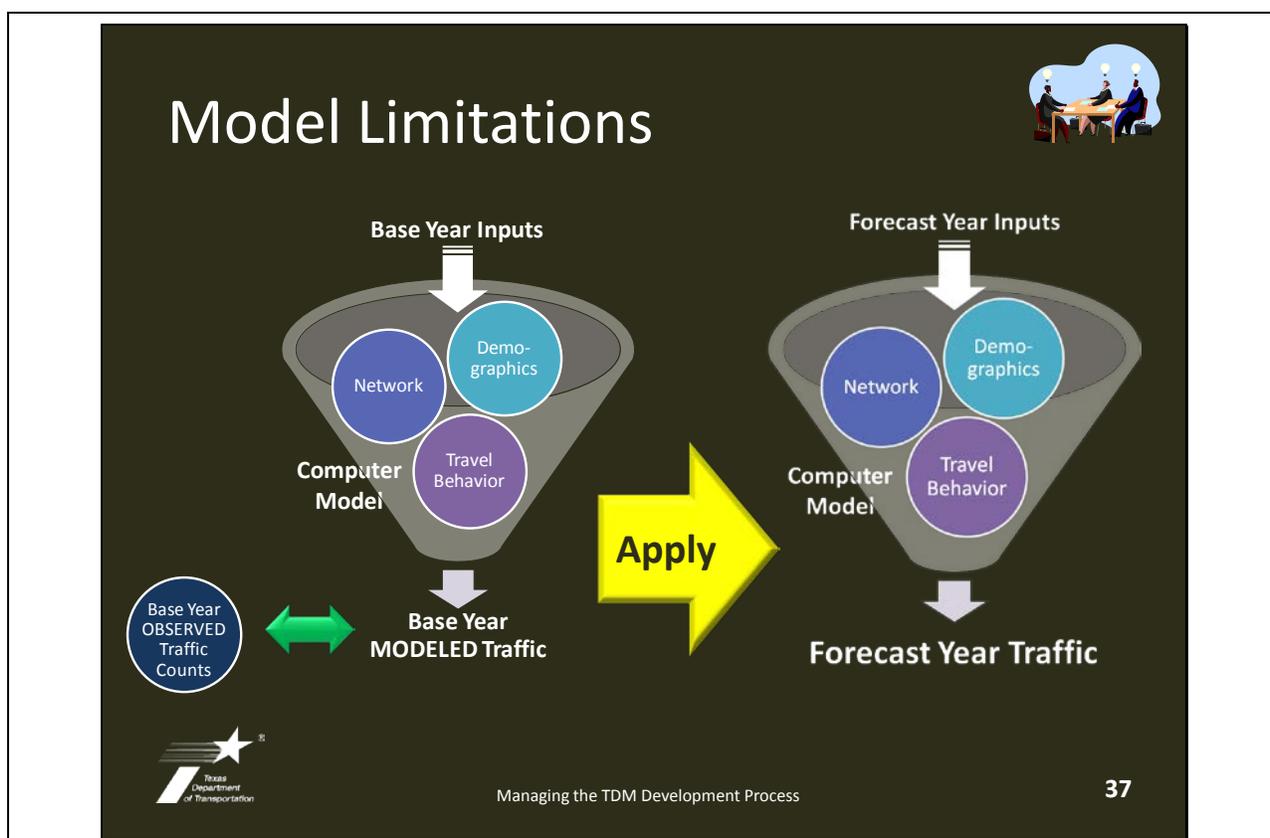
KEY CONCEPT: Travel models are important for a wide variety of project analysis needs; the version that the MPO bases the adopted plan on is the official model for the area.

Topic 1.7 Model Limitations

5 Minutes

Activity 1.3 Model Limitations Brainstorming

Of course, like any tool, travel models have limitations. With what you know now about these models generally, their inputs, and the Texas Package approach, let's work as small groups at each table to brainstorm potential limitations with the model approach we just discussed. Take 5 minutes at your table, then we will share with the larger group.



Answers include: Data availability (incl. correctness and timeliness), knowing the future, unrealistic expectations of what a model can show, only auto and truck modes... (delete from participant notebook)

Micro-level Analysis? NO

How Long Should Signal Time Be?

Are Direct Connects Needed?

Managing the TDM Development Process 38

We know that one type of question comes up a lot:
 Can the Texas Package help someone determine how a specific intersection should be designed (or a signal timed) in the future?

No. This type of question requires a different type of analysis tool, a microscopic analysis tool. This and other types of travel models are described in more depth in Appendix A for further reference outside of class.

Texas Package Applications

INSTRUCTOR HANDBOOK Lesson 1: Travel Model Fundamentals

Activity 1.4 "Would You Use the Texas Package for This?"

Analysis Question	Yes	No
What future traffic will be on road based on changes in demographics?		
What might be the projected bicycle/pedestrian usage along a future trail?		
Will tax-time incentives reduce future traffic?		
Which roadway should we build first of two potential projects?		
Will lengthening a certain bus route help congestion along that roadway?		
Will the projects in the MTP maintain metropolitan air quality status?		
Will additional lanes in a corridor attract more traffic?		
How many left turn lanes are needed at a particular intersection?		
How long should a merge length be between particular on- and off-ramps?		
How much traffic will a bypass remove from other facilities?		

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Take 10 minutes to do the activity at the table. Use the bottom two rows in the table for things you've come across.



KEY CONCEPT:

Limitations of a travel model include technical limitations, as well as the potential for errors. By far the most certain limitation is that the future is unknown. Travel models remain a solid analytical tool for making planning decisions for the future.

Activity 1.4 “Would You Use the Texas Package for This?”

Analysis Question	Yes	No
What future traffic will be on road based on changes in demographics?	✓	
What might be the projected bicycle/pedestrian usage along a future trail?		✓
Will flex-time incentives reduce future traffic?		✓
Which roadway should we build first of two potential projects?	✓	
Will lengthening a certain bus route help congestion along that roadway?		✓
Will the projects in the MTP maintain metropolitan air quality status?	✓	
Will additional lanes in a corridor attract more traffic?	✓	
How many left turn lanes are needed at a particular intersection?		✓
How long should a merge length be between particular on- and off-ramps?		✓
How much traffic will a bypass remove from other facilities?	✓	

Remove answers in student version!

Topic 1.8 Other Helpful Resources

Metropolitan Transportation Planning: Executive Seminar

Tailored for MPO Board members

<http://www.planning.dot.gov/Documents/MetroPlanning/metroTrans.htm>

U.S. DOT Capacity Building Programs Home Page

General capacity building for transportation professionals (see TPCB below)

<http://www.pcbprograms.dot.gov/>

FHWA/FTA Joint Transportation Planning Capacity Building Program (TPCB)

Focused on transportation planning-related capacity-building

<http://planning.dot.gov/>



Transportation Planning Process: Key Issues

A Briefing Book for Transportation Decisionmakers, Officials, and Staff

AKA The “Briefing Book” – a fundamental resource and starting point.

<http://planning.dot.gov/documents/briefingbook/bbook.htm>

or PDF at:

http://planning.dot.gov/documents/briefingbook/bbook_07.pdf



Introduction to Travel Demand Forecasting

Self-instructional CD-ROM (downloadable) covering basic concepts and high-level overview.

http://tmiponline.org/Clearinghouse/Items/Introduction_to_Travel_Demand_Forecasting_Self_Instructional_CD-ROM.aspx

Metropolitan Travel Forecasting: Current Practice and Future

Direction, TRB (SR 288), 2007

An extensive review of MPOs nationwide, needs, challenges, and opportunities.

<http://onlinepubs.trb.org/onlinepubs/sr/sr288.pdf>

Travel Model Improvement Program

Overall general resource for the travel modeling community, from nuts to bolts, including discussion forum and email list.

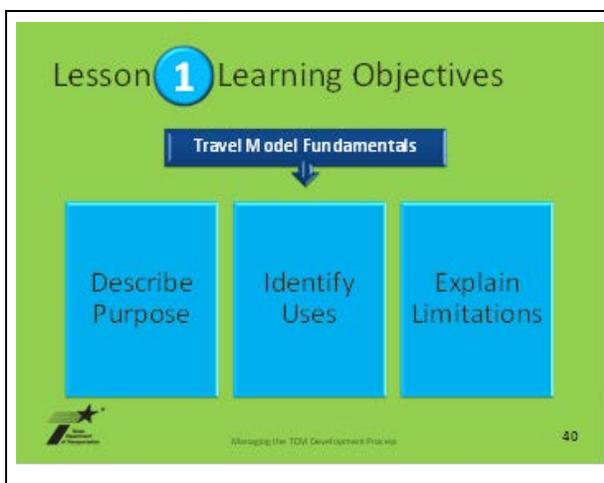
<http://tmiponline.org/>



Topic 1.9 Lesson Wrap-Up

5 Minutes

On the previous page is a list of Other Helpful Resources that cover the topics in this lesson. The Briefing Book, with the three yellow stars, is recommended as a fundamental resource and starting point for MPO Policy Board members, staff, and the public, to understand the role of the MPO in the larger context and the planning process that travel models support.



At the beginning of this lesson, we set the following learning objectives. At this point, you would be able to: (read the objectives).

Does anyone have any questions about the material in Lesson 1? When we get back from break we will conduct a brief, facilitated discussion of Lesson 1.

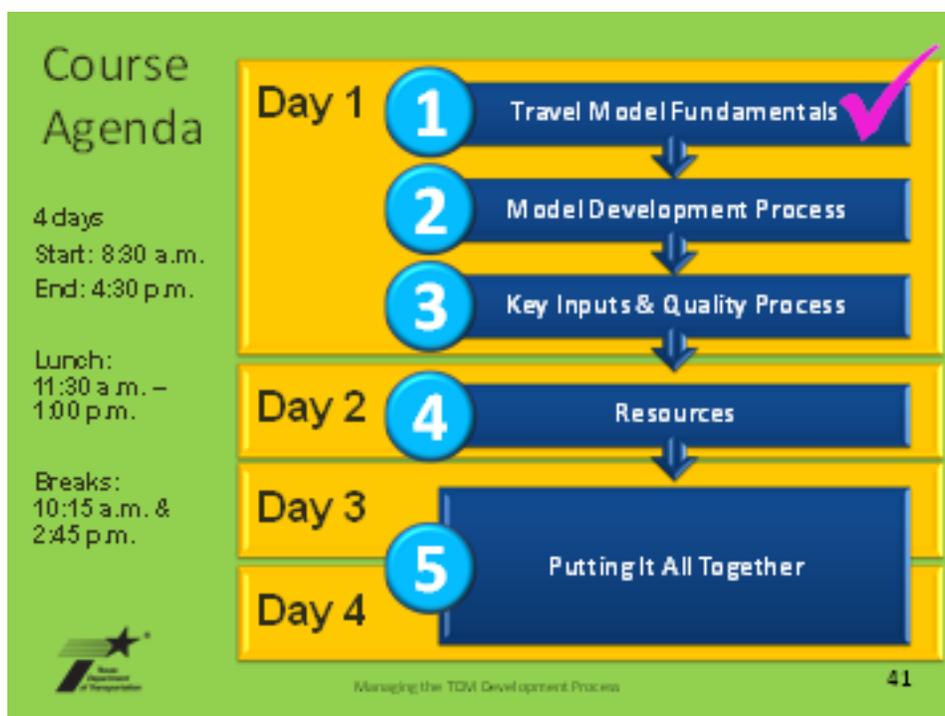
Suggested Break Here

Lesson 1 Reinforcement Questions

After break, before starting the next lesson, review these questions (and answers) as a group:

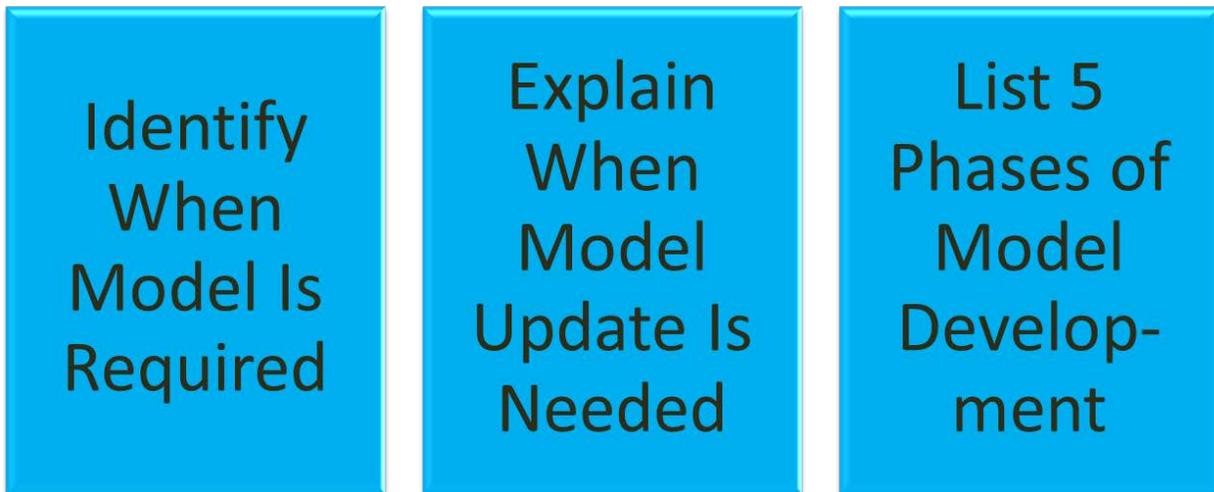
1. Describe the purpose of a travel model?
2. What are some uses of a travel model?
3. What are some limitations of a travel model?

Where Are We?



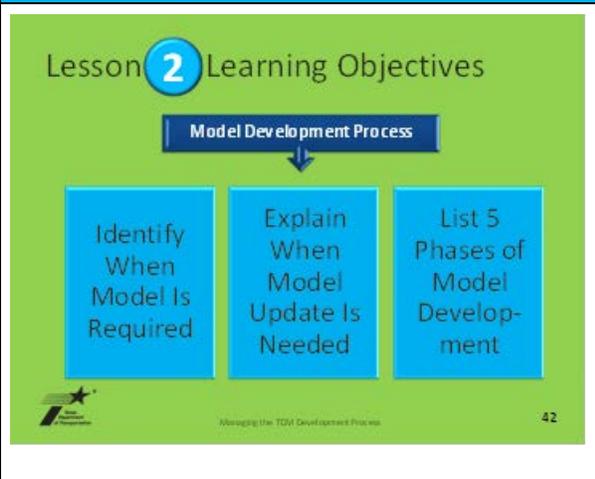
Lesson 2: Model Development Process

Learning Objectives



Lesson Materials Follow

Lesson Total Time: 2 Hours, 30 Minutes (in 2 parts)



At the end of this training course, participants will be able to:
(read from slide)

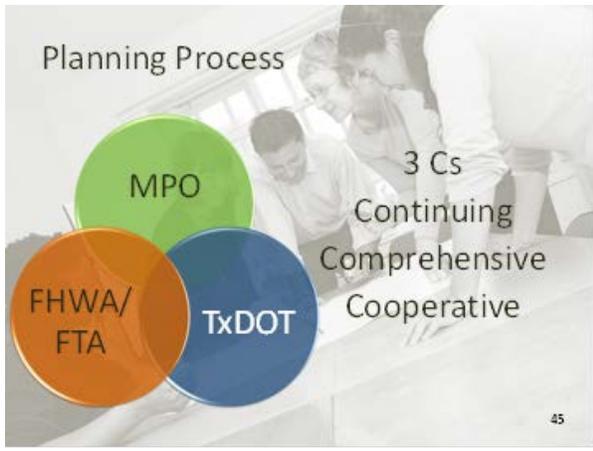
Topic 2.1 MPO Responsibilities Related to Models

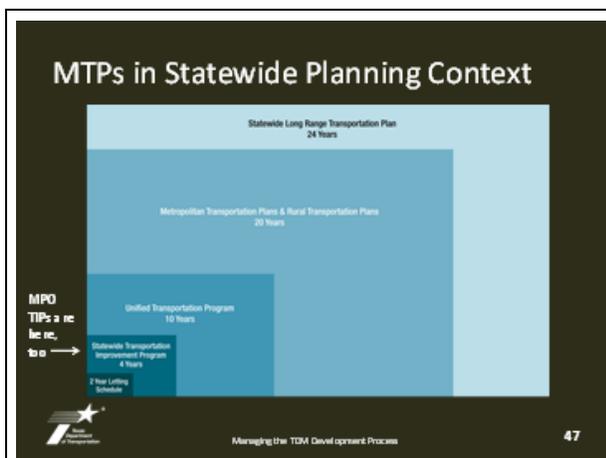
30 Minutes

MPO Responsibilities Relevant to Travel Modeling



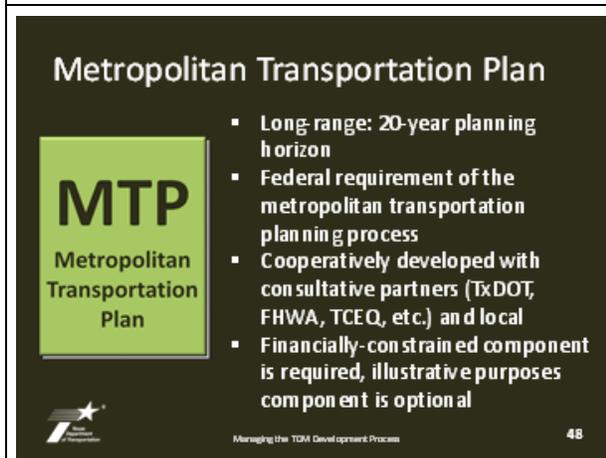
To understand when a travel forecasting is required and the specific model requirements, one has to have a fundamental understanding of the larger context for MPO planning.

<p>What Is an MPO? TMA?</p> <ul style="list-style-type: none"> ▪ A Metropolitan Planning Organization (MPO) is designated for urbanized areas with population over 50,000. ▪ A Transportation Management Area (TMA) is an MPO with population over 200,000.  <p>Managing the TDM Development Process 44</p>	<p>As a reminder: TMAs are MPOs, but not all MPOs are TMAs. TMAs have been designated as such, based upon population size.</p>
<p>Planning Process</p>  <p>3 Cs Continuing Comprehensive Cooperative</p> <p>45</p>	<p>MPOs, including local agency representatives, conduct regional planning in partnership with federal and state government levels. As stated in TxDOT’s <i>Transportation Planning Manual</i>: “As program manager for the metropolitan transportation planning process, TxDOT serves as both partner in the continuing, comprehensive, and cooperative planning process (also called the “3C” planning process) and as manager of the federal funds used in the process.” (2001, p. 5-5)</p>
<p>Five Core MPO Functions*</p> <ol style="list-style-type: none"> 1. Provide a setting for regional decision making 2. Identify and evaluate alternative transportation improvement options 3. Prepare and maintain a Metropolitan Transportation Plan (MTP) 4. Develop a Transportation Improvement Program (TIP) 5. Involve the public  <p>*Transportation Planning Process: Key Issues A Briefing Book for Transportation Decisionmakers, Officials, and Staff, USDOT Managing the TDM Development Process 46</p>	<p>These five core functions of an MPO are from the Briefing Book referenced in Lesson 1 (don’t read them).</p> <p>Travel models pertain to each of the five core functions.</p> <p>Most directly to #2, 3, and 4</p> <p>Support to: #1 and #5</p> <p>Let’s talk about the MTP and TIP.</p>

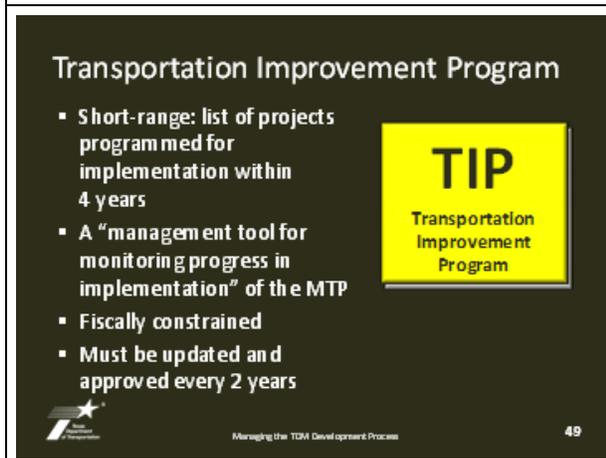


First of all, it is important to be aware of the larger context for Metropolitan Transportation Plans. That is, in addition to being a document of local regional importance, they are part of a family of plan documents for Texas statewide transportation planning & implementation activities. This relationship between these plans is part of the 3Cs process.

<Read through slide starting with the Statewide Plan>

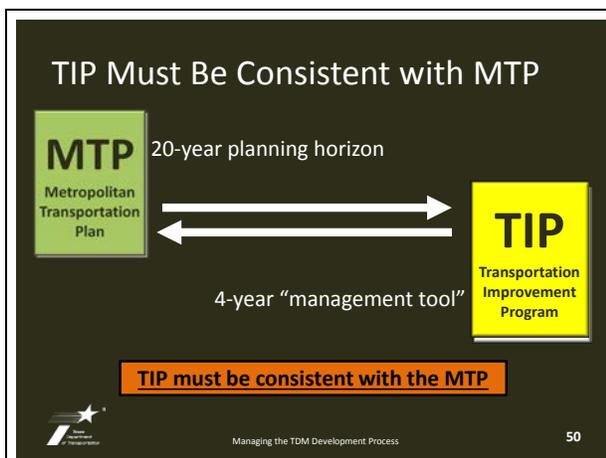


The Metropolitan Transportation Plan is a requirement (both federal and state) of the metropolitan planning process. It is cooperatively developed by the local, state, and federal agencies involved in transportation decision-making. It must include a financially constrained component. The MTP must be updated every 5 years for most MPOs, in order to not lapse. TMA's are on a 4-year adoption cycle and have additional requirements.



The Transportation Improvement Program (TIP) is also a requirement (both federal and state) for MPOs. It is the spending plan, or list, of short-term projects to be developed within 4 years. The TIP must be fiscally constrained.

TxDOT, in its role of ensuring the continuation of federal funding for transportation, has requirements for the format and content of a TIP for each MPO.



The TIP must be consistent with the MTP, as required by federal law, and as stated by the TxDOT Transportation Planning Manual (2001): "The transportation system developed through the MTP process will be the basis for the section of projects for further development."

Thus, in general terms, if a forecast model supports the MTP, any project in the MTP and TIP must also be in the model if it is a regionally significant project that would affect model results.

TIP Amendment Triggers (Exhibit)

INSTRUCTOR HANDBOOK Lesson 2 Model Development Process

EXHIBIT 2.6 TIP Amendment Triggers

Note: Because of various complexities of air quality and conformity issues, the need to revise a TIP should be discussed with TCEQ (see the TCEQ Transportation Planning Manual, 2001, p. 5-25).

Non-Attachment Area Project Change To:	Attachment Area Project Change To:
1. Add or delete any project	1. Same, but only for federally funded projects
2. Project's design concept or scope of work	2. Same, but only for federally funded projects
3. Project phases of work such as the addition of preliminary engineering, construction, or right-of-way	3. Same, but only for federally funded projects
4. In the TIP year if the MPO's project selection procedure does not provide for specific projects from the second, third, or fourth year	4. Same
5. Add Congestion Mitigation and Air Quality funding to a previously approved project for	5. Not applicable
6. Funding from non-federal to federal funding or when the change in funding alters the addition or deletion of federally funded projects or regionally significant state-funded projects	6. Funding that forces the addition or deletion of <u>federally funded</u> projects

Source: U.S. Code of Federal Regulations (23 CFR 450.504(g)). Each project or project phase included in the TIP shall be consistent with the approved metropolitan transportation plan.

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The following exhibit lists the types of events that might trigger an amendment to a TIP. TxDOT-TIP is your recommended resource to discuss when a TIP amendment is necessary and when a model re-application is necessary to support it. Not all TIP amendments require a model run, but clearly some of these activities (like adding or deleting a project that would affect regional capacity) would.

 **KEY CONCEPT:** The MTP, the TIP, and a travel model used to develop the MTP must all be consistent.

Exhibit 2.a TIP Amendment Triggers

Note: Because of various complexities of air quality and conformity issues, the need to revise a TIP should be discussed with TxDOT (see the TxDOT Transportation Planning Manual, 2001, p. 5-25).

Non-Attainment Area Project Change to:	Attainment Area Project Change to:
<ol style="list-style-type: none"> 1. add or delete any project; 2. project's design concept or scope of work; 3. project phase of work (such as the addition of preliminary engineering, construction, or right of way); 4. in the TIP year if the MPO's project selection procedure does not provide for selecting projects from the second, third, or fourth year; 5. add Congestion Mitigation and Air Quality funding to a previously approved project; or 6. funding from non-federal to federal funding or where the change in funding forces the addition or deletion of federally funded projects or regionally significant state funded projects. 	<ol style="list-style-type: none"> 1. Same, but only for <u>federally funded</u> projects 2. Same, but only for <u>federally funded</u> projects 3. Same, but only for <u>federally funded</u> projects 4. Same 5. Not applicable 6. Funding that forces the addition or deletion of <u>federally funded</u> projects

Source: U.S. Code of Federal Regulations [23 CFR 450.324(g)]: "Each project or project phase included in the TIP shall be consistent with the approved metropolitan transportation plan."

Additional MPO Responsibilities Related to Models

<p style="text-align: center;">Additional MPO Responsibilities Related to Models</p> <p style="text-align: right;">Managing the TDM Development Process 52</p>	<p>Areas designated as an air quality nonattainment area (NAA) or maintenance area have additional requirements for transportation planning. In brief, the non-attainment designation itself is based upon real air quality data, not travel model data. “Maintenance” status refers to an area which was previously non-attainment, but is not currently, and applies for a period of years later.</p>
<p style="text-align: center;">Air Quality Conformity</p> <pre> graph TD EPA([EPA (Emissions Standards)]) <--> FHWA([FHWA (Monitors Emission Standards)]) EPA <--> TxDOT([TxDOT & MPOs (Demonstrate Conformity Using Travel Models)]) FHWA <--> TxDOT </pre> <p style="text-align: right;">Managing the TDM Development Process 53</p>	<p>The federal Environmental Protection Agency determines the National Ambient Air Quality Standards. The Federal Highway Administration monitors those standards and ensures that where an area has been designated non-attainment or a maintenance area; the local MPO demonstrates a plan to meet the standards to continue to receive federal funding; the bottom circle shows TxDOT and MPOs working together to demonstrate conformity using a) travel models, b) latest emissions models, and c) latest air quality dispersion models. Source: http://onlinemanuals.txdot.gov/txdotmanuals/tda/air_quality_conformity_modeling.htm</p>
<p style="text-align: center;">Unified Planning Work Program (UPWP)</p> <ul style="list-style-type: none"> ▪ Describes planning work tasks, including those in support of the MTP ▪ Basis for identifying state and federal sources of funding ▪ Typically developed every 1-2 years <p style="text-align: right;">Managing the TDM Development Process 54</p>	<p>Describes planning work tasks of the MPO, including those in support of the MTP.</p> <p>Through the UPWP, the MPO identifies state and federal sources of funding for these tasks. It is typically developed every 1-2 years.</p> <p>The UPWP is discussed more in Lesson 5 as a tool for managing resources.</p>

Certification
Review
(Activity &
Exhibit)



INSTRUCTOR HANDBOOK Lesson 2: Model Development Process

Exhibit 2.3 Typical Checklist for Travel Forecasting Methods

Federal Statutes

- 22 USC 158 (b)
- 41 USC 505 (3)
- 42 USC 7506(b)

Federal Regulations

- 22 CFR 450.322(b), (c), and (f)
- 41 CFR 101-12.2(b), (3), and (8)

Items to Review/Confirm

1. Key Indicators of Risk

- Metropolitan area designated as critical, severe, or extreme ozone or serious carbon monoxide nonattainment area.
- Metropolitan area designated as nonattainment or maintenance area.
- Travel demand model used previously by MPO.
- FTA travel time study grant.
- Major projects that will significantly increase highway capacity.
- Transportation projects when there is strong and coordinated opposition by local planning groups.
- The MPO is a designated, or otherwise with, legal actions in which the adequacy of its travel forecasting methods was challenged.

2. Key Indicators of Agency Technical Capabilities

- Who is responsible for travel forecasting at the MPO?
- Formal memoranda of agreement to delineate technical responsibilities, lines of communication and review, authorized expenditures and reimbursement procedures.
- Who, if anyone, on the MPO staff is responsible for evaluating the technical work of the contractor?

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Now, a question, anyone want to explain what MPO Certification Review is?

(answer)

Thank you, let's look at the next page, where there is a brief description and then a copy of a page from a Certification Review checklist.

Let's look at the questions in the activity together.

Activity 2.1 Certification Review

MPO Certification Review is required for TMAs, and occurs at least every 4 years. Certification review covers many different aspects of the MPO responsibilities, only one part is the travel forecasting model. When FHWA and TxDOT meet with the MPO for certification review, there is typically a checklist of items to review or confirm regarding the travel forecasting model. A current version of this checklist is included here for discussion.

- What do you think “Key Indicators of Risk” means? ... These are reasons that an MPO’s approach to forecasting might be scrutinized.
- Why might non-TMA MPO’s want to be aware of this Checklist? ... Because might become a TMA, because good practice, etc.

Exhibit 2.b Typical Checklist for Travel Forecasting Methods

Federal Statutes

- 23 USC 134 (i)
- 49 USC 5303 (i)
- 42 USC 7506(c)

Federal Regulations

- 23 CFR 450.322(b), (e), and (f)
- 40 CFR 93.122(b), (c), and (d)

Items to Review/Confirm

1. *Key Indicators of Risk*

- Metropolitan area designated as serious, severe, or extreme ozone or serious carbon monoxide nonattainment area.
- Metropolitan area designated as nonattainment or maintenance area.
- Travel demand models used previously by MPO.
- FTA transit new start grant.
- Major projects that will significantly increase highway capacity.
- Transportation projects where there is strong and coordinated opposition by local advocacy groups.
- The MPO is a defendant in, or threatened with, legal actions in which the adequacy of its travel forecasting methods was challenged.

2. *Key Indicators of Agency Technical Capabilities*

- Who is responsible for travel forecasting at the MPO?
- Formal memorandum of agreement to delineate technical responsibilities, lines of communication and review, authorized expenditures and reimbursement procedures.
- Who, if anyone, on the MPO staff is responsible for evaluating the technical work of the contractor?

- Formal training or experience in the use of travel forecasting methods.
- MPO organization structure includes a technical committee to review planning assumptions and forecasting methods.
- Strategic plan and a guaranteed minimum level of funding in its UPWP for maintenance and improvements to its travel forecasting methods.
- Peer review or other independent assessment of its travel forecasting methods.

3. Documentation

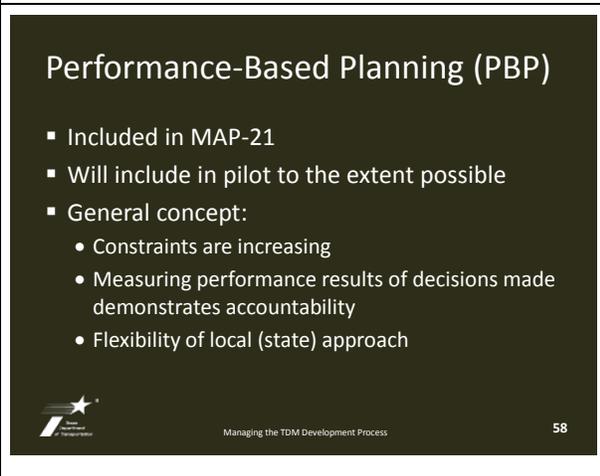
- Inventory of current state of transportation.
- Key planning assumptions used in developing the forecasts.
- Descriptions of the methods used to develop forecasts of future travel demand.

Source: Federal Highway Administration/Federal Transit Administration, Transportation Management Area Planning Certification Review Primer,

http://www.planning.dot.gov/documents/primer/intro_primer.asp#3.2.

For more information, contact TxDOT or the Texas field office of FHWA, or reference FHWA's Planning Capacity Building Program (included in the References section at the end of this chapter).

MAP-21 and How It May (or May Not) Change Things

 <p>How Does MAP-21 Change Things?</p> <p>Managing the TDM Development Process 56</p>	<p>How does MAP-21 change things?</p>
 <p>MAP-21</p> <ul style="list-style-type: none"> ▪ Federal transportation bill signed into law July 6, 2012 ▪ Initial findings are discussed ▪ Timing of pilot in September allows additional time for examination of Texas policy implications (e.g., considering Texas Administrative Code, as well) <p>Managing the TDM Development Process 57</p>	<p>The new federal transportation funding bill was passed in July 2012. It's like ISTEA, TEA-21, and SAFETEA-LU.</p>
 <p>Performance-Based Planning (PBP)</p> <ul style="list-style-type: none"> ▪ Included in MAP-21 ▪ Will include in pilot to the extent possible ▪ General concept: <ul style="list-style-type: none"> • Constraints are increasing • Measuring performance results of decisions made demonstrates accountability • Flexibility of local (state) approach <p>Managing the TDM Development Process 58</p>	<p>Performance-based planning is, itself, not a new concept. FHWA national and state, as well as the state of Texas, will work to address any changes necessary to current procedures.</p>

Topic 2.2 When Is a Model Necessary?

30 Minutes

When Is a Travel Forecasting Model Required for the MTP?

When Is a Model Necessary?
Start with:
When Is a Model Required?

Managing the TDM Development Process 59

When IS a model necessary? Believe it or not, this isn't the simple question it appears to be.

Why Do Travel Modeling?

“Quantitative”

“Objective”

“Required”

“Conformity”

Managing the TDM Development Process 60

We asked this question in Lesson 1. Why do we do modeling? Sometimes, it is necessary. Sometimes we do modeling because it facilitates planning.

When Is a Model Required for MTP?

Start

Is area in question the same as the area in the last MTP update for a TMA (over 200,000 in population)?

Yes

Model is required for MTP update for air quality conformity determination (every 4 years)

No

Is the MPO a TMA (over 200,000 in population)?

Yes

Model is required for MTP update (MTP update every 4 years)

No

Model is NOT REQUIRED to support other MPOs' Metropolitan Transportation Plan (MTP). TPP considers it.

Best Practice: when feasible, apply a travel model to support MTP development. Options include:

Options:

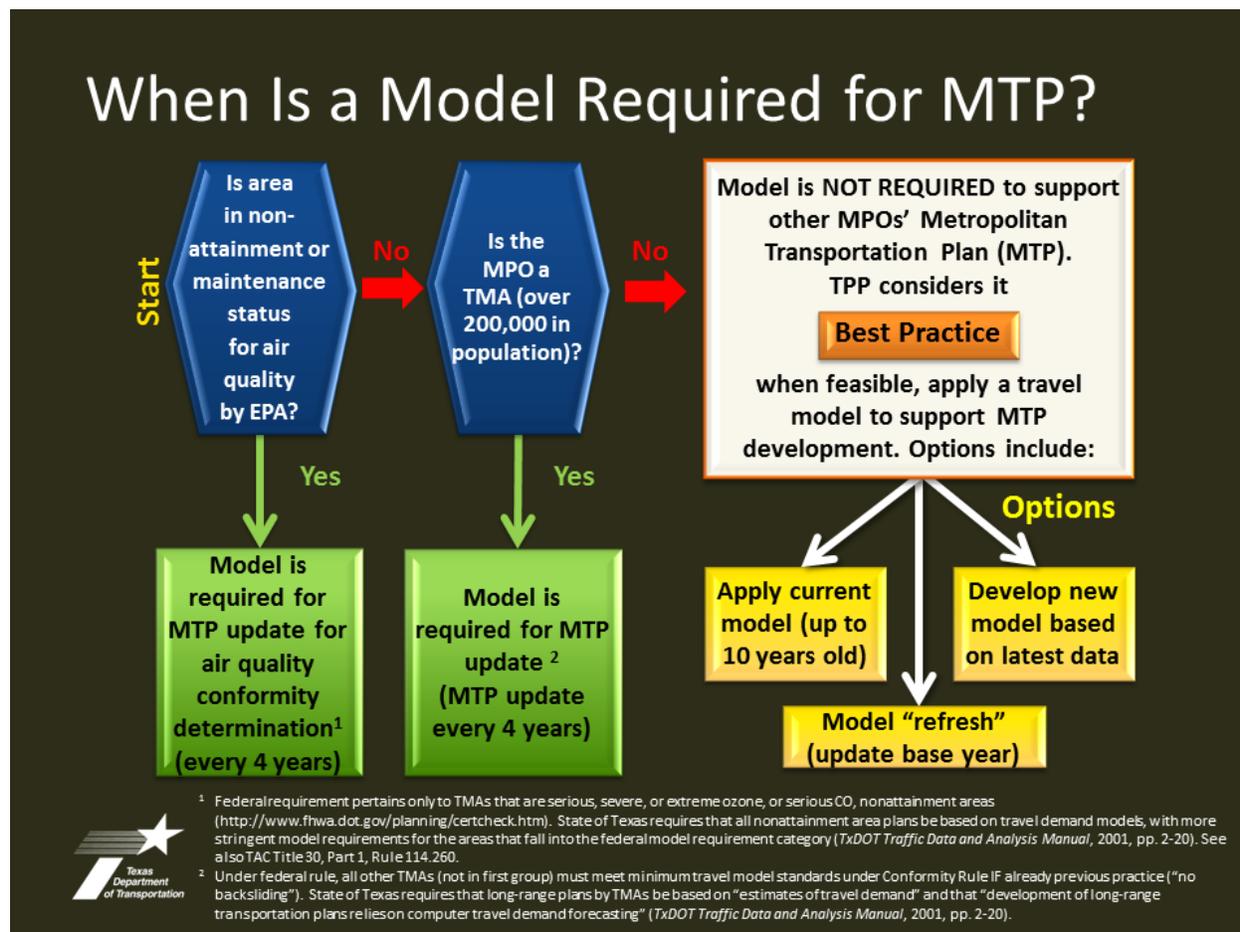
- Apply current model (up to 10 years old)
- Develop new model based on latest data
- Model "refresh" (update base year)

Managing the TDM Development Process 61

With the above information, we now have the information we need in order to decide if a model is required to support an MTP.

Refer to Exhibit 2.c and walk through it.

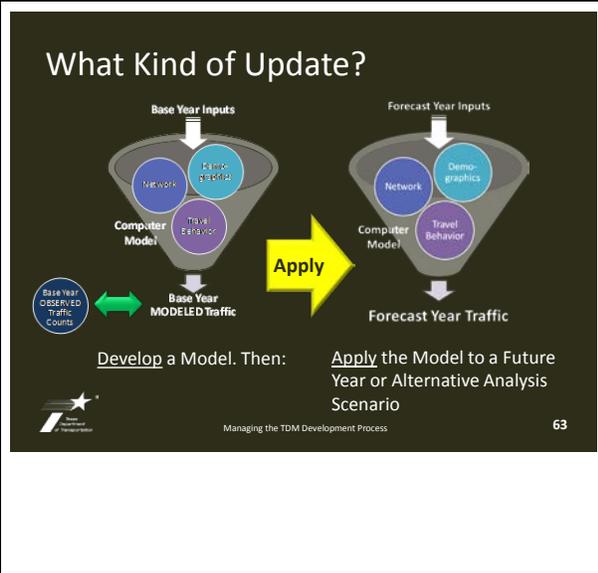
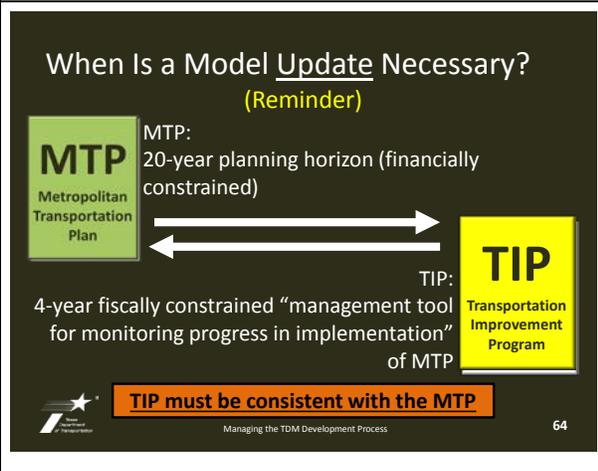
Exhibit 2.c When Is a Travel Model Required for an MTP?

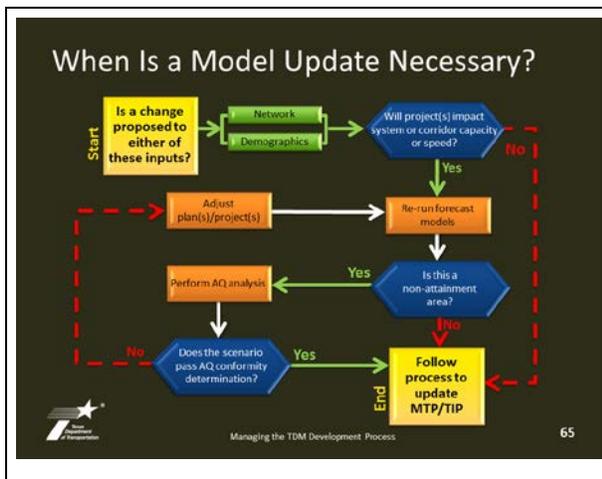


The fine print:

- ¹ Federal requirement pertains only to TMAs that are serious, severe, or extreme ozone, or serious CO, nonattainment areas (<http://www.fhwa.dot.gov/planning/certcheck.htm>). State of Texas requires that all nonattainment area plans be based on travel demand models, with more stringent model requirements for the areas that fall into the federal model requirement category (TxDOT Traffic Data and Analysis Manual, 2001, pp. 2-20). See also TAC Title 30, Part 1, Rule 114.260.
- ² Under federal rule, all other TMAs (not in first group) must meet minimum travel model standards under Conformity Rule IF already previous practice ("no backsliding"). State of Texas requires that long-range plans by TMAs be based on "estimates of travel demand" and that "development of long-range transportation plans relies on computer travel demand forecasting" (TxDOT Traffic Data and Analysis Manual, 2001, pp. 2-20).

When Is a Model Update Required for an Application Scenario?

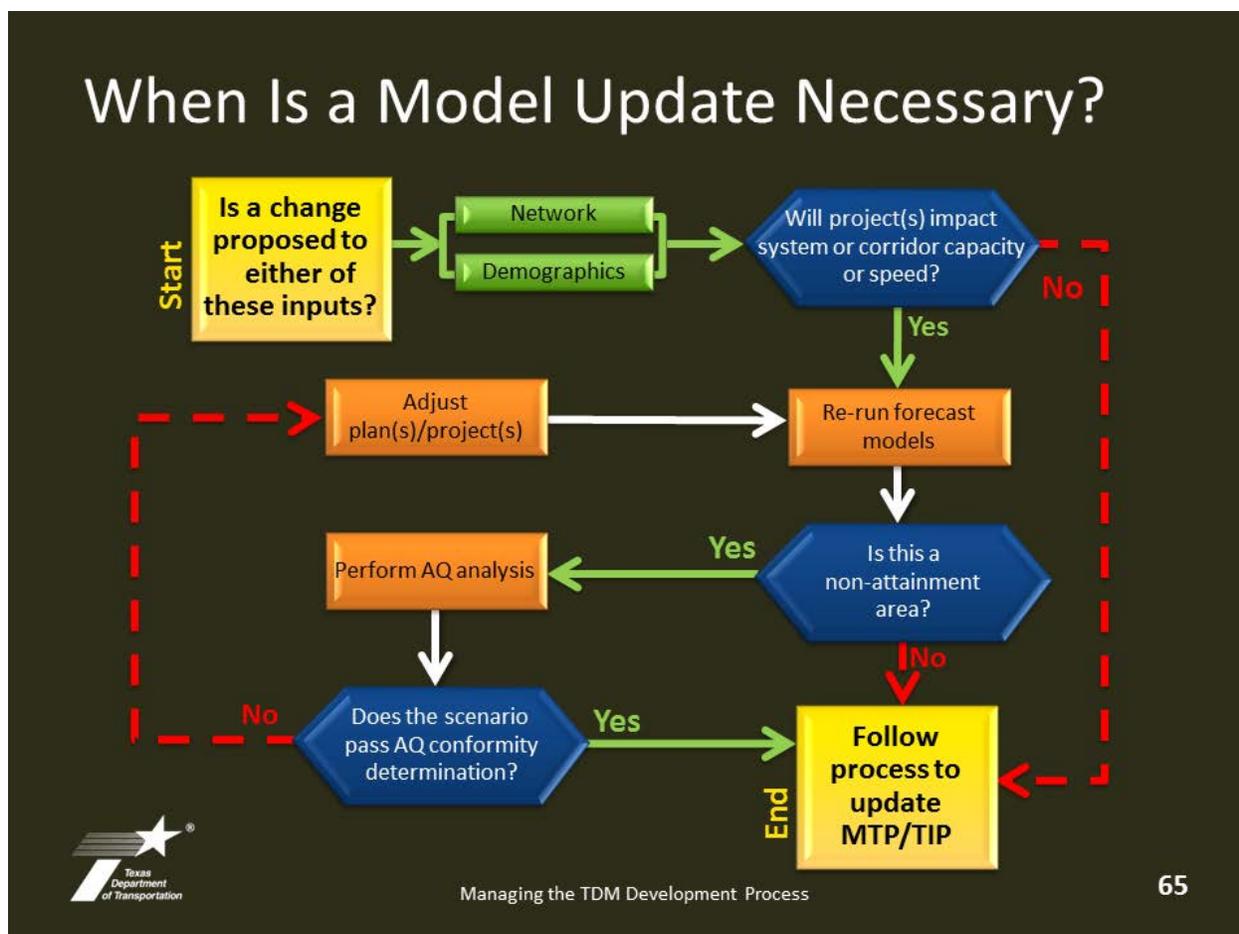
 <p>When Is a Model Update Required for an Application Scenario?</p> <p>Managing the TDM Development Process 62</p>	<p>Sometimes a model is available and we need to decide if we need an update.</p>
 <p>What Kind of Update?</p> <p>Base Year Inputs: Network, Public Facilities, TDM Behavior</p> <p>Forecast Year Inputs: Network, Demographics, Travel Behavior</p> <p>Computer Model</p> <p>Base Year OBSERVED Traffic Counts</p> <p>Base Year MODELED Traffic</p> <p>Forecast Year Traffic</p> <p>Apply</p> <p>Develop a Model. Then: Apply the Model to a Future Year or Alternative Analysis Scenario</p> <p>Managing the TDM Development Process 63</p>	<p>First of all, what type of update is being referred to?</p> <p>The term “update” is often loosely applied for travel models. For this course, we will refer to two major types of updates:</p> <ul style="list-style-type: none"> • Most commonly, on the “Apply” side, one updates a model application scenario (interim or forecast year) with new information about demographics or projects in the network. • Another type of update is to the “Develop” side: a nontraditional update of a base year model. <p>We will address the first type of update in this section.</p>
 <p>When Is a Model Update Necessary? (Reminder)</p> <p>MTP: Metropolitan Transportation Plan 20-year planning horizon (financially constrained)</p> <p>TIP: Transportation Improvement Program 4-year fiscally constrained “management tool for monitoring progress in implementation” of MTP</p> <p>TIP must be consistent with the MTP</p> <p>Managing the TDM Development Process 64</p>	<p>A model “Application Update” must occur when either the MTP or the TIP is being updated and the project will affect conformity.</p> <p>If a model was required for an MTP, and the TIP and the MTP must be consistent, and a project has been proposed by a local implementing agency for inclusion in the TIP, then: the model supporting the MTP must include the project in the forecast years when the project will be in place.</p>

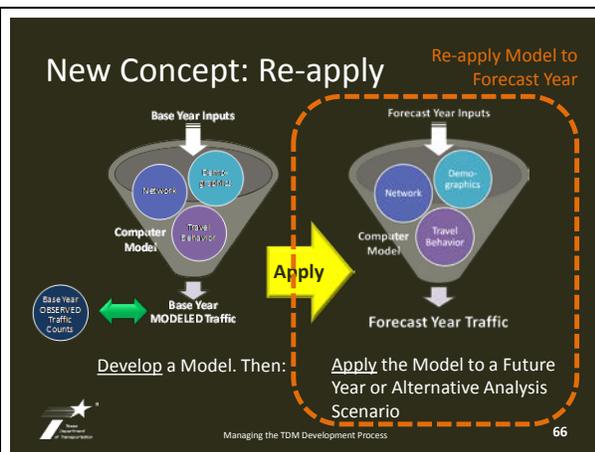


This decision flow is demonstrated in this flow chart in Exhibit 2.d on page 49 on the Handbook.

Example: Model to support MTP:
 Base year of model was 2005
 Forecast year model is 2040. Project will be built by 2020 and needs to be included in the TIP so that advanced planning activities for the project can continue. Therefore, the forecast year model must be reapplied with the project included in the network.

Exhibit 2.d When Is a Model Update Required for an Application Scenario?





Let's pause a moment, because a new action has been introduced:

We've talked previously about the two stages of "Develop" and "Apply."

When updating a forecast year model input and re-running just that forecast year, then we will call this a "Re-apply."

Note that for this type of update, it is not necessary in this case to revisit the base year model at all (no model calibration or validation, in modeler terms).

When Is a Model Required Otherwise?

Examples include:

- Major investments/NEPA analyses
- Environmental justice examination of tolling projects (current and future)
- Mobile source air toxics analysis

MPOs should confer with TxDOT in these cases

Managing the TDM Development Process 67

(read from slide)

Activity: Is a Model Update Required?

ACTIVITY 2.2 Is a Model Forecast Update/Application Required?

As a small group that, work through these five questions, and we will share answers as a full group. Place in the small group, brainstorm one additional question.

Chances:

- Your MPO has an adopted MTP less than three years old.
- Your MPO is a TDM and you are in transportation status for air quality.

For each of these scenarios, and referring to TABLE 2.1 (on page 45), is a model forecast year update and model application required?

Scenario	Yes	No
1. Through a technical oversight when the TIP was selected, a new location, special routing, area located in the TIP that was not in the MTP.		
2. The TxDOT District office is proposing to add a 0.1 mile auxiliary lane to a freeway segment between existing ramps and that project was not included previously in the MTP or TIP.		
3. Your MPO model does not include transit mode changes in the transit mode. The transit mode has been decided to add a new mode to that system.		
4. The City Council has approved a zoning change and appropriate documents to allow a regional mall in a location previously designated commercial.		
5. The City and TxDOT District are jointly funding a project to install lighting and other traffic signal to improve traveling with transit/mass transit mode in front of an existing commercial, high traffic area.		

These scenarios are for discussion purposes only. MPOs should check with TxDOT and FHWA before making a final decision.

Managing the Travel Model Process 68

Walk through activity on following page.

 **KEY CONCEPT:** The requirement that the TIP be consistent with the MTP drives need to "re-apply" the forecast year model

Activity 2.2 Is a Model Forecast Update/Application Required?

As a small group first, work through these five questions, and we will share answers as a full group. While in the small group, brainstorm one additional question.

Givens:

- Your MPO has an adopted MTP less than three years old.
- Your MPO is a TMA and you are in maintenance status for air quality.

For each of these scenarios, and referring to Exhibit 2.d on page 49, is a model forecast year update and model application required?

Scenario	Yes	No
1. Through a technical oversight when the TIP was adopted, a new-location arterial roadway was included in the TIP that was not in the MTP.	<input checked="" type="checkbox"/>	
2. The TxDOT District office is proposing to add a 0.1 mile auxiliary lane to a freeway segment between existing ramps, and this project was not included previously in the MTP or TIP.		<input checked="" type="checkbox"/>
3. Your MPO model does not include transit (mode choice) in the travel model. The local transit provider has decided to add a new route to their system.		<input checked="" type="checkbox"/>
4. The City Council has approved a zoning change and appropriate documents to allow a regional mall in a location previously designated parkland.	<input checked="" type="checkbox"/>	
5. The City and TxDOT District are jointly funding a project to braid existing on- and off-ramps in order to improve mainlane and frontage road operations in front of an existing commercial, high traffic area.		<input checked="" type="checkbox"/>

These examples are for discussion purposes only. MPOs should check with TxDOT and FHWA before making a final decision.



Topic 2.3 Best Practice Model Uses to Support the MTP Development Process

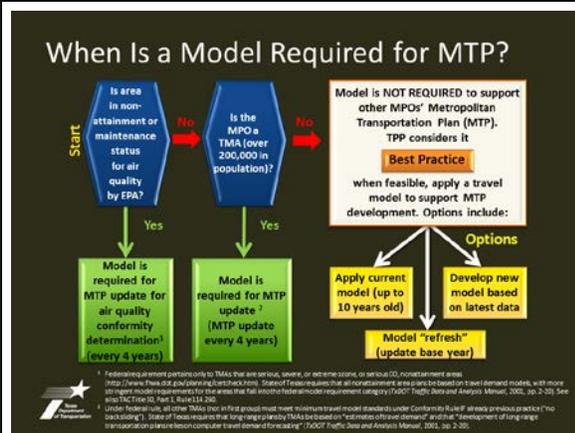
Lesson Total Time: 30 Minutes

So, If a Model Is Not Required...
When Is a Model Best Practice?



Managing the TDM Development Process 69

So, as we discussed previously, sometimes a model is not required, even for an MPO's MTP. This situation applies most often for the smallest MPOs. Why would we consider it best practice to use one anyway?



We already looked at this flow chart. Notably, all the paths lead to a travel model, if not because it is required, because it is best practice. Why is that? (click)

Why Do Travel Modeling?



Managing the TDM Development Process 71

Remember this slide from Lesson 1? We asked "Why do travel modeling? Two of the answers we received were related to requirements. When these go away (click, click), there are still very good reasons for using a model for the MTP.

<p>Best Practice Model Uses for MTP</p> <ul style="list-style-type: none"> ▪ Scenario testing ▪ Project prioritization ▪ To support performance measure examination under MAP-21 (specifics still being explored)   <p>Managing the TDM Development Process 72</p>	<p>There are several opportunities to use a travel model as part of the planning process for the MTP.</p>
<p>Scenarios for Testing</p> <ul style="list-style-type: none"> ▪ Fiscally-constrained forecast year (as required) ▪ No build (really: existing plus committed) ▪ Other test scenarios to define plan <ul style="list-style-type: none"> • To prioritize projects • To determine project implementation year • Etc. ▪ Needs plan/illustrative purposes   <p>Managing the TDM Development Process 73</p>	<p>Scenario testing (read from slide)</p>
<p>Project Prioritization</p> <p><i>How Does an MPO Decide Which Projects to Include in the Financially Constrained Plan?</i></p> <ul style="list-style-type: none"> ▪ Run existing plus committed scenario to identify needs ▪ Test projects to address needs <ul style="list-style-type: none"> • Projects with existing funding/schedule • New projects not previously identified ▪ Examine measures of effectiveness   <p>Managing the TDM Development Process 74</p>	<p>Project prioritization (read from slide)</p>

Performance Measures

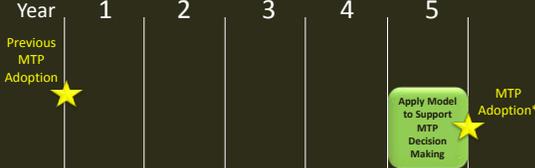
- More to come as MAP-21 is interpreted
- One possible approach:
 - MPO, with public, identifies goals to meet
 - Performance measures are used to evaluate how well the MTP meets those goals
 - Total regional delay reduction
 - Hot spots addressed
 - More people using sustainable modes
 - Other goals/measures not from a travel model



Managing the TDM Development Process 75

Performance measures (read from slide)

MTP Development Model Need (5-Year MTP Adoption Cycle)



* (a) ...In attainment areas, the effective date of the transportation plan shall be its date of adoption by the MPO...
(c) The MPO shall review and update the transportation plan at least every four years in air quality nonattainment and maintenance areas and at least every five years in attainment areas...” (23 CFR 450.322)

Managing the TDM Development Process 76

This schedule refers to the MPO’s MTP Adoption Cycle for non-TMAs: a 5-year schedule.

We just talked about scenario testing, project prioritization, and performance measures. This use of the model will occur in the last period preceding MTP adoption.

This is where you **apply** the model.

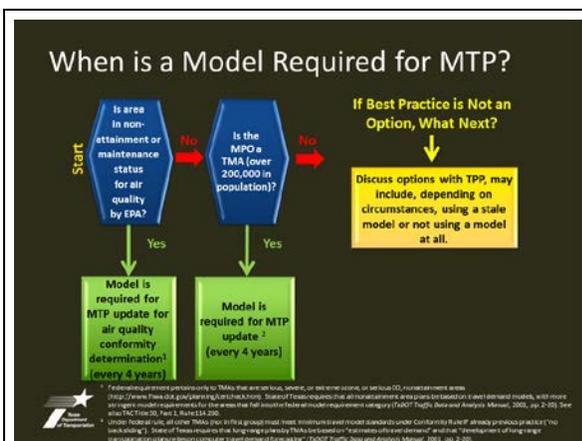
MTP Development Model Need (4-Year MTP Adoption Cycle)



* In nonattainment and maintenance areas, the effective date of the transportation plan shall be the date of a conformity determination issued by the FHWA and the FTA.” (23 CFR 450.322)

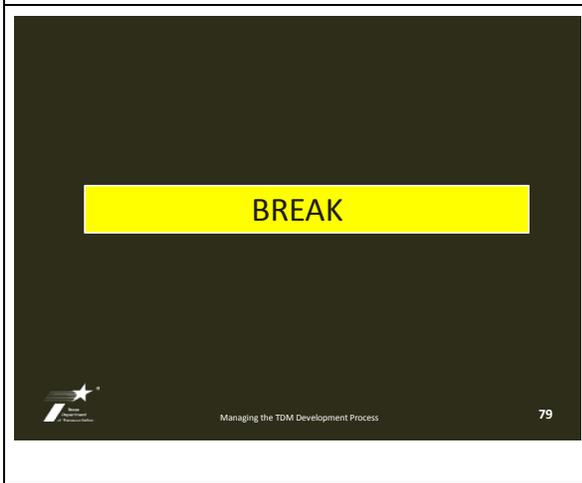
Managing the TDM Development Process 77

And, for 4-year cycle (TMAs and non-attainment areas)



Finally, what if, despite all the advantages of using a travel model, you are not sure that you have a model you can use?

After the break, we will describe all the options you have. Primarily, what you should understand, is that you should always discuss your modeling options with TxDOT-TPP. In some cases, you may even have the option to not use a model.



Let's take a break.

Suggested BREAK TIME: Hour 1.5 of 2.5 hours on this lesson

Post-Break Reinforcement Questions

1. What are some MPO functions where the model is particularly relevant?
Answer: MTP, TIP, air quality conformity, UPWP, certification review
2. What are the two primary triggers that require a model for an MTP?
Answer: Nonattainment or maintenance status and TMA.
3. What does reapply when in the context we just discussed? Answer: You don't have to redevelop the model. You just have to rerun the forecast year with modifications to input.

Topic 2.4 Key Dates for Modeling and the MTP

30 Minutes

Key Dates for Modeling and the MTP



Managing the TDM Development Process 80

The preceding topics of this lesson have examined the need for a model and best practice application of a model as part of the MTP development process.

In this section, we will discuss the key dates in the MTP development process.

3-Model Concept

- Current model available
- Model under development
- Data collection for next model after that

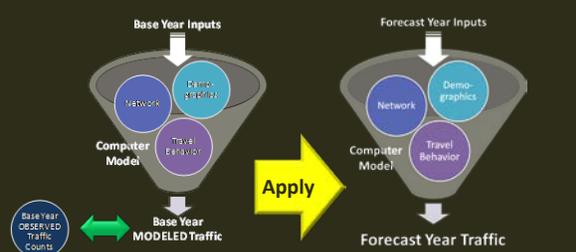


Managing the TDM Development Process 81

Keep in mind that, in general, MPOs have three models at different development stages at any one time: (read from slide) The third model, for which data are currently being collected, is likely not under consideration. The first two are.

Before we discuss which model to use, it is important to have an understanding of the key dates for the MTP and for models and how they correspond.

Reminder: Base Year and Forecast Year



Develop a Model. Then: Apply the Model to a Future Year or Alternative Analysis Scenario

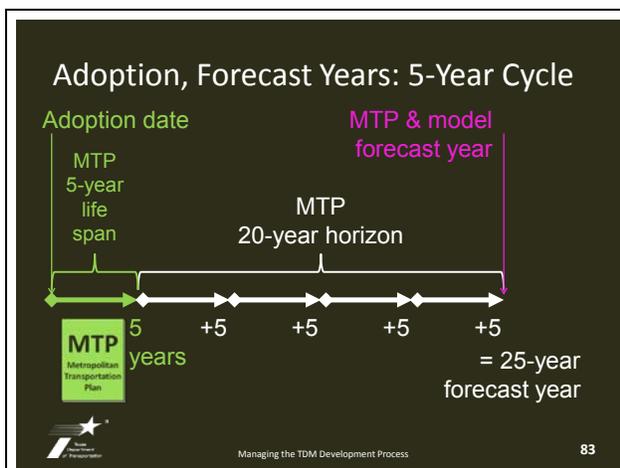


Managing the TDM Development Process 82

As a reminder, when we are talking about a model application, there are two very important years we need to know – the model base year and the model forecast year.

The documentation of an existing model tells you what the base year is. Often the filenames include the base year, as well.

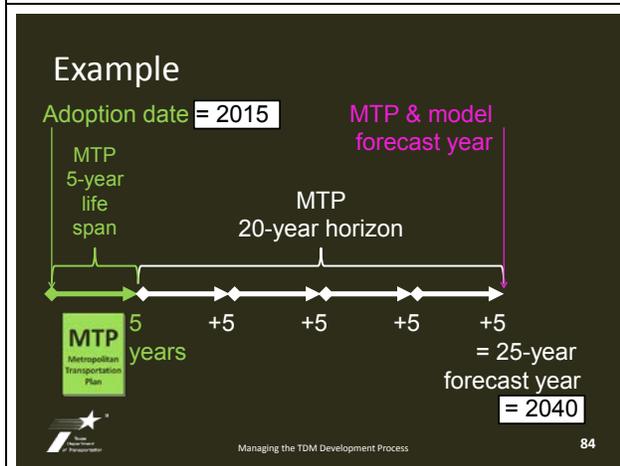
How do you determine what forecast year you need?



Let's start with the date you have targeted for plan adoption. Usually, this date is about 5 years (4 years in the case of a TMA) from the previous plan adoption.

The first date we will calculate is the horizon year of an MTP. This year needs to take into account both the required 20-year horizon of the MTP and the lifespan of the MTP of 5 years (or 4 years in the case of a TMA).

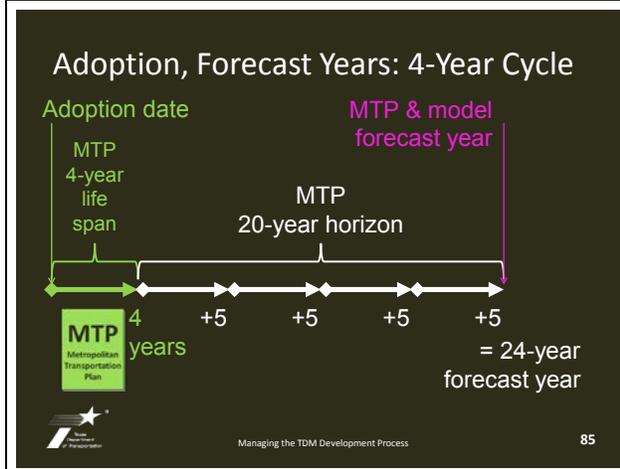
(walk through example on slide)
 The green text refers to the adoption date and life span of the MTP.
 The white text refers to the required 20-year planning horizon (yellow arrows in 5-year increments).



Example: MTP adopted for the period of 2015–2020 needs to address a 20-year horizon in 2020, so the forecast year is 2040.

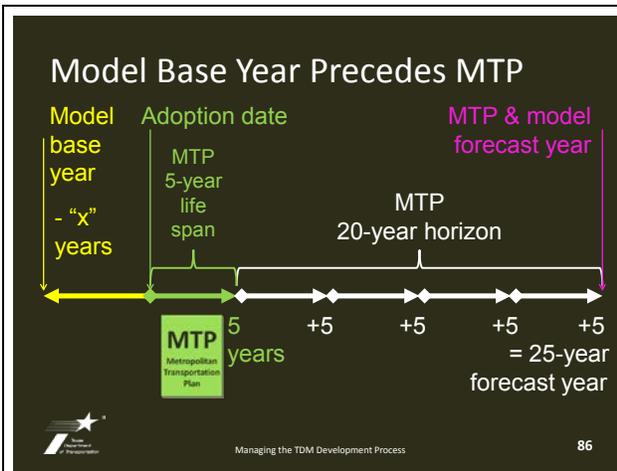
What if the adoption date is not a year ending in 5 or 0? Some MPOs choose to maintain the uneven year. Some MPOs round up.

What happens at the end of the MTP lifespan after 5 years? (let participants answer) ... another MTP must be adopted before the previous MTP lapses.



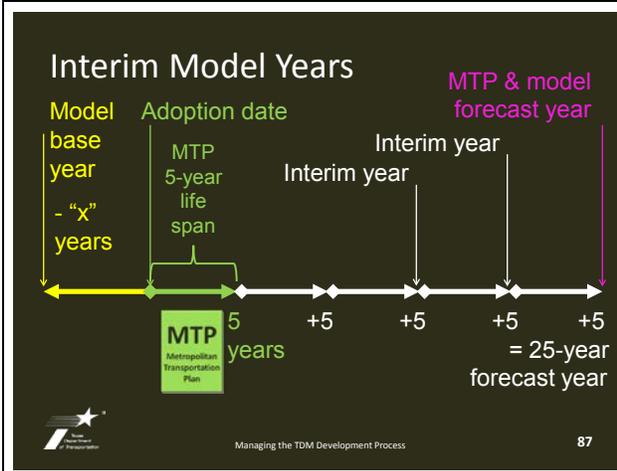
Calculating the horizon year for an MTP of a TMA (updated every 4 years) is similar. The result is a forecast year at least 24 years into the future from date of MTP adoption.

The model forecast year is the same as the forecast year for the MTP.

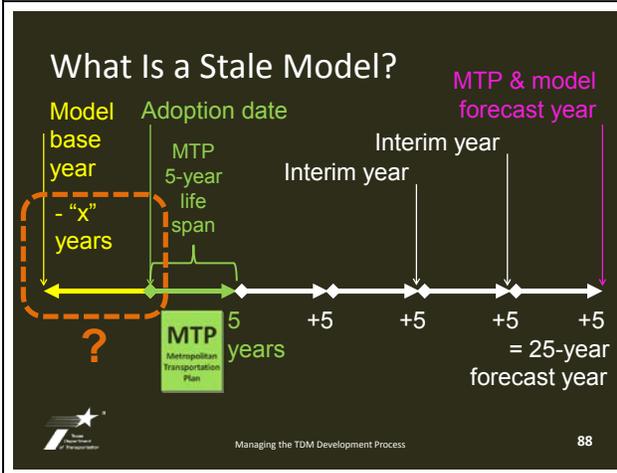


The model base year precedes the MTP adoption date, because of the necessity to have the model fully developed for use in MTP development activities.

In a moment, we will discuss how old that model base year should be.



There can be interim year model applications to serve MTP/MPO purposes. Some interim year model applications are required as part of the air quality conformity analysis process (get with TPP for details) or otherwise negotiated through the consultative partners of FHWA, FTA, EPA, TCEQ, and TxDOT.



What is a Stale Model?

Base year > 10 years old at time of MTP adoption (or at the time of Conformity Determination, applicable for areas in non-attainment or maintenance status).

Models: 5 Years Old versus New

2007 4 Runner



2012 4 Runner



Managing the TDM Development Process 89

What if the base year is less than 10 years old, but not brand new?

Talk about example of car models...2007 and 2012...do they both get the job done?

"Kicking the Tires" Exhibit



Managing the TDM Development Process 90

Potential differences to consider: refer to Exhibit 2.e



KEY CONCEPT: A model with base year less than 5 years old at MTP adoption is not stale.

Exhibit 2.e “Kicking the Tires” of an “Older” Base Year Model

How Old Is “Old”?

If the base year of the model is...	Then the model is...
< 5 years old at MTP adoption,	not “old.”
> 5 years old but < 10 years old at MTP adoption,	may need adjustments for application. See the remaining sections of this exhibit.
> 10 years old at MTP adoption,	“stale.” Review options for a full new model development OR nontraditional update of the base year model.

What Is the Forecast Year of the Current Model?

If the forecast year of the model is...	Then...
≥ the 20+5 rule (the 20-year planning horizon that the MTP must span plus the 5 years that the MTP is valid),	The current forecast year is still applicable without additional work, as long as the network is adjusted to include any new projects added to the MTP and the model is re-applied for the forecast year.
< the 20+5 rule (the 20-year planning horizon that the MTP must span plus the 5 years that the MTP is valid),	One simple option is to create forecast year demographics and network, and re-apply the existing model to the new forecast year.

Other Questions to Consider: Confidence in Model Performance

Has the study area undergone significant change since the base year that would affect the model’s representation of the study area?

Examples:

- How confident are you in the quality of model inputs for the original base year? For the forecast year?
- From a practical perspective, is there potential to develop a new model within your MTP time frame?
- Are data available to support a new base year?

One test to consider is running new base data in the model (demographics and network) and looking at how well the model matches counts (a preliminary “refresh” – see next section).

What Is a “Nontraditional” Base Year Model “Refresh”?

Models: Older than 10 Years

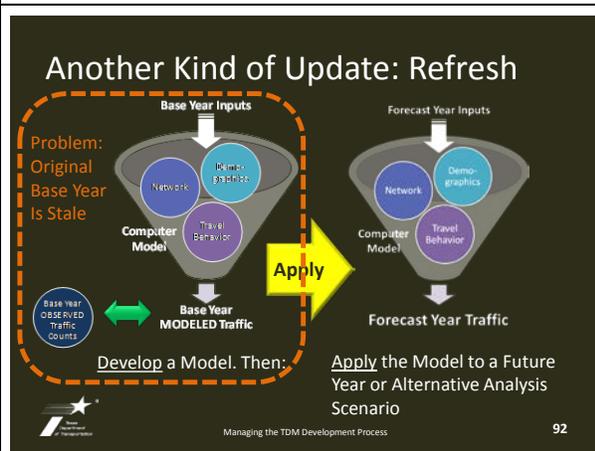
2002 Camry



Managing the TDM Development Process 91

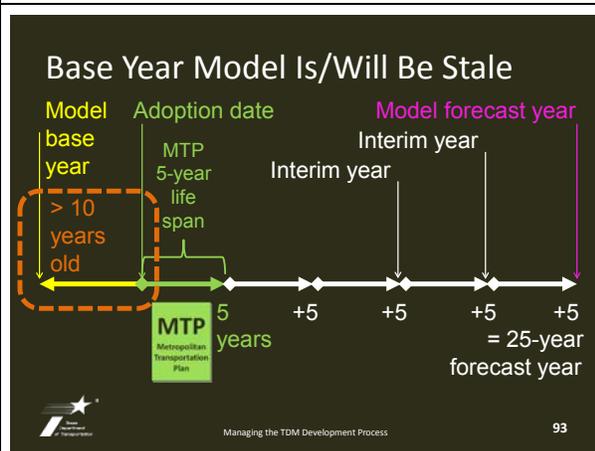
What about the situation where you have a stale model, There are good reasons why you might want to consider a nontraditional update of your base year model:

- 1) You have confidence in your model (see Kicking the Tires exhibit on previous page),
- 2) You do not have substantially new data to support a new model, or
- 3) You don't have time for a full calibration of a new model.

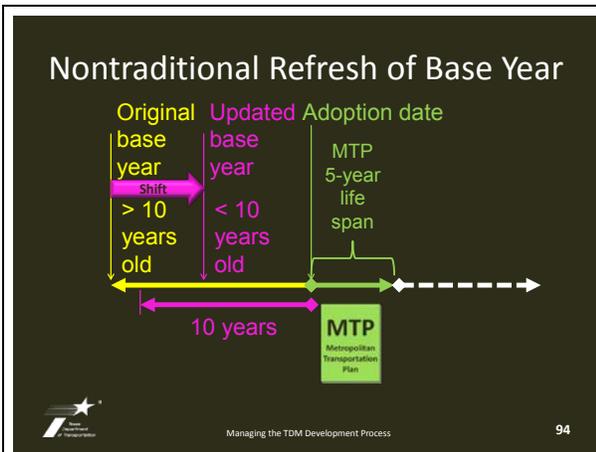


Remember that a few minutes ago we talked about the word “update” being often loosely applied for travel models.

Now we will address the other type of update we will discuss in this course, to the “Develop” side: a nontraditional update of a base year model. From now on, we will use the term “refresh” instead of update for this activity.

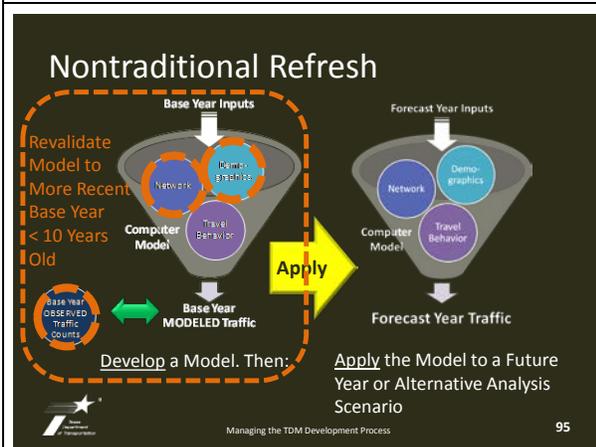


A nontraditional update of a base year model applies when the base year of your current model will be stale (over 10 years old) at the time of MTP adoption (or at the time of Conformity Determination, applicable for areas in non-attainment or maintenance status).



A nontraditional update of a base year model shifts the base year of an existing older model to be within 10 years old at the time of MTP adoption.

In modeling terms, this is a revalidation of the model, revalidating it to a new set of counts. This requires a new set of demographics.



In terms of the model inputs... items outlined in orange pink are still needed for new base year and one still has to validate the model for the new base year.

Still have to apply the model for forecast year(s).

Potential time/inputs saved are: survey processing and model calibration.

Potential risk: model does not validate, procedures have changed too much.

ONE IMPORTANT NOTE: Once a model has been re-calibrated, the base year “resets.”

Topic 2.5 Calibrating a New Base Year Model

15 Minutes

3-Model Concept

- Current model available
- Model under development
- Data collection for next model after that



Managing the TDM Development Process

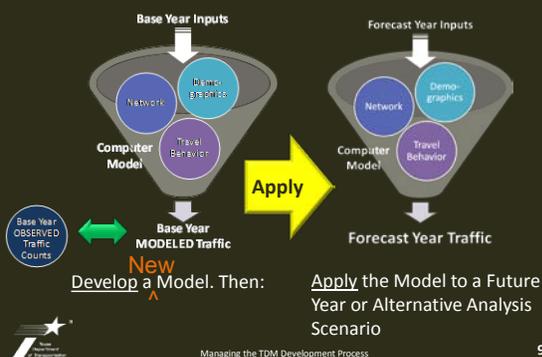
96

The previous slides have explored using the model currently available for use.

The other option is to calibrate a new base year model, typically a model already under development.

Here we are going to briefly examine the big picture schedule for calibrating a new base year model. This schedule will be more fully explored in Lesson 5.

Calibration of New Model



Managing the TDM Development Process

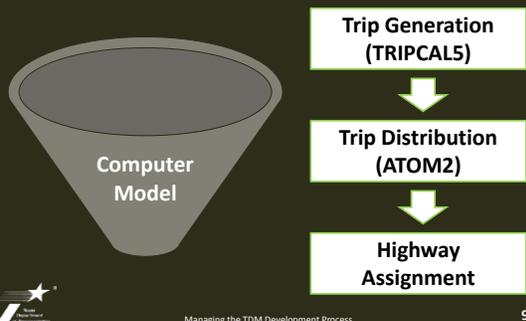
97

In calibration, an entirely new model is developed, including model inputs for a new base year, any updated information regarding travel behavior.

As a reminder, **Calibration** refers to the model approach and parameters and is represented by the cone shape in the graphic to the left. Once the model inputs are developed, calibration is the effort that takes the most time.

Validation refers to the process of demonstrating that a model appropriately fits observed count data.

From Lesson 1: The Texas Package Is a Trip-Based Model, Generally 3 Steps



Managing the TDM Development Process

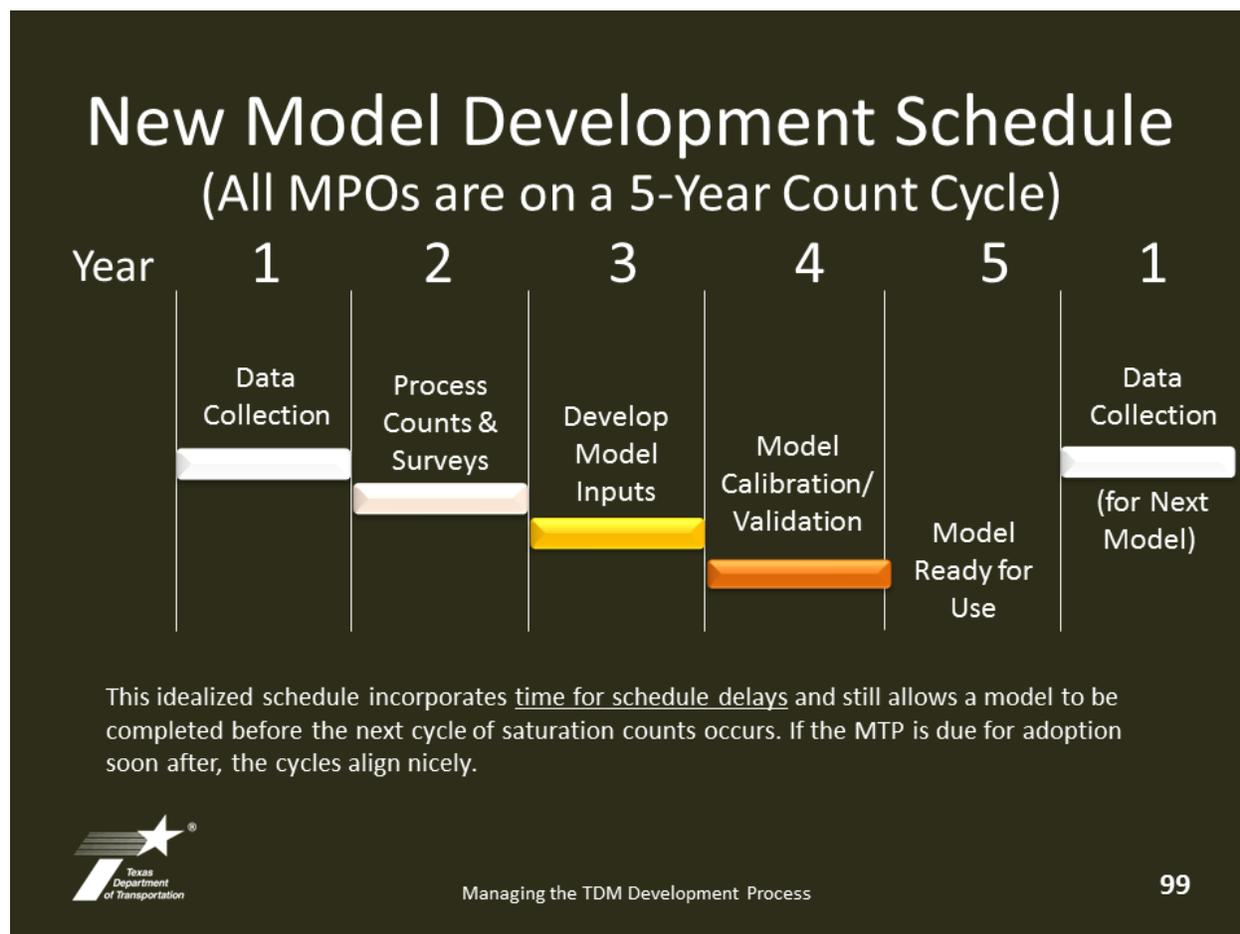
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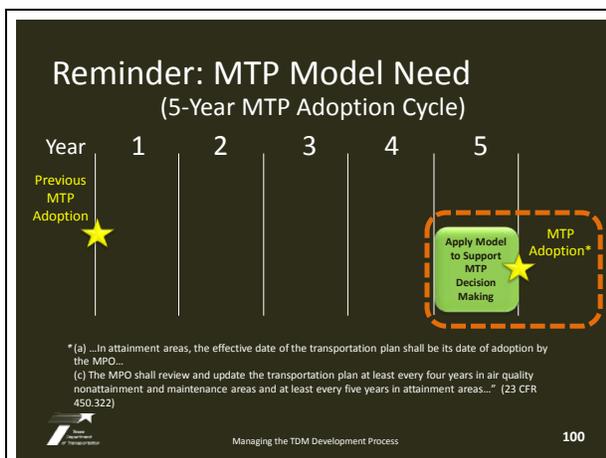
Reminder: the Texas Package has 3 (or 4) steps. Next, I am going to talk about phases of model development. These are not the same – steps here, phases of model development.

Exhibit 2.f Travel Model Development and Application Timeline to Support an MTP on a 5-Year Count Cycle

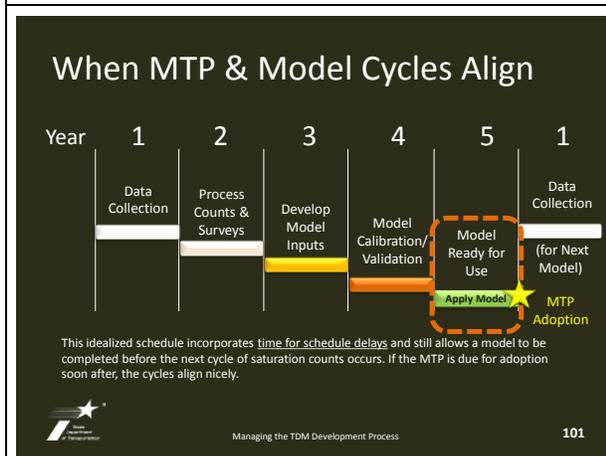
Four phases of model development are shown in the schedule shown in this exhibit. The fifth phase is actual model application for the purpose of planning and analysis.

IMPORTANT: This is an idealized schedule in order to explore the basic concept of model develop schedule.

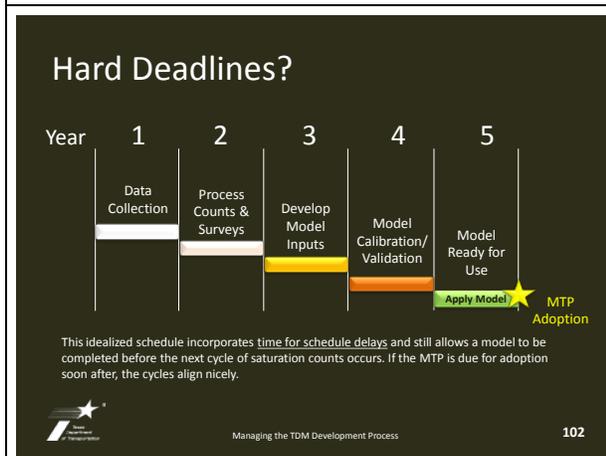




Recall this MTP development schedule, where we highlighted the time period when the model would be needed to support the MTP.



In the ideal schedule we are discussing, the model development schedule and the MTP development timeline fit together well.



(refer to exhibit on next page)
After this walk-through, what are some critical path activities that we can identify? Critical path items are those which aren't very flexible with regard to timing.

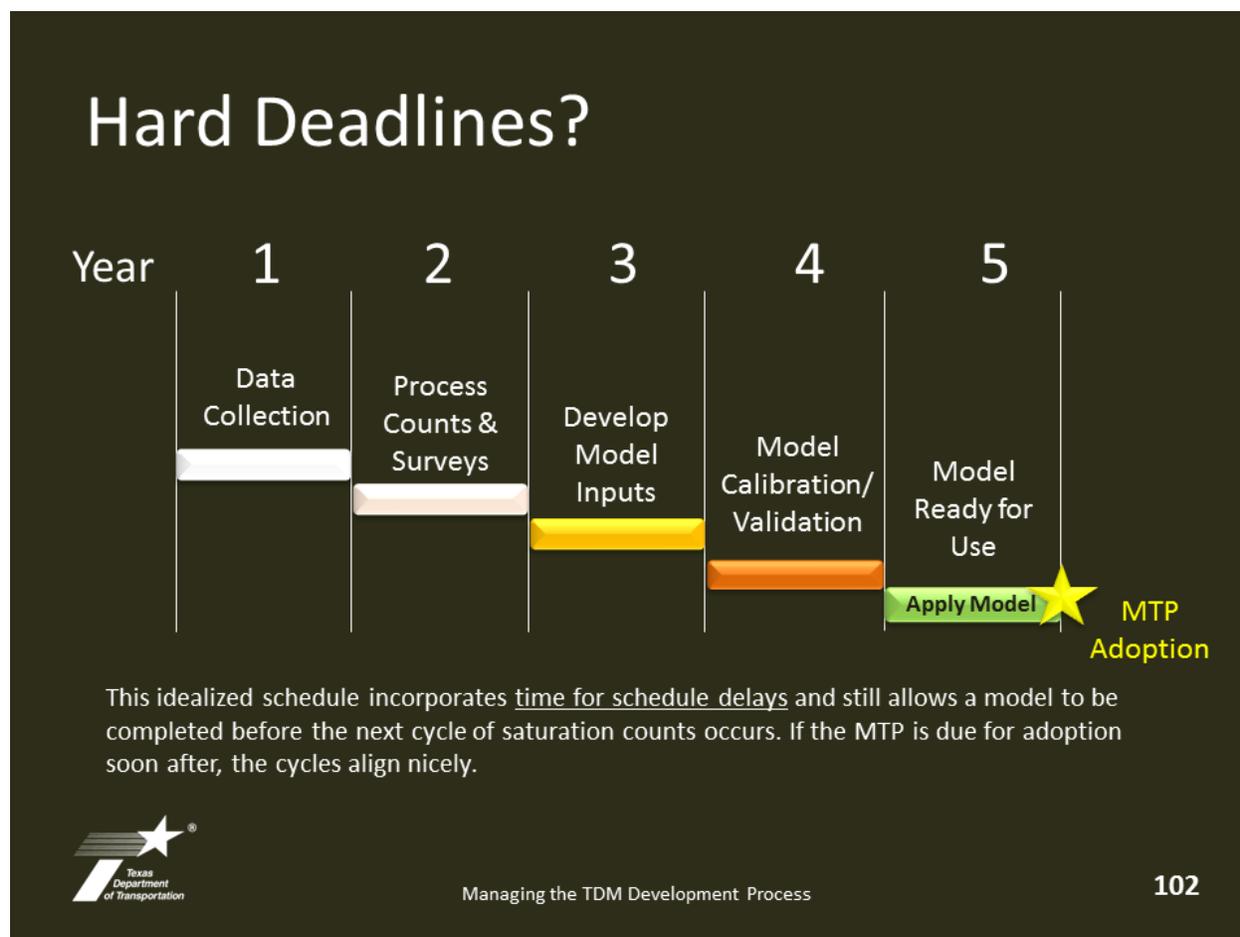
(discuss as a group)

Some include:

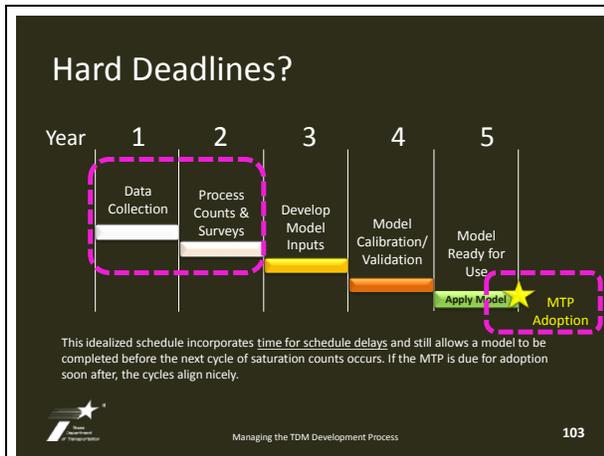
- Counts and survey schedule are set processes, so their timing is not very flexible.
- MPO adoption "by" date and the time for model application is a constraint, as well.

Activity 2.3 What Critical Path Items Can We Identify from This Idealized Schedule?

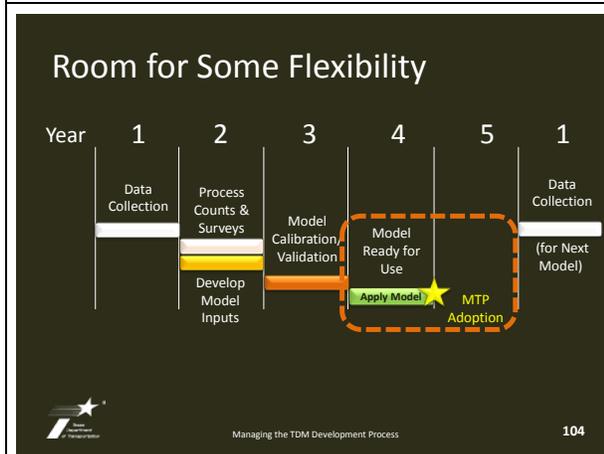
As a small group, looking at this graphic, identify the critical path activities. Critical path items are those that are not very flexible with regard to timing. Discuss for 5 minutes and then come back to the full group.



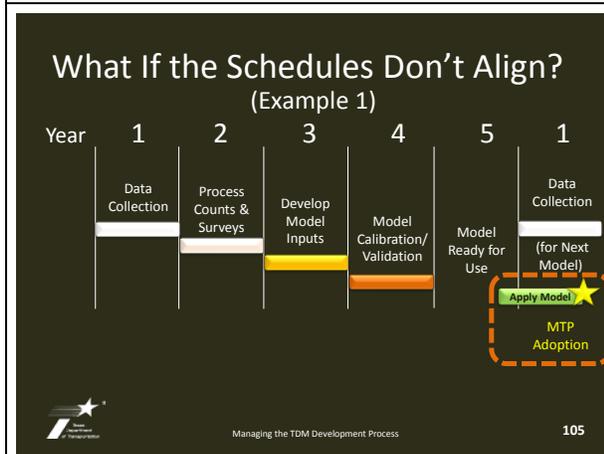
After discussing the critical path activities, what opportunities are there to compress the schedule if you needed the model sooner than this schedule shows?



Critical path items are circled in pink.



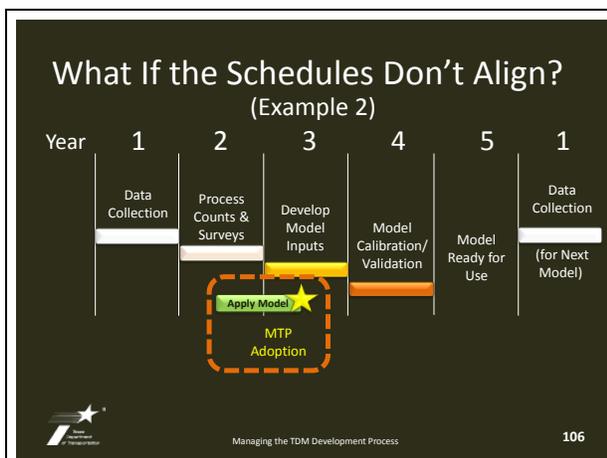
This example shows one compression opportunity. Others are shortening the calibration or application periods.



What if the count/model calibration cycle and the MTP adoption cycle don't align so nicely?

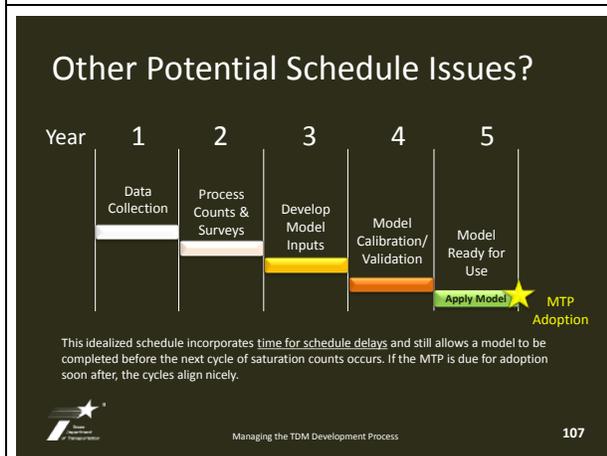
Example 1

OK for MPO!



Example 2

This schedule represents an example of where the MPO may prefer to use its older base year model with a forecast year update or a base year refresh if necessary.



After this walk-through, what are some other opportunities for missed schedule that we can identify? (refer to exhibit on next page)

(discuss as a group)

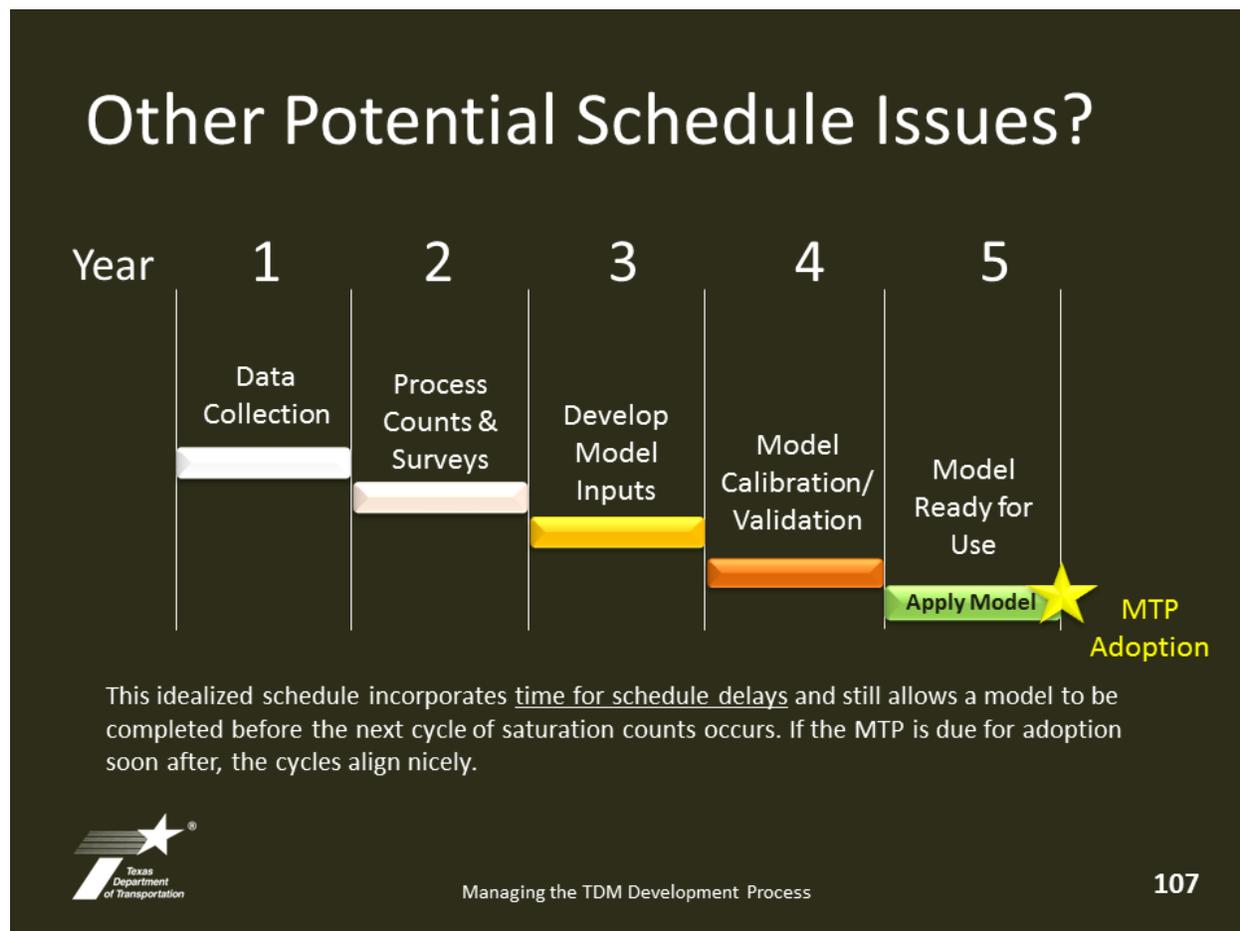
Some include:

- Any step on the schedule can be delayed or missed or extended for reasons both in and out of the control of the MPO.

The MPO adoption “by” date and the time for model application is set; however (not achieving the adoption date is called a “lapse” and there are significant implications).

Activity 2.4 What Other Potential Schedule Issues Might Arise?

As a large group, looking at this graphic, brainstorm some potential issues that might delay the schedule.



Topic 2.6 Other Helpful Resources

MAP-21 – Federal Highway Administration (FHWA) Website

Federal transportation funding authorization, signed into July 6, 2012.

<http://www.fhwa.dot.gov/map21/>

MAP-21 – Federal Transit Administration (FTA) Website

Federal transportation funding authorization, signed into July 6, 2012.

<http://www.fta.dot.gov/map21/>

Texas Administrative Code regarding Non-attainment Areas

[TAC Title 30, Part 1, Rule 114.260] Texas rule regarding conformity for transportation: “Applicability. **This section applies to transportation-related criteria pollutants for which an area is designated nonattainment or is subject to a maintenance plan.**

The transportation-related criteria pollutants are ozone, carbon monoxide, nitrogen dioxide, particles with an aerodynamic diameter of ten micrometers (PM₁₀) and smaller, and particles with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers (PM_{2.5}). This section also applies to the precursors of ozone, nitrogen dioxide, PM₁₀, and PM_{2.5} as required in 40 CFR §93.102.”

[http://info.sos.state.tx.us/pls/pub/readtac\\$ext.TacPage?sl=R&app=2&p_dir=&p_rloc=131077&p_tloc=&p_ploc=&pg=1&p_tac=131077&ti=30&pt=1&ch=114&rl=260&dt=&z_chk=2542442&z_contains=Metropolitan%20Planning](http://info.sos.state.tx.us/pls/pub/readtac$ext.TacPage?sl=R&app=2&p_dir=&p_rloc=131077&p_tloc=&p_ploc=&pg=1&p_tac=131077&ti=30&pt=1&ch=114&rl=260&dt=&z_chk=2542442&z_contains=Metropolitan%20Planning)

Transportation Planning Process: Key Issues

A Briefing Book for Transportation Decisionmakers, Officials, and Staff

AKA The “Briefing Book” – a fundamental resource and starting point.

<http://planning.dot.gov/documents/briefingbook/bbook.htm>

or PDF at:

http://planning.dot.gov/documents/briefingbook/bbook_07.pdf

Transportation Planning Capacity Building

FHWA/FTA joint Web site – resources for MPOs.

<http://www.planning.dot.gov/default.asp>



TxDOT Data and Analysis Manual, 2001

Explanation of the Traffic Estimation and Count Programs (Section 1), Urban Travel Demand Forecasting (Section 2, including Air Quality in Subsection 5), and Project Level Traffic Data Development (Section 3). NOTE THIS MANUAL IS CURRENTLY UNDER UPDATE AND SOME MATERIAL MAY BE OUT OF DATE.

<http://onlinemanuals.txdot.gov/txdotmanuals/tda/tda.pdf>

TxDOT Transportation Planning Manual, 2001

Guidelines for the planning process, see especially Chapter 5.
<http://onlinemanuals.txdot.gov/txdotmanuals/pln/pln.pdf>

**MPO Certification Review: Checklist for Travel Model Forecasting Methods – FHWA Overview**

This Web page provides readable but comprehensive discussion of the role that travel models play in certification review and air quality conformity analysis. May continue to evolve following MAP-21 legislation.

<http://www.fhwa.dot.gov/planning/certcheck.htm>

**Transportation Management Area Planning Certification Review****Primer**

The TMA Certification Review Primer Itself and the checklist included in this Lesson. May continue to evolve following MAP-21 legislation.

http://www.planning.dot.gov/documents/primer/intro_primer.asp#3.2

U.S. Code of Federal Regulations

The federal Transportation Conformity Rule [40 CFR 93.122 (b) and (c)] at

<http://ecfr.gpoaccess.gov/cgi/t/text/text->

[idx?c=ecfr&rgn=div5&view=text&node=40%3A21.0.1.1.7&idno=40#40:21.0.1.1.7.1.1.23](http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div5&view=text&node=40%3A21.0.1.1.7&idno=40#40:21.0.1.1.7.1.1.23)

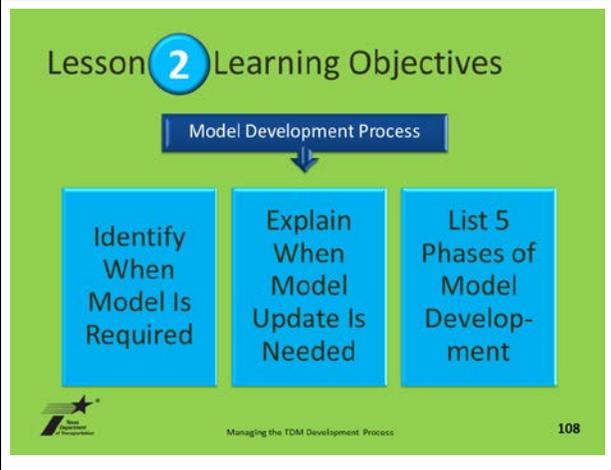
The import of this section of the code is best described as:

“The Transportation Conformity Rule established a regulatory requirement that includes minimum specifications for travel models used to forecast vehicle activity for regional emission analyses in conformity determinations in certain non-attainment and maintenance areas [40 CFR 93.122 (b) and (c)]. However, these minimum specifications apply only to metropolitan planning areas with an urbanized area population over 200,000 that are also serious, severe or extreme ozone or serious carbon monoxide non-attainment areas. All other non-attainment or maintenance areas must continue to meet the minimum specifications for travel models established in the Conformity Rule to the extent that those procedures have been the previous practice of the MPO.” From: <http://www.fhwa.dot.gov/planning/certcheck.htm>

Topic 2.7 Lesson Wrap-Up

5 Minutes

On the previous page is a list of Other Helpful Resources that cover the topics in this lesson.

 <p>Lesson 2 Learning Objectives</p> <p>Model Development Process</p> <p>Identify When Model Is Required</p> <p>Explain When Model Update Is Needed</p> <p>List 5 Phases of Model Development</p> <p>Managing the TDM Development Process 108</p>	<p>At the beginning of this lesson, we set the following learning objectives. At this point, you would be able to: (read the objectives).</p> <p>Does anyone have any questions about this material?</p>
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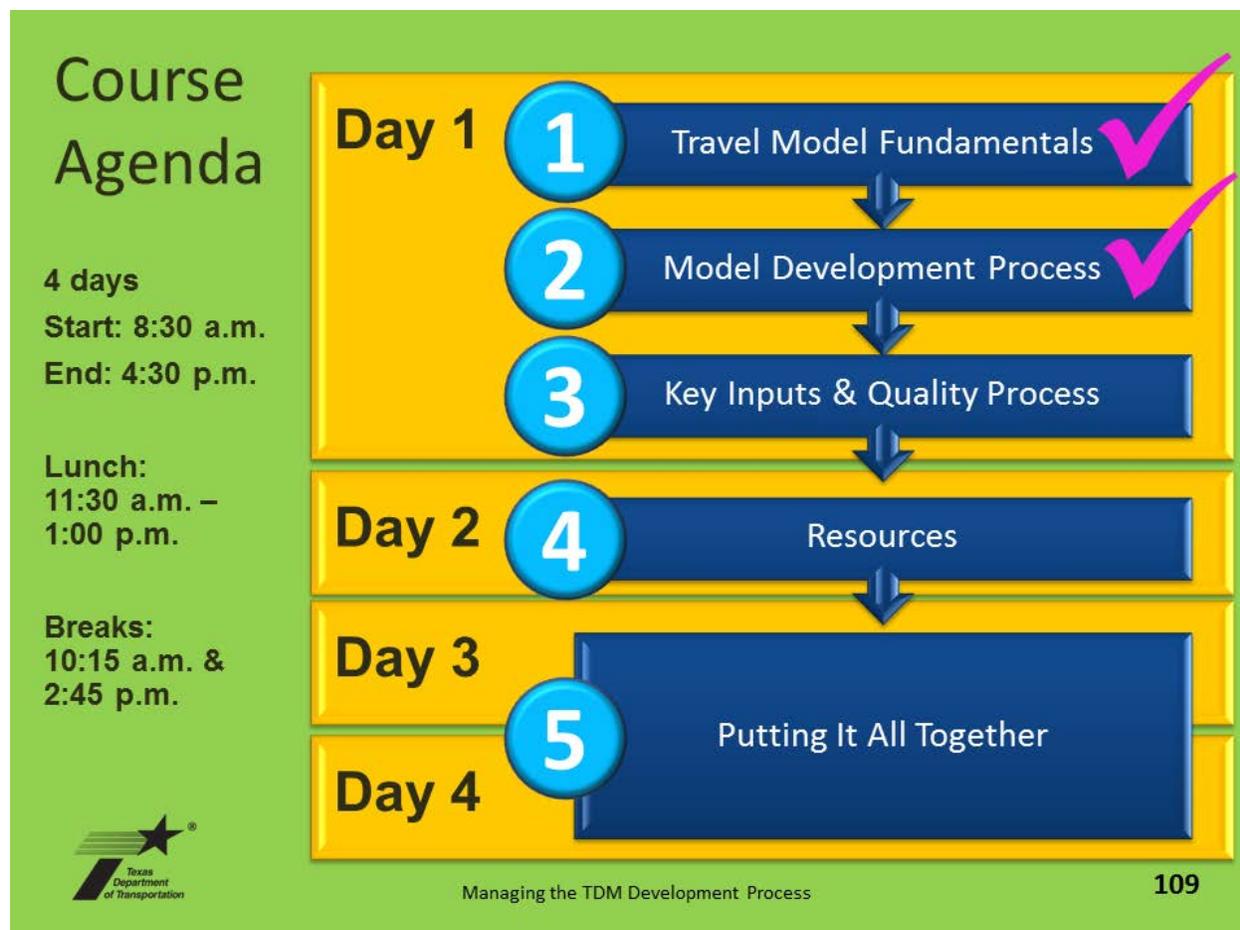
Suggested Break Here

Lesson 2 Reinforcement Questions

After break, before starting the next lesson, review these questions (and answers) as a group:

1. What are the three models? Answer: Model in hand, model in development, and data collection for next model.
2. What is a stale model? Answer: Base year older than 10 years at the time of MTP adoption (or conformity determination).
3. What's a model refresh? Answer: A new base year validation of an older model.
4. What are the five phases to develop a new base year model? Answer: see schedule graphic

Where Are We?



Lesson 3: Key Inputs and the Quality Process

Learning Objectives

Key Inputs & Quality Process



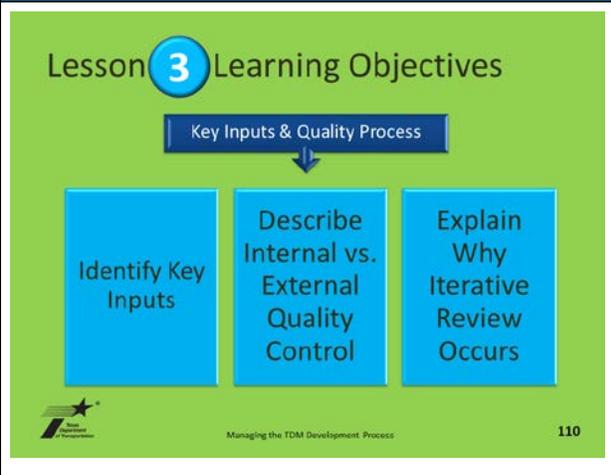
Identify Key
Inputs

Describe
Internal vs.
External
Quality
Control

Explain
Why
Iterative
Review
Occurs

Lesson Materials Follow

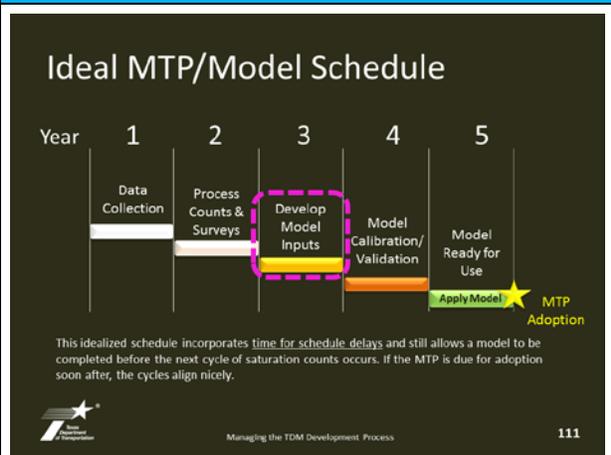
Lesson Total Time: 3 hours, 15 minutes (in 2 parts)



At the end of this training course, participants will be able to:
(read from slide)

Topic 3.1 Overview

15 Minutes



So we ended Lesson 2 with an Idealized Model Development Schedule. In this lesson, we are going to focus on the “Develop Model Inputs” task, which typically, but not always, is the MPO’s contribution to the model development process for small- and medium-sized MPOs.

This Lesson will not cover everything that other technical training on this topic does—the orientation is on what an MPO director needs to know to manage the process and staff or consultants, and review the deliverables prior to their use as a model input.

Plan for Lessons 3, 4, and 5

Lessons

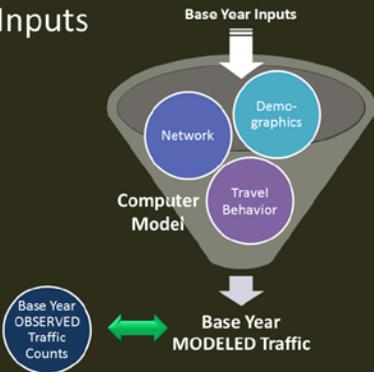
- WHAT **3** Key Inputs & Quality Process
- WHO & HOW **4** Resources
- WHEN **5** Putting It All Together



Managing the TDM Development Process 112

In this lesson, we are concentrating on **WHAT** the key inputs are from the perspective of managing the process, not the details of how to develop the inputs, not even exactly when you need to develop these inputs in the model process. These other aspects will be covered in Lessons 4 and 5.

Base Year Inputs



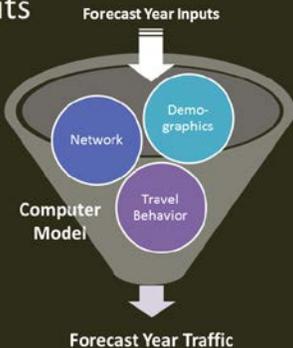
Base Year OBSERVED Traffic Counts ↔ Base Year MODELED Traffic



Managing the TDM Development Process 113

In the previous lesson, we presented the base year model...you will remember that building this model is called the **DEVELOPMENT** stage.

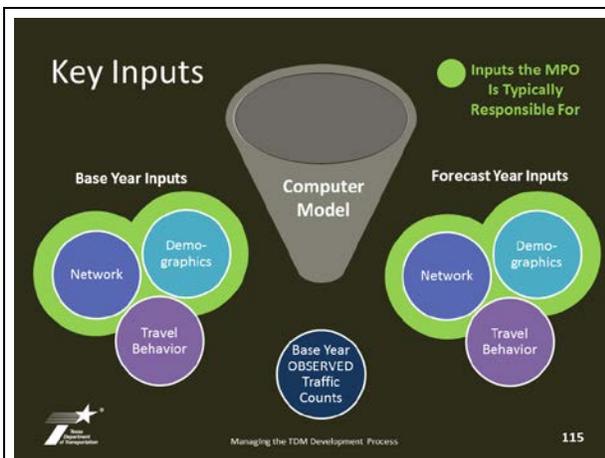
Future Year Inputs





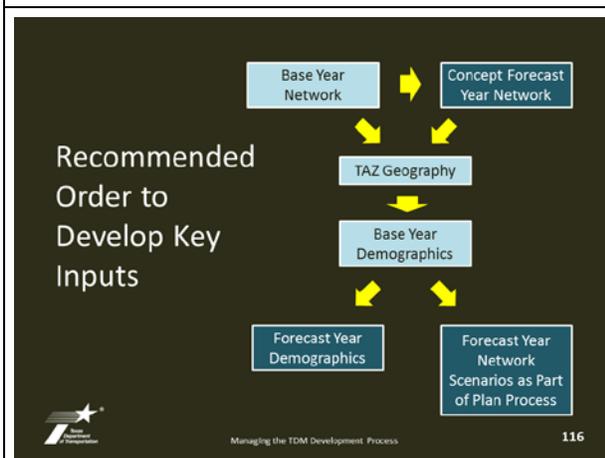
Managing the TDM Development Process 114

And then we talked about the **APPLICATION** stage, for the model, where we put in our best guess of future year inputs, and run the model, to see what future year traffic might look like.



In those graphics, each of those pieces shown was what we refer to as the “Key Inputs.” The key inputs that the MPOs are typically responsible for when collaborating with TxDOT to develop the model, are:

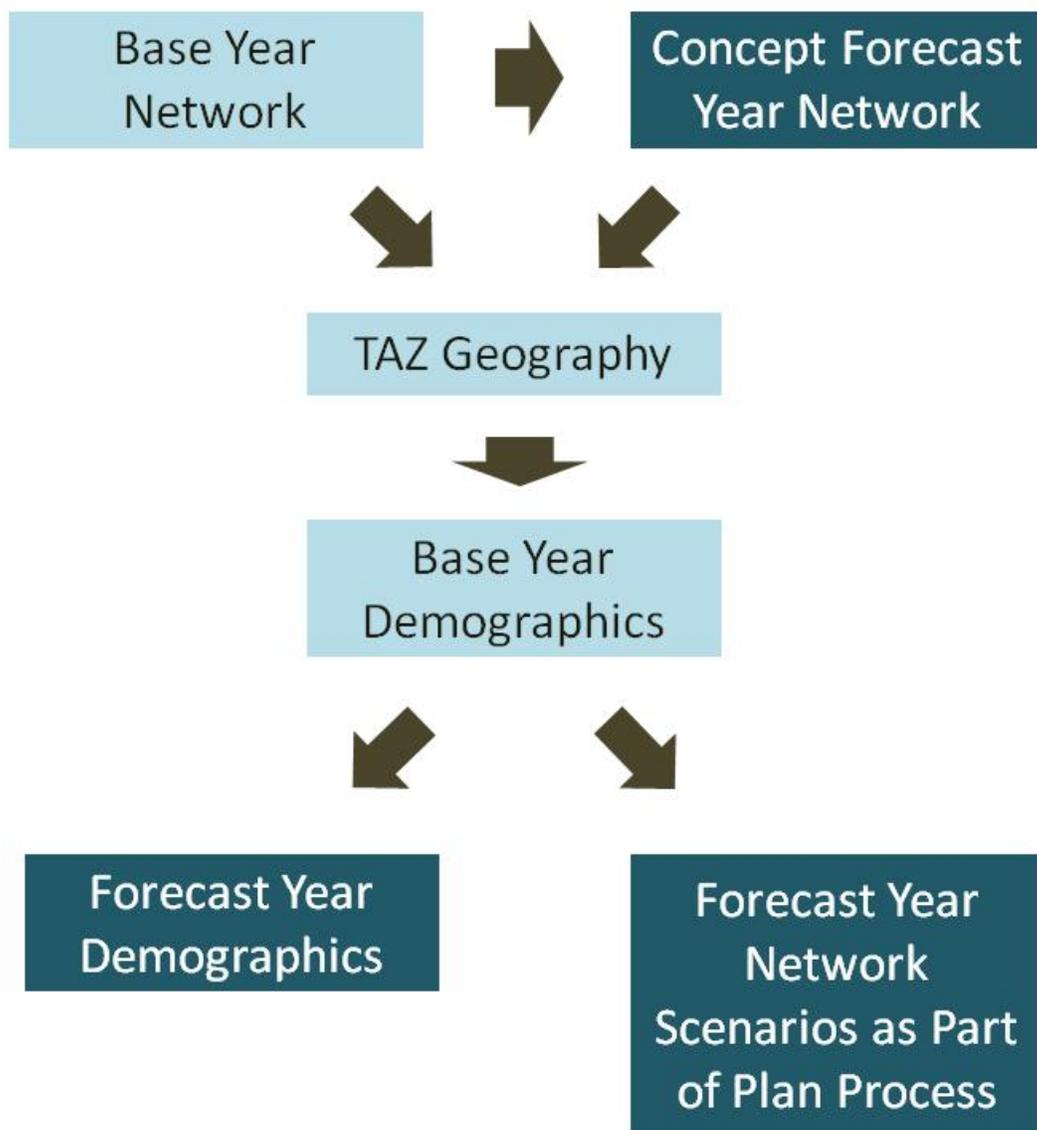
- Network.
- Demographics.

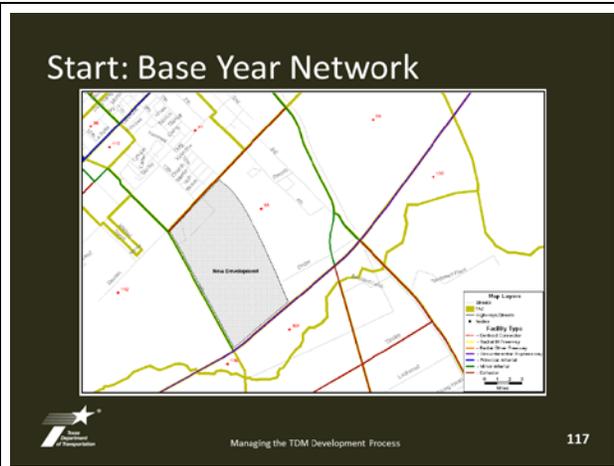


The recommended ORDER for network and demographics development is shown here in this slide and in the exhibit on the next page.

The rationale for this order is demonstrated in the following slides.

Exhibit 3.a Travel Model Network and Demographics Inputs Development: Recommended Order

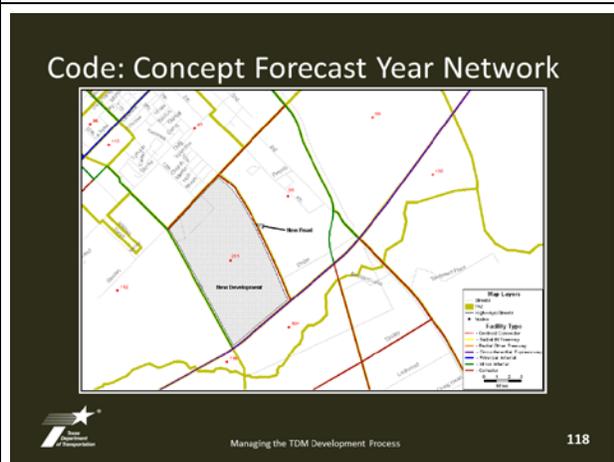




These slides demonstrate the “building block” effect of the order presented in the previous exhibit and what that order is suggested.

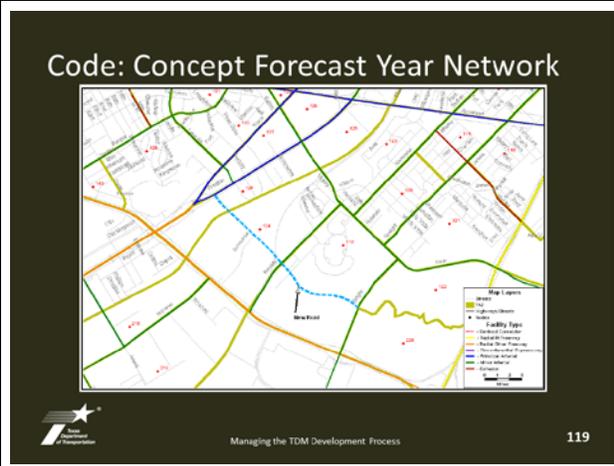
After this “ORDER” group of slides, see next section, which gets into a little more detail...like what I mention in the bullets on these slides and more.

Source: TxDOT-TPP, *Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook*, TxDOT and TTI, February 2007.



At this point in the MPO planning process, it is too early to determine all the projects that will be identified for the forecast year. However, many projects from the previous plan will still be applicable, and some new concept projects will be on the horizon. The MPO should have some idea of a “concept forecast year network” of facilities, merely for the purpose of developing TAZ structure.

The forecast year network obviously builds upon the base year network. Here is one example of a concept of a new road that is likely to be built because of a new development the MPO is aware of.



Here is a second example of a new road that the MPO is aware of, either in the near- or long-term, which should be included in the “concept forecast year network.”

Define Traffic Analysis Zones (TAZs)



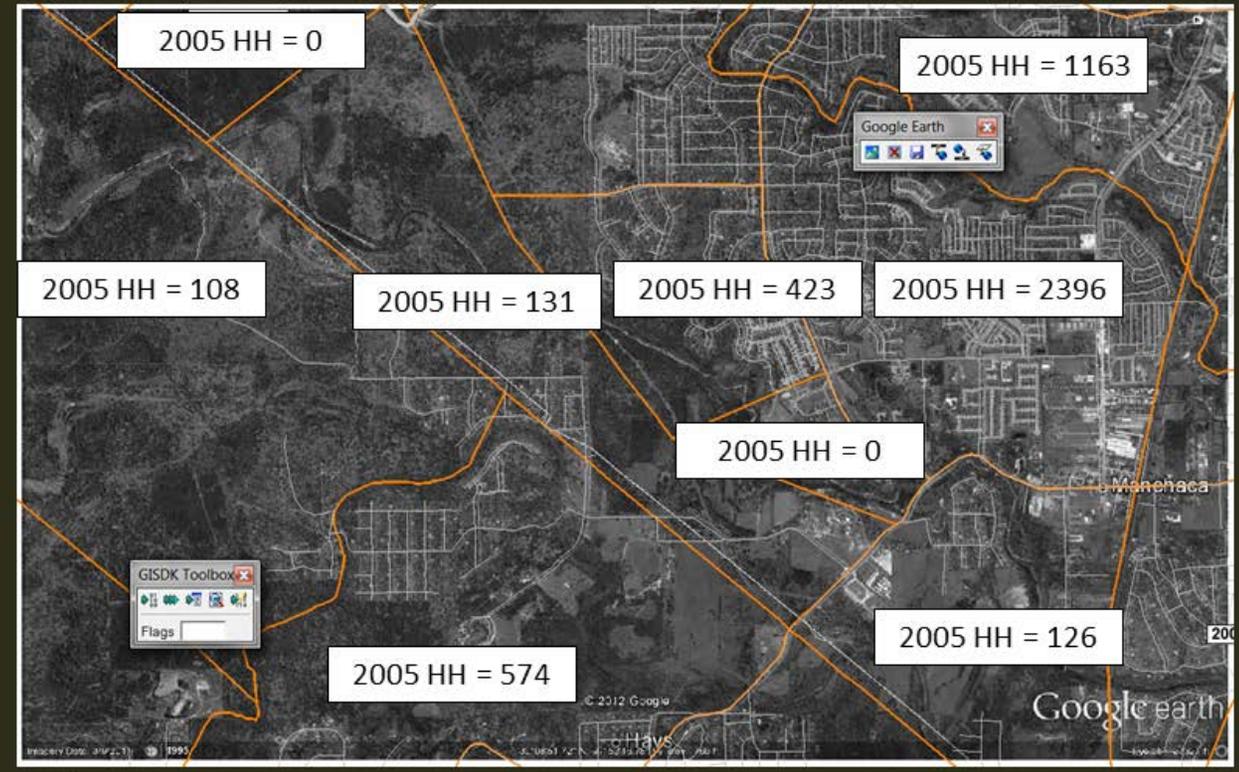
Managing the TDM Development Process

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Once the concept forecast year network is defined, then the TAZ geography is defined.

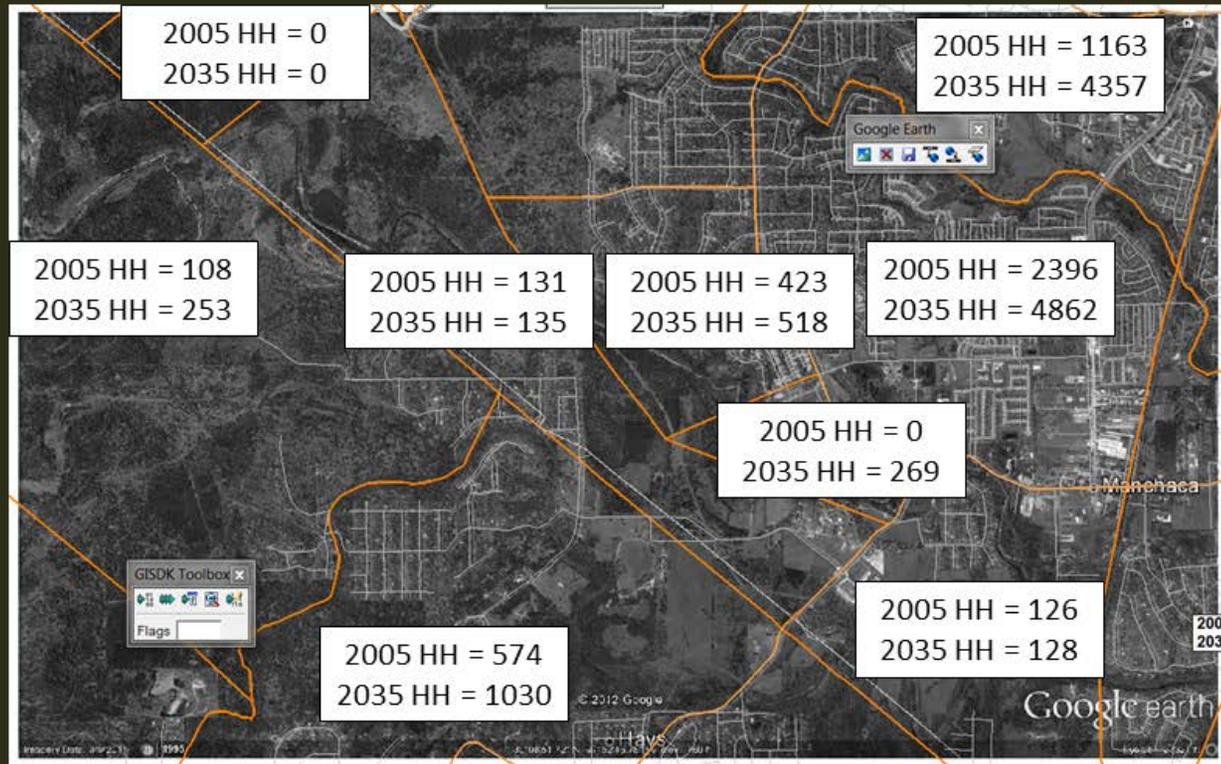
“TAZ” stands for Traffic Analysis Zone and it represents an aggregation of data. This is another example of how the model is a simplified representation of reality: aggregating the data into zones allows for data to be less detailed and facilitates computer application.

Develop Base Year Demographics



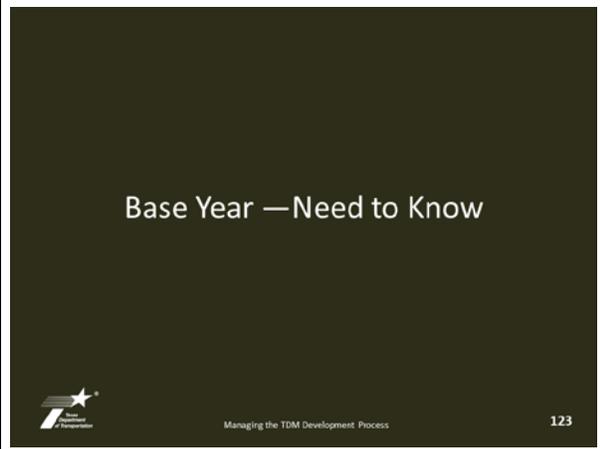
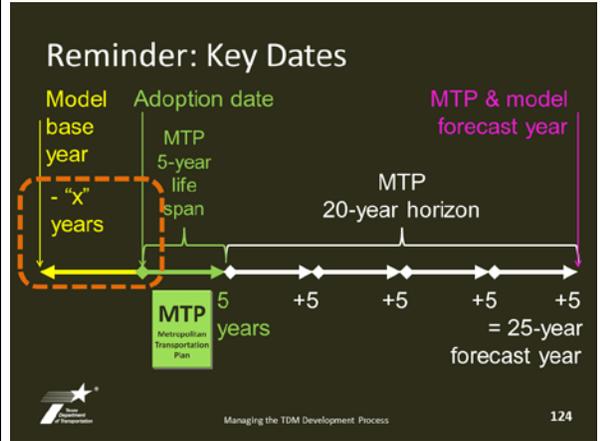
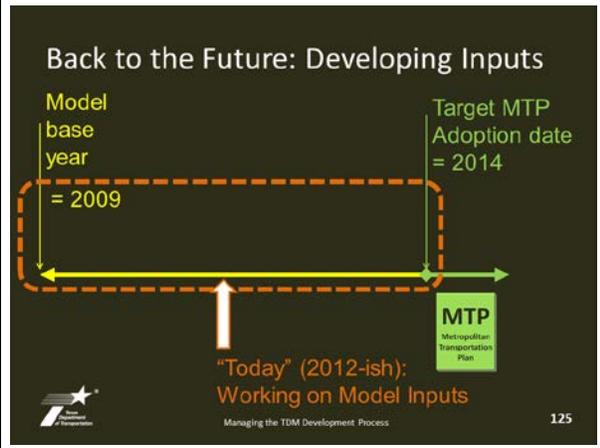
Base year demographics are developed for the TAZ geography.

Develop Forecast Year Demographics



Forecast year demographics use the same TAZ geography and build upon the base year data.

Topic 3.2 Base Year – Need to Know

 <p>Base Year — Need to Know</p> <p>Managing the TDM Development Process 123</p>	<p>So what are some “need to knows” about base year?</p>
 <p>Reminder: Key Dates</p> <p>Model base year - “X” years</p> <p>Adoption date</p> <p>MTP 5-year life span</p> <p>MTP 20-year horizon</p> <p>MTP & model forecast year</p> <p>MTP 5 years</p> <p>+5 +5 +5 +5 = 25-year forecast year</p> <p>Managing the TDM Development Process 124</p>	<p>This slide is a reminder of the key dates we talked about in Lesson 2.</p> <p><click></p> <p>Please recall that there was this period between the model base year and the MTP adoption, during which the model development and application occurs.</p> <p>We are briefly going to look at this part of the schedule in a little more detail.</p>
 <p>Back to the Future: Developing Inputs</p> <p>Model base year = 2009</p> <p>Target MTP Adoption date = 2014</p> <p>“Today” (2012-ish): Working on Model Inputs</p> <p>MTP Metropolitan Transportation Plan</p> <p>Managing the TDM Development Process 125</p>	<p>Let’s zoom in to this period and stretch it out so we can see it better. I’ve added a couple of dates here, as well, using an example base year model date of 2009 and target MTP adoption date of 2014.</p> <p><click></p> <p>We are sitting here “today” in 2012-ish, working on our model inputs. The question is, what demographics and network improvements get included in the base year?</p>

Back to the Future: Developing Inputs

Model base year = 2009

Projects that were built after the base year (network and demographics) do NOT belong in base year.

Target MTP Adoption date = 2014

"Today" (2012-ish): Working on Model Inputs

MTP Metropolitan Transportation Plan

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That is, there are changes in population, households, income, and employment, as well as network improvements, that have occurred between the model base year and the current year.

<click>

These projects do NOT get included in the base year. Of course, they do need to be included when coding any forward or forecast model years.

Topic 3.3 Key Concepts for MPO Model Inputs

1 Hour, 30 minutes

Networks—Need to Know

Managing the TDM Development Process

127

This sub-section examines the key concepts an MPO Director needs to know to manage the development of the network model inputs.

Network Key Concepts Exhibit

Managing the TDM Development Process

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INSTRUCTOR HANDBOOK Lesson 3: Key Inputs and the Quality Process

Exhibit 3.3 Base Year and Forecast Year Network Approaches

	Base Year	Forecast Year
Description of Data	TransCAD outputs and required attribute data representing the base year roadway transportation network	Same, but for forecast year
Key Input Data	<ul style="list-style-type: none"> Geographic labels in the model (names and IDs) Access and connectivity to other facilities (streets, transit, etc.) Facility type (see next exhibit) Year/number of lanes 	<ul style="list-style-type: none"> Same as Base Year Includes all facilities in Base Year network Plus regionally significant future facilities And any other facilities for which forecast year volumes are needed Same as Base Year network, but with forecast year volumes Same as Base Year network, but with forecast year volumes Same as Base Year network, but with forecast year volumes
Possible Input Data Options	<ul style="list-style-type: none"> Previous Base Year Network Recently Constructed Projects Get with other local agencies Drive out the network Tap phone records to get Available hard-copy maps in local agencies Review Aerial Imagery 	<ul style="list-style-type: none"> Same as Base Year network Plus regionally significant future facilities And any other facilities for which forecast year volumes are needed Same as Base Year network, but with forecast year volumes Same as Base Year network, but with forecast year volumes Same as Base Year network, but with forecast year volumes
Suggested Skill Set of Technical Staff Doing the Work	<ul style="list-style-type: none"> Local knowledge of network to create Basic knowledge of attributes between Facilities 	<ul style="list-style-type: none"> Same, plus to derive forecast year network from base year planning documents
Suggested Skill Set of Reviewers	<ul style="list-style-type: none"> Local knowledge of network to create Basic knowledge of attributes between Facilities 	<ul style="list-style-type: none"> Same, plus knowledge of planned projects
Common Issues to Avoid	<ul style="list-style-type: none"> Local knowledge of network to create Basic knowledge of attributes between Facilities Check directly that were recently constructed just in the base year network to determine whether they were open in base year Check directionality 	<ul style="list-style-type: none"> Same, plus knowledge of planned projects Check directly that were recently constructed just in the forecast year Check directionality

The technical details underlying each model input are explored in other training referenced in Lesson 4. The following exhibit describes the general approaches for the base year and forecast year network development.

(walk through the table, discuss as large group)

Exhibit 3.b Base Year and Forecast Year Network Approaches

	Base Year	Forecast Year
Description of Item	TransCAD network with required attribute data representing the base year roadway transportation system	Same, but for forecast year
Key Input Data	<ul style="list-style-type: none"> • Geography (where is the road? Where will it be?) • Access and connectivity to other facilities (intersections, ramps) • Facility type (see next exhibit) • Total number of lanes 	
Possible Input Data Options	<ul style="list-style-type: none"> • Previous Base Year Network • Recently Constructed Projects • Get with other local agencies • Drive-out the Network • Two-person approach is best • Annotate hard-copy maps is typical approach • Review Aerial Imagery 	<ul style="list-style-type: none"> • Includes all facilities in Base Year network • Plus regionally significant future facilities • And any other facilities for which forecast year volumes are needed • Maintain link-node consistency as much as possible with Base Year network to facilitate comparison of link-level model results
Suggested Skill Set of Technical Staff Doing the Work	<ul style="list-style-type: none"> • Local knowledge • Attention to detail • Basic knowledge of differences between facility types 	<ul style="list-style-type: none"> • Same, plus to derive planned projects from local planning documents
Suggested Skill Set of Reviewer	<ul style="list-style-type: none"> • Local knowledge • Basic knowledge of how data are used in model 	<ul style="list-style-type: none"> • Same, plus knowledge of planned projects
Common Issues to Avoid	<ul style="list-style-type: none"> • Local streets should not be included unless providing access not otherwise provided • Check streets that were recently constructed (not in the base year network) to determine whether they were open in base year • Check directionality 	<ul style="list-style-type: none"> • Avoid including additional detail and facilities not supported by TAZ structure • Ensure streets that were recently constructed are included in the forecast year • Check directionality

Network Facility Types Exhibit

INSTRUCTOR HANDBOOK Lesson 3: Key Inputs and the Quality Process

Exhibit 3.c: Network Facility Types

NOTE: These functional classes and facility types are specific to the travel mode process. They may be informed by the functional class definition used by TxDOT and the MPOs for the purpose of funding categories and by those used in partner agency Thoroughfare Plans, but should not be combined by these documents.

Functional Class	Facility Type	Agency/State/Local	Source	Facility Type
1	1.1	State	State	1.1
	1.2	State	State	1.2
	1.3	State	State	1.3
	1.4	State	State	1.4
2	2.1	State	State	2.1
	2.2	State	State	2.2
	2.3	State	State	2.3
	2.4	State	State	2.4
3	3.1	State	State	3.1
	3.2	State	State	3.2
	3.3	State	State	3.3
	3.4	State	State	3.4
4	4.1	State	State	4.1
	4.2	State	State	4.2
	4.3	State	State	4.3
	4.4	State	State	4.4
5	5.1	State	State	5.1
	5.2	State	State	5.2
	5.3	State	State	5.3
	5.4	State	State	5.4
6	6.1	State	State	6.1
	6.2	State	State	6.2
	6.3	State	State	6.3
	6.4	State	State	6.4
7	7.1	State	State	7.1
	7.2	State	State	7.2
	7.3	State	State	7.3
	7.4	State	State	7.4
8	8.1	State	State	8.1
	8.2	State	State	8.2
	8.3	State	State	8.3
	8.4	State	State	8.4

Source: TxDOT, 2006

Managing the Transportation Process 92 TxDOT 09/13

One of the key concepts that must be understood by the technical staff performing the network development and the staff reviewing the work (typically the MPO Director) is that of Facility Type, shown in the following exhibit.

(walk through the table, discuss as large group)

Exhibit 3.c Network Facility Types

NOTE: These functional classes and facility types are specific to the travel model process. They may be informed by the functional class definition used by TxDOT and the MPOs for the purpose of funding categories and by those used in partner agency Thoroughfare Plans, but should not be constrained by those documents.

Functional Class Code	Facility Type Code	Facility Type Codes		General Color Description	Detailed Color Description
		Facility Type Code	Facility Types Descriptions		
1			INTERSTATE FREEWAYS	Yellow	
	1		Radial IH Freeways - Mainlanes Only		
	2		Radial IH Freeways - Mainlanes & Frontage Roads		
	3		Circumferential IH Freeways (Loops) - Mainlanes Only		
2			OTHER FREEWAYS	Orange	
	4		Circumferential IH Freeways (Loops) - Mainlanes & Frontage Roads		
	5		Radial Other Freeways - Mainlanes Only		
	6		Radial Other Freeways - Mainlanes & Frontage Roads		
3			EXPRESSWAYS	Purple	
	7		Circumferential Other Freeways (Loops) - Mainlanes Only		
	8		Circumferential Other Freeways (Loops) - Mainlanes & Frontage Roads		
	9		Radial Expressways		
10			Circumferential Expressways (Loops)		Dark Light
4			PRINCIPAL ARTERIALS	Blue	
	11		Principal Arterial - Divided		
	12		Principal Arterial - Continuous Left Turn Lane		
	13		Principal Arterial - Undivided		
5			MINOR ARTERIALS	Dark Green	
	14		Minor Arterial - Divided		
	15		Minor Arterial - Continuous Left Turn Lane		
	16		Minor Arterial - Undivided		
6			COLLECTORS	Brown	
	17		Collector - Divided		
	18		Collector - Continuous Left Turn Lane		
	19		Collector - Undivided		
7			FRONTAGE ROADS	Mustard	
	20		Frontage Road		
8			RAMPS	Gray	
	21		Ramp (Between Frontage Road and Mainlanes)		
	22		Interchange Ramp (Freeway-to-freeway Interchange Ramps)		

Source: TxDOT, 2006.

Networks Activity



Managing the TDM Development Process

INSTRUCTOR HANDBOOK Lesson 3: Key Inputs and the Quality Process

Activity 3.3 Networks*

As a large group, discuss these and different types of facilities that an MPO might question whether or not to include in a model network. The sources are citations only; the facilities are shown to provoke discussion only.

	<p style="font-size: x-small;">Should this alley be included in the MPO later year network? Why or why not? What facility type might this be? <small>Source: Alley near 4th Street Downtown Austin, www.austintexas.gov</small></p>
	<p style="font-size: x-small;">Should this dirt road be included in the MPO later year network? Why or why not? What facility type might this be? <small>Source: TxDOT Districts of Park road 22 North Plains Texas</small></p>

(What other types of roadways have you had trouble deciding whether or not to include in a roadway network?)

*General concepts only. This is not definitive of any particular area and judgment will need to be applied to particular situations.

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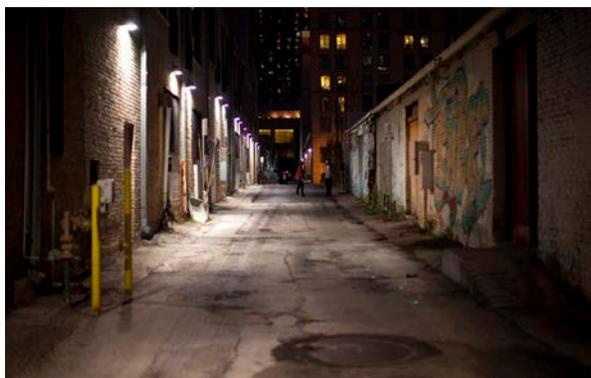
Referring to the exhibit on the next page, as a large group, discuss these and different types of facilities that an MPO might question whether or not to include in a model network. The sources are citations only; the facilities are shown to provoke discussion only.

(walk through the activity, discuss as large group)

Concepts: alleys usually not included (only collectors and above), dirt roads depends.

Activity 3.1 Networks*

As a large group, discuss these and different types of facilities that an MPO might question whether or not to include in a model network. The sources are citations only; the facilities are shown to provoke discussion only.

	<p>Should this alley be included in the MPO base year network?</p> <p>Why or why not?</p> <p>What facility type might this be?</p> <p><i>(Source: Alley near 6th Street Downtown Austin; www.deanterry.com)</i></p>
	<p>Should this dirt road be included in the MPO base year network?</p> <p>Why or why not?</p> <p>What facility type might this be?</p> <p><i>Source: TxDOT; Dirt roads off Park road 22, North Padre Island</i></p>
<p>What other types of roadways have you had trouble deciding whether or not to include in a roadway network?</p>	

**General concepts only. This is not definitive of any particular area and judgment will need to be applied to particular situations.*

TAZs—Need to Know

Managing the TDM Development Process 131

This sub-section examines the key concepts an MPO Director needs to know to manage the development of the TAZ geography as a model input.

TAZ geography is literally the shapes and borders that define each TAZ.

TAZ Development Approaches Exhibit

Managing the TDM Development Process 132

The next exhibit discusses TAZ development approaches. Again, not in technical detail, but for the purpose of managing the process, people, and reviewing the work.

TAZ Development Example

Managing the TDM Development Process 133

Let's look at an example that gets to the heart of the issue of TAZs needing to reflect traffic loading patterns. Here we have an aerial image of a large indoor retail mall with adjacent residential development. If we draw the TAZ border along the pink dashed line, this would result in the model loading mall traffic to all the streets border the TAZ (along the pink dashed line). This is not correct. Instead, the TAZ should be split into two, so that mall traffic exits to streets abutting it. This concept is very important in areas with a large difference in area type and potential trip generation (mall versus residential).

Exhibit 3.d TAZ Development Approaches

	Base & Forecast Year
Description of Item	TransCAD shape geography with required attribute data (typically provided by TxDOT) <ul style="list-style-type: none"> • Supports desired network detail • Not so detailed that some areas are isolated from network
Possible Input Data Options	<ul style="list-style-type: none"> • Prior model traffic analysis zones • Base year model network • Forecast year model network • Most recent Census data block group geography • Other helpful boundaries <ul style="list-style-type: none"> ○ Major water features ○ Rail ○ Evacuation routes
Suggested Skill Set of Technical Staff Doing the Work	<ul style="list-style-type: none"> • Local knowledge • Attention to detail • Basic knowledge of differences between facility types
Suggested Skill Set of Reviewer	<ul style="list-style-type: none"> • Local knowledge • Basic knowledge of how data are used in model
Common Issues to Avoid	<ul style="list-style-type: none"> • Avoid narrow, elongated zones where possible

Demographics—Need to Know



Managing the TDM Development Process

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This sub-section examines the key concepts an MPO Director needs to know to manage the development of the demographic model inputs.

What Do Demographics Include?

- Population in households
- Households
- Population in group quarters (institutionalized and not)
- Median income
- Employment by basic, retail, and service categories
- Special generators data (covered separately)



Managing the TDM Development Process

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First of all, we'd better stop and visit what we mean by "demographics."

(read from slide)

Example Demographics Submittal

TAZ	Pop/HH	GQ_NST	GQ_NCN	HH	Pop/HH	Income\$K	REGULAR EMPLOYMENT				SG EMPLOYMENT				
							Subtotal				Subtotal				
							Reg	BAS	RET	SERV/ EDUC	SG	BAS	RET	SERV/ EDUC	
113527	3482	5713	46704	2.43	49548	11426	14632	21022	2468	20893	5136	2232	11937	1588	
1	8	3	0	0	0.00	0	49	2	2	45	0	75	0	0	76
2	8	0	0	0	0.00	0	15	6	2	7	0	3	0	0	0
3	19	0	0	3	3.80	13234	15	2	9	4	0	0	0	0	0
4	31	0	0	14	2.21	13234	66	8	6	52	0	0	0	0	0
5	8	12	0	0	0.00	0	8	2	2	4	0	0	0	0	0
6	8	0	0	0	0.00	0	8	2	2	4	0	11	0	0	11
7	8	0	0	0	0.00	0	90	6	76	8	0	3	0	0	0
8	8	0	0	0	0.00	0	21	7	2	12	0	3	0	0	0
9	8	0	0	0	0.00	0	42	33	4	5	0	0	0	0	0
10	8	0	0	0	0.00	0	13	2	7	4	0	108	0	0	108
11	14	0	0	13	1.08	20614	293	59	3	231	0	3	0	0	0
12	8	202	0	0	0.00	0	8	2	4	0	580	0	0	580	
13	0	0	0	0	0.00	0	64	2	58	4	0	3	0	0	0
14	8	0	0	0	0.00	0	48	2	42	4	0	0	0	0	0
15	8	0	0	0	0.00	0	64	3	2	49	0	0	0	0	0
16	8	0	0	0	0.00	0	4	2	2	0	0	178	0	0	178
17	27	0	0	12	2.25	20614	8	2	2	4	0	3	0	0	0
18	41	0	0	19	2.16	20614	31	24	2	5	0	0	0	0	0
19	8	0	0	0	0.00	0	48	9	2	37	0	0	0	0	0
20	8	0	0	0	0.00	0	32	26	2	4	0	0	0	0	0
21	8	0	0	0	0.00	0	221	123	25	73	0	50	0	0	50



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example

Demographics Key Concepts Exhibit



Managing the TDM Development Process

Exhibit 3.e on page 100 presents the general approaches for deriving demographics for the base and future years.

Lesson 3: Key Inputs and the Quality Process PG 107 - INSTRUCTOR HANDBOOK

Exhibit 3.e Base Year and Forecast Year Demographic Approaches

Description of Item	Base Year	Forecast Year
Possible Input Data Options	<ul style="list-style-type: none"> • TransCAD shapefile with associated attribute data • Surveying the base year traffic analysis zones (TAZs) directly provided by TxDOT • TAZ geography • Population data • Employment data • Census data (Texas State Census) • One-Stop Demographic Data Analysis Tool • Most recent Census data by block group • Other data to consider (including points or route system geometry) • Employment data (Texas Workforce Commission) • Local knowledge • GIS datasets 	<ul style="list-style-type: none"> • Same geography, but data for forecast year • TDC forecast year control table • MPO needs to choose recommendation • Local plan knowledge • Check with other agencies who have to do forecast planning
Suggested Skill Set of Technical Staff Doing the Work	<ul style="list-style-type: none"> • Attention to detail • Awareness of local data sources • General level of understanding of spatial development patterns of region 	<ul style="list-style-type: none"> • Understanding of expected economic growth and/or changes in diverse of population and employment changes
Suggested Skill Set of Reviewer	<ul style="list-style-type: none"> • Same as technical staff or better understanding 	<ul style="list-style-type: none"> • Understanding of relationship of population growth to employment growth
Common Issues to Avoid	<ul style="list-style-type: none"> • Employment by employment type not consistent with population or household characteristics 	<ul style="list-style-type: none"> • Changes in employment total and mix from base year inconsistent w/ changes in population • Failure to match diverse control table or respecting to explain discrepancies

Exhibit 3.e Base Year and Forecast Year Demographic Approaches

	Base Year	Forecast Year
Description of Item	TransCAD shapefile with required attribute data representing the base year traffic analysis zones (TAZs) (typically provided by TxDOT)	Same geography, but data for forecast year
Possible Input Data Options	<ul style="list-style-type: none"> • TAZ geography • Population data estimates/control totals (Texas State Data Center) • One-Stop Demographic Data Analysis Tool • Most recent Census data by block group • Other ways to account (building permits or septic system permits) • Employment data (Texas Workforce Commission) • Local knowledge • 911 datasets 	<ul style="list-style-type: none"> • SDC forecast year control totals • MPO needs to choose Recommendation • Local plans/knowledge • Check with other agencies that have to do forecast planning
Suggested Skill Set of Technical Staff Doing the Work	<ul style="list-style-type: none"> • Attention to detail • Awareness of local data sources • General level of understanding of typical development patterns of region 	<ul style="list-style-type: none"> • Understanding of expected economic growth and/or changes to drivers of population and employment change
Suggested Skill Set of Reviewer	<ul style="list-style-type: none"> • Same as technical staff or better understanding 	<ul style="list-style-type: none"> • Understanding of relationship of population growth to employment growth
Common Issues to Avoid	<ul style="list-style-type: none"> • Employment by employment type not consistent with population or household characteristics 	<ul style="list-style-type: none"> • Changes in employment total and mix from base year inconsistent w/ changes in population • Failure to match chosen control total (or neglecting to explain discrepancy)

Demographics Development: Base Year Estimate

Past Known Demographics Point

- U.S. Census Data for Local Area

What Happened Up until Base Year?

- Local Knowledge
- Aerial Photography
- Other Resource (See Local Agencies, e.g., Water, Permitting, ISDs)

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This slide presents walks through the steps to develop base year population and household estimates, for instance.

Demographics Development: Forecast Year

Establish Control Totals

- Base Year Estimate is "Base"
- Examine State Data Center Scenarios
- Make Local Decision Which to Use

Allocation to TAZs

- Enter known development that occurred since base year
- Developable Areas (Consider Physical, Political, and Typical Densities)
- Land Use Modeling
- Other Agency Input (see Local Agencies, e.g., Water, Permitting, ISDs)

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The steps to develop forecast year population and households start with the base year estimate.

Median Income

Base Year

- U.S. Census Data
- Aerial Imagery (Size of Homes, Swimming Pools, Gates, Etc.)
- Local Knowledge

Forecast Year

- In Base Year \$
- Real Income Change ONLY (Not Inflation Change)
- Regional Economic Change (Examine Trends)
- TAZ Level
- New Development
- Adjacent TAZ Incomes

Managing the TDM Development Process 140

Median household income is a critical model input that MPOs often struggle to forecast. This graphic walks through a general approach and tips for addressing income.

The issue most often encountered is that MPOs grow income by inflation. This is not correct as a model input. Median income should be provided in base year dollars (no inflation) and reflect REAL changes in income as appropriate.

Special Generators (SGs)

- Travel behavior is not adequately described by general travel rates (too low, too high)
- Suggested approach
 - Identify potential SGs during demographics development
 - Model developer has the discretion to treat as SG
- As for other demographics, base year and future year characteristics must be identified



Managing the TDM Development Process 141

Special generators are typically group quarter populations or employers that have travel behavior characteristics not adequately described by the general rates.

The important point to make about special generators is that the MPO identifies POTENTIAL SGs, and it is the model developer's discretion whether or not to separate them out as SGs for the purpose of the model.

Special Generators Section in Guidebook

SECTION SEVEN – SPECIAL GENERATORS

UNDERSTANDING SPECIAL GENERATORS

Special generators are used on activities that are identified to be special use activities in the modeling process. They are identified as special generators if they are not typical of the activity characteristics that can be replicated using trip generation rates based on the results of the travel surveys. As a result, data specific to the special generator needs to be collected to account for the base year and future year activity.

Typically, special generators include, but are not limited to, activities such as colleges and universities, military bases, major hospitals, airports, and major regional shopping centers. Special generators include only those activities that present unusual characteristics relative to other activities. This means that the needs of office, retail, industrial, and educational trips are for public transportation are not high enough to be considered as special generators.

SPECIAL GENERATOR DATA REQUIREMENTS

Specific data are required for each special generator according to the type of activity. Table 7.1 lists the data required for special generators according to the type of facility.

Type of Special Generator	Additional Data Required
Educational	<ul style="list-style-type: none"> # of employees # of students # of students who live on campus (if college)
Hospitals	<ul style="list-style-type: none"> # of employees # of beds
Airports	<ul style="list-style-type: none"> # of employees # of incoming passengers
Military Bases	<ul style="list-style-type: none"> # of military personnel # of civilian employment # of military personnel living on base
Industrial Sites	<ul style="list-style-type: none"> # of employees
Regional Malls	<ul style="list-style-type: none"> # of employees

The specific data items listed in Table 7.1 will need to be collected for the base year and for each forecast year.



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There is a section of the *Demographics Guidebook* devoted to Special Generators. It includes examples and types of information that should be gathered for each.

Special Generators Activity

Activity 3.2 Discussion: Special Generators*

Should this airport be annotated as a potential Special Generator? Why or why not?

Source: Texas Transportation Institute, 2011

Should this large employer be annotated as a potential Special Generator? Why or why not?

Should this military base be annotated as a potential Special Generator? Why or why not?



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Let's walk through the Activity in the next exhibit, just to get a feel for different types of Special Generators and issues that might arise.

 **KEY CONCEPT:** Use the TxDOT-developed *Demographics Guidebook* for developing model inputs.

Activity 3.2 Discussion: Special Generators*



Should this airport be annotated as a potential Special Generator?

Why or why not?

Source: Texas Transportation Institute, 2011.



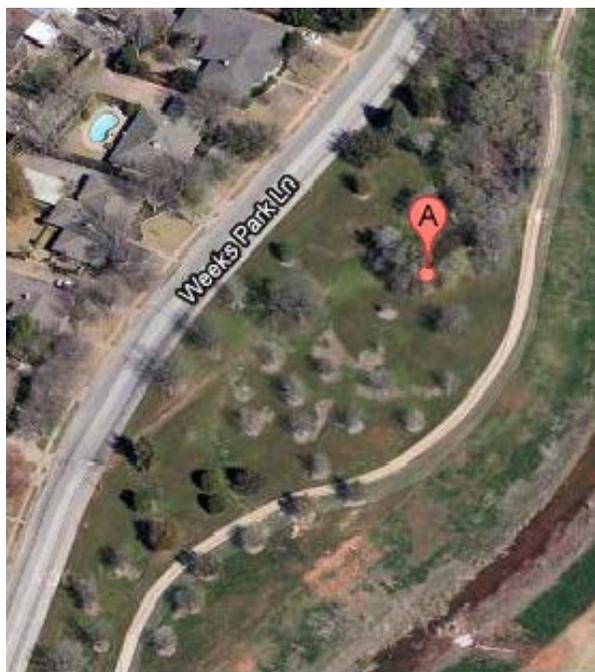
Should this large employer be annotated as a potential Special Generator?

Why or why not?



Should this military base be annotated as a potential Special Generator?

Why or why not?



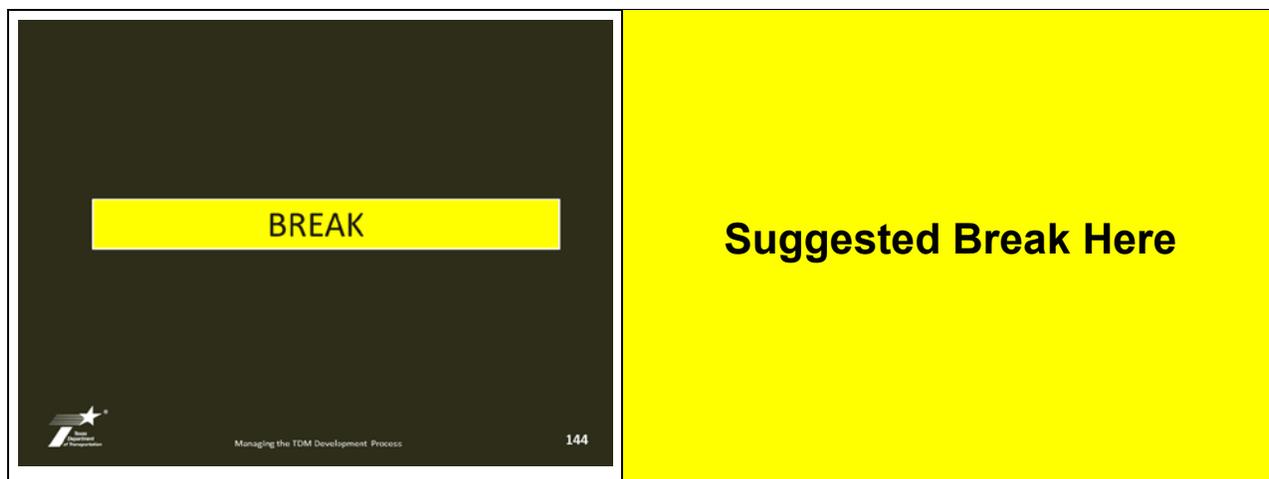
Imagery ©2012 Google, Map data ©2012 Google - Repo

Should this golf course be annotated as a potential Special Generator?

Why or why not?

What other types of special generators have you had trouble deciding whether or not to identify as such?

**General concepts only. This is not definitive of any particular area and judgment will need to be applied to particular situations.*



Post-Break Reinforcement Questions

1. What are the model inputs that MPOs are typically responsible for, as a partner in travel model development? **Networks, TAZs, Demographics**
2. What are some examples of Special Generators and what makes them special? **Hospitals, Military Bases, Golf Courses, Nursing Homes, Prisons, Institutional Housing where residents don't travel or travel less than typical rates (e.g., nursing homes, prisons) industrial employers with 3 shifts (24 hour operation) – anything with travel patterns largely different from general travel rates.**
3. What is the most common error made with forecasting median income? **Applying inflationary change but no real change to income.**

Topic 3.4 Best Practice Strategies Model Inputs

Minimum and Ideal Data to Support Development of Model Inputs

1 Hour, 20 Minutes

Best Practice Strategies for Developing Model Inputs



Managing the TDM Development Process **145**

Let's talk about best practice strategies.

Minimum and Desirable Model Input Data Exhibit



Managing the TDM Development Process **146**

Lesson 3: Key Inputs and the Quality Process PG.137 - INSTRUCTOR HANDBOOK

Exhibit 3.f Minimum and Desirable Model Input Data*

Model Subject	Minimum	Desirable
Count Data	• Maximum identification of input data sources, facility and area types	• 40% fit coverage with observed count data (not estimated)
Traveled Network	• Street-level data	• Local service roads • Workplace • Household • Commercial vehicle • College
TAZ Layer	• Should cover geographic area and represent 10% of residents who travel in region	• Should cover geographic area that represents 20% of residents who travel in region
Networks	• Arterial and higher	• Collector and higher facilities
Demographics	• TAZ data updated for each model year run • Number of households • Population in household • Group Quarters • Population Institutional • Employment by type • Other Special categories • Median income	• Tracked and updated annually
Census Journey-to-Work Data	• County-level flows	• Sector-level flows (or percentages)

*Exhibit dependent upon challenges of particular model. Discuss with TDDOT as part of model development scheduling and planning process ahead of time.

TDDOT 0213 138 Managing the Travel Model Process

The inputs discussed above are the primary inputs to the Texas Package and they are typically what the MPO is responsible for. This section briefly covers the comprehensive list of minimum and ideal model inputs, primarily referencing Exhibit 3.f.

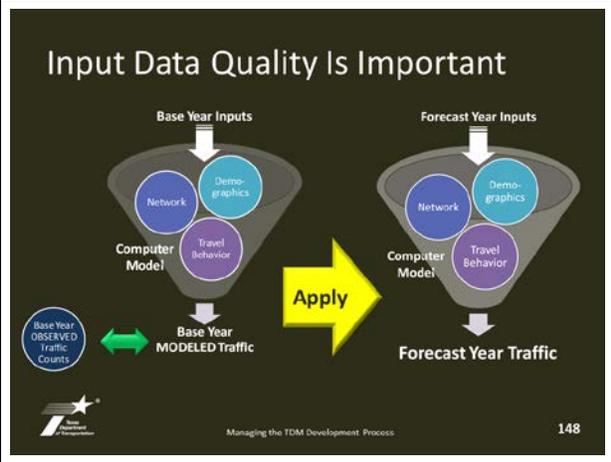
IN SUMMARY: use the best inputs you can, be creative, and know the limitations of the data being used.

Exhibit 3.f Minimum and Desirable Model Input Data*

Model Aspect	Minimum	Desirable
Count Data	<ul style="list-style-type: none"> Reasonable stratification of count data across facility and area types 	<ul style="list-style-type: none"> 40% link coverage with observed count data (not estimated)
Travel Surveys	<ul style="list-style-type: none"> Small-area rates 	Local survey data: <ul style="list-style-type: none"> Workplace Household Commercial Vehicle External
TAZ Layer	<ul style="list-style-type: none"> Should cover geographic area that represents 50% of residents who travel in region 	<ul style="list-style-type: none"> Should cover geographic area that represents 80% of residents who travel in region
Networks	<ul style="list-style-type: none"> Arterial and higher facilities 	<ul style="list-style-type: none"> Collector and higher facilities
Demographics	<ul style="list-style-type: none"> TAZ data updated for each model base year: <ul style="list-style-type: none"> Number of households Population in households Group Quarters Population (Institutional versus not) Employment by type Other Special Generators Median income 	<ul style="list-style-type: none"> Tracked and updated annually
Census Journey-to-Work Data	<ul style="list-style-type: none"> County-county flows 	<ul style="list-style-type: none"> Sector-sector flows (or percentages)

* Flexible dependent upon challenges of particular model, discuss with TxDOT as part of model development scheduling and planning process ahead of time.

Quality Assurance



Remember this slide from Lesson 1? What was one of the significant potential limitations of a model?

(let participants answer)

Answer: the quality of the data inputs.

A slide titled "Quality Discussion" on the left. On the right is a worksheet for "Activity 3.3 Discussion: Effective and Efficient Quality Procedures". The worksheet contains the following questions:

- Who does quality start with?
- Can an individual ensure quality on a complex, technical product alone?
- Is a reviewer always correct?
- Does reviewing a product always find all mistakes made?

Below the questions is a large text box for notes: "Based on the above discussion, give a model input deliverable (a network or demographic), describe an effective and efficient quality procedure that you would feel confident in." At the bottom of the worksheet, it says "TxDOT 2015" and "Managing the Travel Model Process". The slide includes the TxDOT logo, "Managing the TDM Development Process", and the slide number "149".

Let's discuss the exhibit on the next page.

Activity 3.3 Discussion: Effective and Efficient Quality Procedures

Who does quality start with?

Can an individual ensure quality on a complex, technical product alone?

Is a reviewer always correct?

Does reviewing a product always find all mistakes made?

Based on the above discussion, given a model input deliverable (a network or demographics), describe an effective and efficient quality procedure that you would feel confident in.



Internal MPO Quality Assurance Protocol Example

INSTRUCTOR HANDBOOK Lesson 3: Key Inputs and the Quality Process PG.111-INTERNAL MPO QUALITY ASSURANCE PROTOCOL

Exhibit 3.g Example INTERNAL MPO Quality Assurance Protocol
Suggestion: tailor, reproduce this Protocol for each technical deliverable.

____ MPO Quality Assurance Commitment

The _____ MPO follows this procedure for all technical products. This procedure, or comparable variation with permission, is required for MPO staff and persons working under contract to the MPO.

QA/QC Tracking Log for Current Deliverable*

Role Description	Print Name	Date	Initial
GAP Assigns Task			
SP Complete Task			
IR Reviews Task			
RP Address Comments			
IR Reviews Changes			
GAP Signs Off			

*This document to be submitted with deliverable.

Roles and Responsibilities

Quality Assurance Professional (QAP): This person assures that the RP and IR assigned have the appropriate skills to do the task, assures the QC procedure is adhered to and followed and maintains the QC records. The QAP can also be either the RP or IR.

Responsible Professional (RP): The person who is completing the task to be reviewed.

Internal Reviewer (IR): A person (not the RP) with skills equal to or more advanced than the RP.

TODD GIBBS 111 Managing the Travel Model Process

The exhibit on the following page shows an example best practice approach to standardize INTERNAL review of technical products as part of an Quality Assurance Protocol for the MPO.

QA/QC Roles Exercise

INSTRUCTOR HANDBOOK Lesson 3: Key Inputs and the Quality Process

Activity 3.4 Example INTERNAL MPO QA/QC Roles Activity

NOTE: Assumes that non-MPO parties below have agreed to be a partner to the MPO in the development of their deliverable.

Consider a travel model Network or Demographics deliverable that the MPO is responsible for. QAP role is set. Who can serve as the IR role? Is the IR role?

(a) Review and discuss (large group).
(b) Who else could be RP or IR (MPO is always QAP)?

Role	MPO	Contractor	Travel Model Network	Demographics	Other	IR	RP	Peer MPO	?
Quality Assurance Professional (QAP)	✓								
Responsible Professional (RP)*	✓								
Internal Reviewer (IR)*	✓								

*Remember that the RP and IR cannot be the same person.

NOTE: As will be discussed later, ideally, the Policy Board adoption occurs after the model development and initial application is complete.

Managing the Travel Model Process 111 TDDG 010

Let's pause for a moment and do some role-playing with our quality review discussion.

Please refer to Activity 3.4 on page 113.

Exhibit 3.g Example INTERNAL MPO Quality Assurance Protocol

Suggestion: tailor, reproduce this Protocol for each technical deliverable.

_____ MPO Quality Assurance Commitment

The _____ MPO follows this procedure for all technical products. This procedure, or comparable variation with permission, is required for MPO staff and persons working under contract to the MPO.

QA/QC Tracking Log for Current Deliverable*

Role Description	Print Name	Date	Initial
QAP Assigns Task			
RP Complete Task			
IR Reviews Task			
RP Address Comments			
IR Reviews Changes			
QAP Signs Off			

*This document to be submitted with deliverable.

Roles and Responsibilities

Quality Assurance Professional (QAP): This person assures that the RP and IR assigned have the appropriate skills to do the task, assures the QC procedure is scheduled and followed, and maintains the QC records. The QAP can also be either the RP or IR.

Responsible Professional (RP): The person who is completing the task to be reviewed.

Internal Reviewer (IR): A person (not the RP) with skills equal to or more advanced than the RP.

Activity 3.4 Example INTERNAL MPO QA/QC Roles Activity

NOTE: Assumes that non-MPO parties below have agreed to be a partner to the MPO in the development of their deliverable.

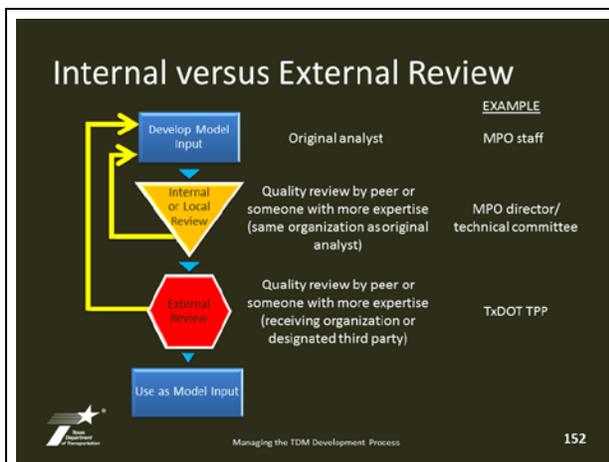
Consider a travel model **Network** or **Demographics** deliverable that the MPO is responsible for. QAP role is set. Who can serve in the RP role? In the IR role?

- (a) Review and discuss (large group).
- (b) Who else could be RP or IR? (MPO is always QAP)

Role	MPO	Consultant	TxDOT District/Region	City/County	TPP	Peer MPO?	?
Quality Assurance Professional (QAP) Responsible Professional (RP)*	✓						
Internal Reviewer (IR)*	✓						

* Remember that the RP and IR cannot be the same person.

NOTE: As will be discussed later, ideally, the Policy Board adoption occurs after the model development and initial application is complete.



EXTERNAL review of the model inputs refers to a layer of review that occurs after the INTERNAL review.

The EXTERNAL review example shown in this Activity is currently typical for MPOs where TxDOT-TPP is responsible for model development for the MPO. There are two components in the TPP review process: Reasonableness Review (RR), typically by a demographics expert, and Modeling Formatting (MF), by a modeler.

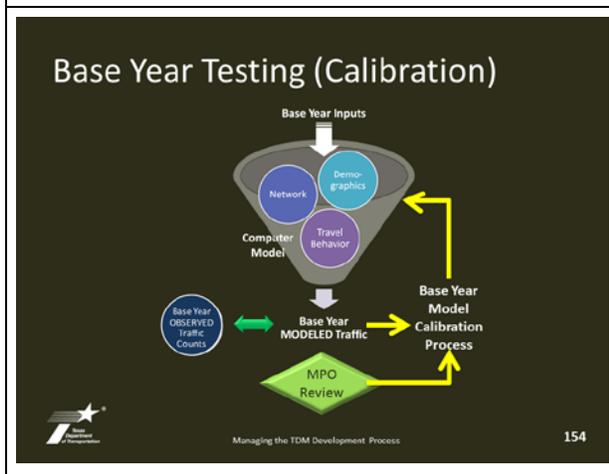
KEY CONCEPTS: **Schedule** INTERNAL and EXTERNAL review (if required) as part of model development process.
Identify expected roles when scheduling.
Get concurrence of TPP on these roles.

“Revisit” Phenomenon for Model Inputs



Has anyone had that experience where you thought you had submitted the inputs, TxDOT had reviewed them, said they were all OK, and then TxDOT asks you about six months later to make a change?

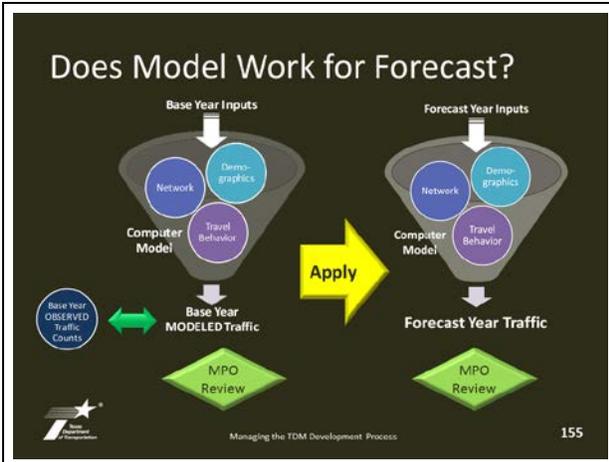
Well, there is a phenomenon that we need that explains why that sometimes occurs as part of the travel model process.



As a reminder, **Calibration** refers to the model approach and parameters and is represented by the cone shape in the graphic to the left.

Validation refers to the process of demonstrating that a model appropriately fits observed count data.

In the process of calibrating the model, the person developing the model often will find issues with model input data. **THIS IS AN EXPECTED PART OF THE PROCESS.**



Less often, issues are discovered when the model is applied.

Realistically, given the complexity of the data inputs to the model, there will always be issues. If minor issues are discovered during or after model application to support the MTP, they should ALWAYS be documented for the purpose of correction or avoiding the same issue for the next model. The MPO and TxDOT-TPP can decide together whether the issue merits revisiting the current model calibration.

Minimum & Desirable Checks for Base Year Model (Exhibit)

Model Aspect	Minimum	Desirable
Count Data	Horizontal coefficients of count data within specific area types	% of counts with observed count data just within 10%
Trip Generation	Attraction scale factors no more than 10%	Attraction scale factors no more than 10%
Trip Distribution	Trip lengths to trip purpose are reasonable and within reasonable for local area Distribution of trip to trip purposes is reasonably stable HEW trip length longest of interest purposes	Trip lengths to trip purposes are comparable to other model local study data HEW attraction % no more than 10% Attraction scale factors no more than 10% Distribution of trip purposes demonstrates similar pattern to model used, consistent with planning to 2035, 2050
Base Year Traffic Assignment Overall	Model converges to 2031 relative gap within 24 assignment iterations	Model converges to 2031 relative gap within 10 assignment iterations
Volume-to-Count Performance		
System-wide RMSE**	30%	none
System-wide %	10% to 15%	6% to 1%
% by Area Type	10% to 15%	1% to 1%
% by Functional Class	10% to 15%	10% to 10%
% by Facility Type	10% to 15%	10% to 10%

*Assumes that checks of the network and demographics have already occurred
**Root Mean Square Error

TxDOT 2013 118 Managing the Travel Model Process 156

See following exhibit.

For many of the small and medium-size MPOs, TxDOT handles these checks. It is important to be aware of the minimum and desirable standards that the models are being evaluated by.

Minimum & Desirable Checks for Forecast Year Model (Exhibit)

Model Aspect	Minimum	Desirable
Trip Generation	Ratio of production/attractions by area consistent with planning ratio	Ratio of production/attractions by area consistent with planning ratio Change from base year trip attractions consistent with changes in employment total and changes in base year production/attractions Change from base year production/attractions consistent with changes in the rate of economic
Trip Distribution	Trip lengths to trip purpose should be reasonable for the study area	Change in trip lengths reflect demographic changes
Forecast Year Traffic Assignment	Region-wide system model based on multi-modal distribution (VMT/AT/HT) & color-coded by area are reasonable for study area from forecast	Model converges to 2031 relative gap within 24 assignment iterations

*Assumes that checks of the network and demographics have already occurred

Managing the Travel Model Process 118 TxDOT 2013 157

See following exhibit for the forecast year model checks.

Exhibit 3.h Minimum and Desirable Model Performance Checks (Base Year Model)*

Model Aspect	Minimum	Desirable
Count Data	<ul style="list-style-type: none"> Reasonable stratification of count data across facility and area types 	<ul style="list-style-type: none"> 40% link coverage with observed count data (not estimated)
Trip Generation	<ul style="list-style-type: none"> Attraction scale factors no more than 15%? 	<ul style="list-style-type: none"> Attraction scale factors no more than 10%?
Trip Distribution	<ul style="list-style-type: none"> Trip lengths by trip purpose are reasonable and scaled appropriately for local area Distribution of trips by trip purposes is reasonably intuitive HBW trip length longest of internal purposes 	<ul style="list-style-type: none"> Trip lengths by trip purpose are comparable to most recent local survey data HBW intrazonal % no more than 10% Non-work intrazonal percentages no more than 15%? Distribution of Home-based Work trip purpose trips demonstrates similar pattern to most recent Census Bureau Journey-to-Work data
Base-Year Traffic Assignment Overall	<ul style="list-style-type: none"> Model converges to .001 relative gap within 24 assignment iterations 	<ul style="list-style-type: none"> Model converges to .001 relative gap in less than 15 assignment iterations
Volume-to-Count Performance		
System-wide RMSE**	<ul style="list-style-type: none"> 30% 	<ul style="list-style-type: none"> same
System-wide %	<ul style="list-style-type: none"> -5% to 5% 	<ul style="list-style-type: none"> 0% to 1%
% by Area Type	<ul style="list-style-type: none"> -5% to 5% 	<ul style="list-style-type: none"> -3% to 3%
% by Functional Class	<ul style="list-style-type: none"> -20% to 20%** 	<ul style="list-style-type: none"> -10% to 10%
% by Facility Type	<ul style="list-style-type: none"> -30% to 30%** 	<ul style="list-style-type: none"> -10% to 10%

*Assumes that checks of the networks and demographics have already occurred, and Flexible dependent upon challenges of particular model, discuss with TxDOT.

**Root Mean Square Error.

Exhibit 3.i Minimum and Desirable Model Performance Checks for the Forecast Year Model

Model Aspect	Minimum	Desirable
Trip Generation	<ul style="list-style-type: none"> Ratio of productions/attractions by are consistent with hh/emp ratio 	<ul style="list-style-type: none"> Ratio of productions/attractions by are consistent with hh/emp ratio Change from base work trip attractions consistent with changes in employment total and employment by type Changes from base total productions consistent with changes in hh size and income
Trip Distribution	<ul style="list-style-type: none"> Trip lengths by trip purpose should be reasonable for the study area 	<ul style="list-style-type: none"> Changes in trip length reflect demographic changes
Forecast-Year Traffic Assignment	<ul style="list-style-type: none"> Region-wide system implied speed (vehicle-miles-traveled/vehicle-hours-traveled, VMT/VHT) & volume/capacity ratio are reasonable for study area given forecast 	<ul style="list-style-type: none"> Model converges to .001 relative gap within 24 assignment iterations

**Assumes that checks of the networks and demographics have already occurred.*

Helpful Strategies for Model Data Inputs

Other Best Practice Strategies

Managing the TDM Development Process 158

There are some helpful strategies that MPOs can employ to facilitate this process.

Update Model Inputs More Often

Year 1 2 3 4 1

Data Collection, Process Counts & Surveys, Model Calibration/Validation, Model Runs, Public Involvement, MTP Adoption, Develop Model Inputs, Update, Update, Update

This idealized schedule incorporates time for schedule delays and still allows a model to be completed before the next cycle of saturation counts occurs. If the MTP is due for adoption soon after, the cycles align nicely.

Managing the TDM Development Process 159

Maintain and update model inputs on a regular basis, as often as is reasonable for staff resources, but at least annually. Example: frequently check with local stakeholders regarding new projects and growth affecting demographics and networks used in the model.

If doing annual updates, be sure to “freeze” or save each year’s model input data set.

Coordinating Model Data with MPO's GIS

Start here: Previous Model Base Year → New Model Base Year

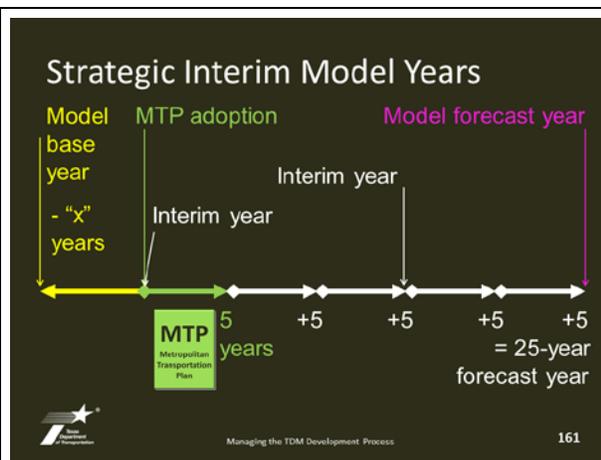
MPO GIS Planning Data

Use MPO Data to Inform Base Year (Make Sure Not Current Year)

Managing the TDM Development Process 160

Do utilize any locally-maintained GIS datasets to inform model input data updates.

Be careful, though, to ensure that any updates reflect the base year intended.



As discussed in Lesson 2, it is a Best Practice strategy to maintain an interim year forecast model for the next potential base model year.

- ### Other Strategies for Data Inputs
- Avoid getting demographics or networks adopted by MPO board until the model is complete
 - Specific to MPOs hiring consultants
 - Product is not final until TPP has reviewed it with respect to demographic reasonableness *and* model format
 - Adjustments may still be necessary as issues are uncovered during model calibration and application
- The slide includes the TxDOT logo and the text 'Managing the TDM Development Process' and '162'.

(read from slide)
 To adopt or not to adopt model inputs: It is recommended that the Board not adopt the model inputs until the model is completed, due to the "Revisit" Process. If adoption of model inputs is unavoidable, it is recommended that the Board adopt language that supports the MPO director making changes in response to technical findings as the model development process proceeds, both for base year and forecast year (since some base year changes impact forecast year inputs)

KEY CONCEPT: Treating model inputs development, at least regarding population, households, and employers, as a regular maintenance activity may improve quality and decrease schedule problems.

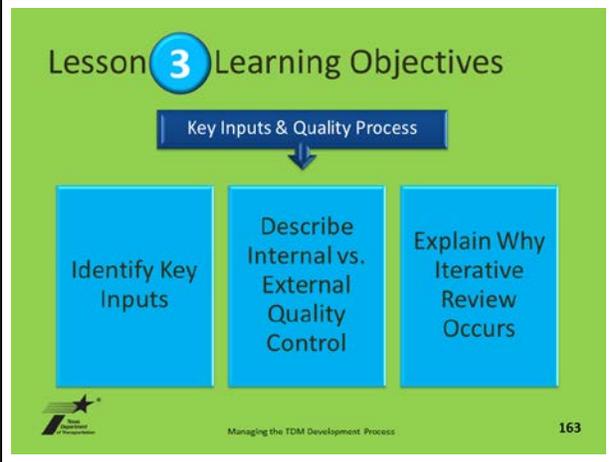
Topic 3.5 Other Helpful Resources

<p>TxDOT Transportation Planning Manual Guidelines for the planning process. http://onlinemanuals.txdot.gov/txdotmanuals/pln/pln.pdf</p>
<p>TxDOT One-Stop Demographic Data Analysis Tool (beta) Tool designed to give TxDOT and MPOs a “one-stop” location to derive general demographic information. http://www.txdot.gov/business/demographic.htm</p>
<p>Transportation Planning Process: Key Issues A Briefing Book for Transportation Decisionmakers, Officials, and Staff AKA The “Briefing Book” – a fundamental resource and starting point. http://planning.dot.gov/documents/briefingbook/bbook.htm or PDF at: http://planning.dot.gov/documents/briefingbook/bbook_07.pdf</p>
<p>Transportation Planning Capacity Building  FHWA/FTA joint Web site – resources for MPOs http://www.planning.dot.gov/default.asp</p>
<p>TxDOT-TPP <i>Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook</i>, TxDOT and TTI, February 2007.  Current version included in Appendix of this manual (check for updates with TPP)</p>
<p>TxDOT-TPP Tutorial on Aggregating Census Data Current version included in Appendix of this manual (check for updates with TPP)</p>
<p>TxDOT-TPP Tutorial on Geocoding Texas Workforce Commission Data Current version included in Appendix of this manual (check for updates with TPP)</p>
<p>TxDOT-TPP Tutorial on Using Factfinder 2 (Census Bureau data) Current version included in Appendix of this manual (check for updates with TPP)</p>
<p>TxDOT-TPP Tutorial on Using DataFerret Current version included in Appendix of this manual (check for updates with TPP)</p>

Topic 3.6 Lesson Wrap-Up

5 Minutes

On the previous page is a list of Other Helpful Resources that cover the topics in this lesson.

 <p>The diagram shows a green background with the text 'Lesson 3 Learning Objectives' at the top. Below it is a blue box labeled 'Key Inputs & Quality Process' with a downward arrow. Underneath are three blue boxes: 'Identify Key Inputs', 'Describe Internal vs. External Quality Control', and 'Explain Why Iterative Review Occurs'. At the bottom left is a logo for 'Managing the TDM Development Process' and at the bottom right is the number '163'.</p>	<p>At the beginning of this lesson, we set the following learning objectives. At this point, you would be able to: (read the objectives).</p> <p>Does anyone have any questions about this material?</p>
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Suggested Break Here

Lesson 3 Reinforcement Questions

After break, before starting the next lesson, review these questions (and answers) as a group:

(from the second half of Lesson 3)

1. Please describe the difference between internal quality control and external quality control? Internal refers to quality review within the MPO or with its partners—local agencies or consultant. External quality control refers to TxDOT-TPP, TTI under contract to TPP, or a modeler who will be developing the model but who has not been part of the demographics development process.
2. What are some key features of a good internal quality control process? Designating someone who ensures quality procedures are followed, assigning the task to someone with the correct skill set, review by someone with equal or better skills who did not perform the original work, a dialogue between both parties about suggested changes, re-review after change have been made, all parties are accountable for their part in the process.
3. What are some other best practice strategies to facilitate development of the network and demographic inputs for a travel model? Keeping up with data updates at least on an annual basis (instead of just when model inputs are needed), applying data knowledge from the MPO's GIS (with caveats as discussed), choosing interim year of current model under development strategically so that it serves as a starting point for the next model to be developed.

Where Are We?

Course Agenda

4 days
Start: 8:30 a.m.
End: 4:30 p.m.

Lunch:
11:30 a.m. – 1:00 p.m.

Breaks:
10:15 a.m. & 2:45 p.m.

Day 1

- 1 Travel Model Fundamentals ✓
- 2 Model Development Process ✓
- 3 Key Inputs & Quality Process ✓

Day 2

- 4 Resources

Day 3

Day 4

- 5 Putting It All Together



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Lesson 4: Resources

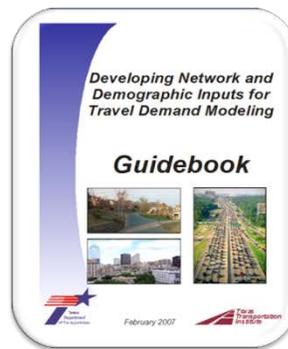
Learning Objectives



Staff



Data



Guidelines/
Instructions



Training

Lesson Materials Follow

Lesson Total Time: 2 Hours, 45 Minutes (in 2 parts)

Lesson **4** Learning Objectives

Resources

Staff Data Guidelines/Instructions Training

Managing the TDM Development Process 165

At the end of this training course, participants will be able to:
(read from slide)

Topic 4.1 Overview of Lesson Purpose

5 Minutes

Plan for Lessons 3, 4, and 5

Lessons

- WHAT **3** Key Inputs & Quality Process
- WHO & HOW **4** Resources
- WHEN **5** Putting It All Together

Managing the TDM Development Process 166

Lesson 3 covered the “WHAT”: the key inputs are from the perspective of managing the travel model process.

Lesson 5 will cover the WHEN and managing the process and resources.

In Lesson 4, we are concentrating on “WHO and HOW”: the potential resources that can develop the model inputs.

Overview of Resources

Staff Data Guidelines Training

Managing the TDM Development Process 167

To organize this lesson, the resources have been divided up into the categories shown.

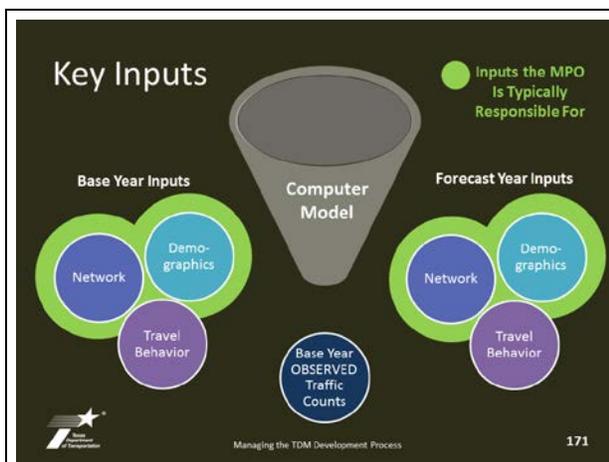
As much as possible, the resources are discussed from a management perspective—knowing your resources and maximizing their potential for application to the model process to support the MTP.

Topic 4.2 Staff Resources

40 Minutes

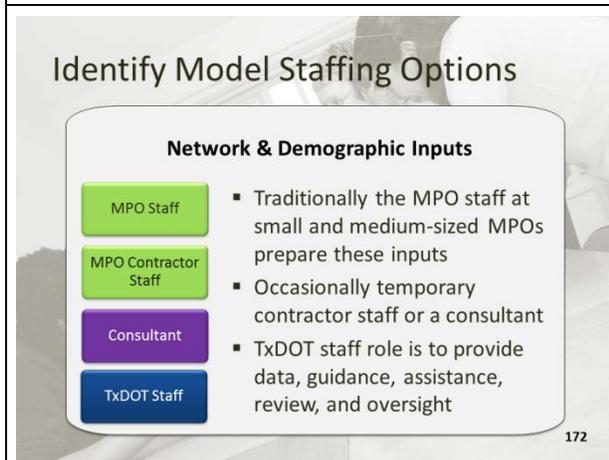
Typical Staffing Options for Model Tasks

	<p>This section will highlight the model tasks typically the responsibility for small- and medium-sized MPOs and also generally cover all of the model development tasks. This establishes a foundation for discussing the management approach of the model development timeline to be covered in Lesson 5.</p>
	<p>Staff resources for modeling tasks generally fall into the categories shown here.</p>
	<p>There is a way to view the modeling tasks as three broad tasks: (read from slide)</p> <p>The first task, of course, is the one that MPOs are typically responsible for in Texas.</p>



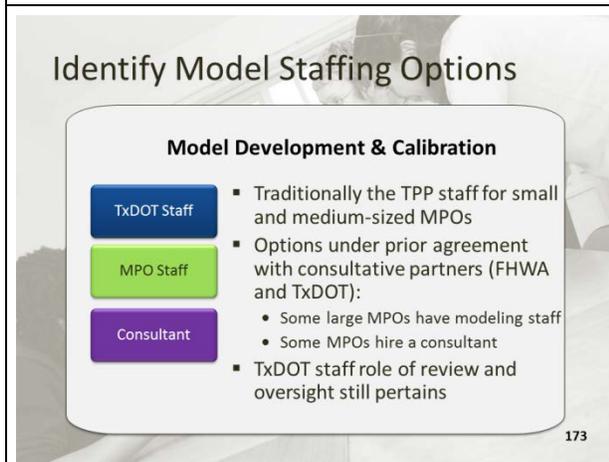
It is important to note that this training is not going to cover technical details of creating the inputs, but what the MPO Director needs to know to manage the development of the inputs, primarily the inputs as discussed in Lessons 1 and 3.

This slide is a reminder from Lesson 3 of which inputs we are referring to when we talk about what the MPO is responsible for: networks, TAZs, and demographics.



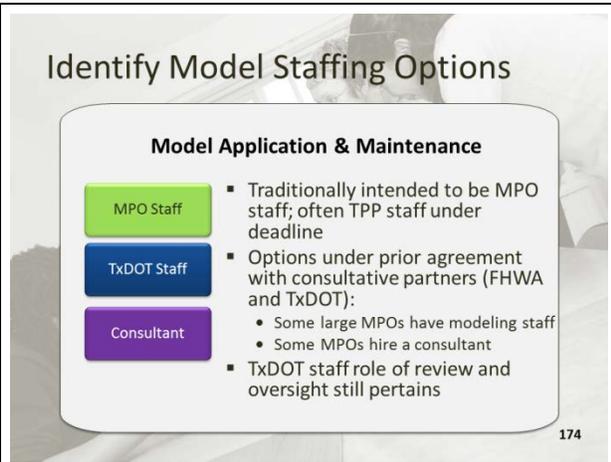
And this slide presents the way the model inputs task is typically staffed in Texas.

(read from slide)



Here we present how the next big broad task is staffed: model development and calibration.

(read from slide)



Identify Model Staffing Options

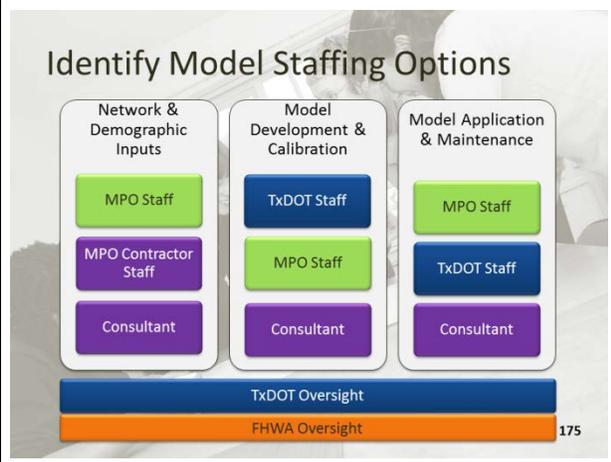
Model Application & Maintenance

- MPO Staff**
 - Traditionally intended to be MPO staff; often TPP staff under deadline
- TxDOT Staff**
 - Options under prior agreement with consultative partners (FHWA and TxDOT):
 - Some large MPOs have modeling staff
 - Some MPOs hire a consultant
- Consultant**
 - TxDOT staff role of review and oversight still pertains

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And finally, how model application and maintenance are typically staffed.

(read from slide)



Identify Model Staffing Options

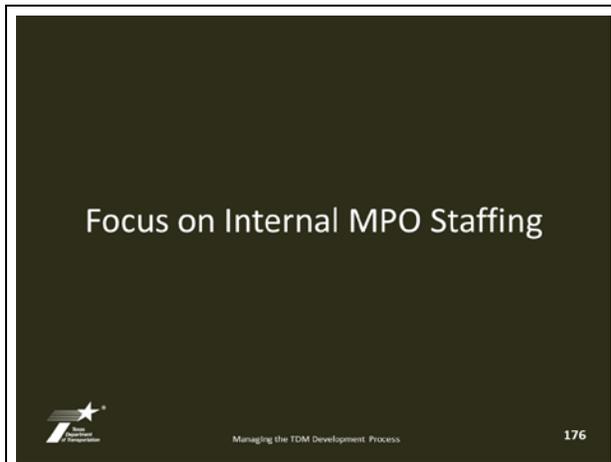
Network & Demographic Inputs	Model Development & Calibration	Model Application & Maintenance
MPO Staff	TxDOT Staff	MPO Staff
MPO Contractor Staff	MPO Staff	TxDOT Staff
Consultant	Consultant	Consultant
TxDOT Oversight		
FHWA Oversight		

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These are summarized here in one slide, which will be referred to later as we explore actually assigning staff to particular model tasks.

Of course, TxDOT and FHWA/FTA maintain an oversight role, as well.

MPO Staffing for Model Tasks

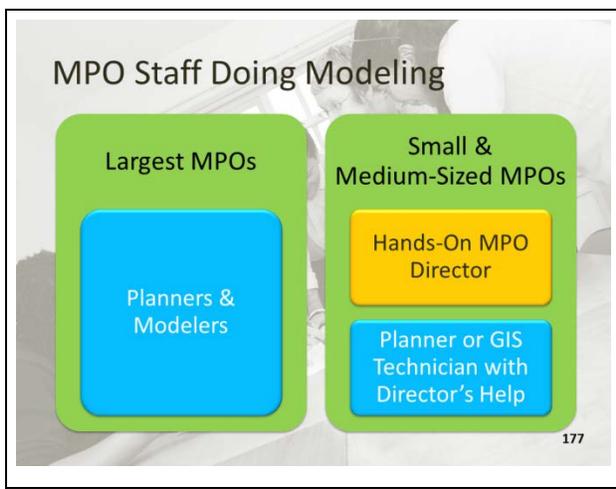


Focus on Internal MPO Staffing

Managing the TDM Development Process

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Let's look at MPO staffing, starting with the people who are available internal to the MPO.

 <p>MPO Staff Doing Modeling</p> <p>Largest MPOs Planners & Modelers</p> <p>Small & Medium-Sized MPOs Hands-On MPO Director Planner or GIS Technician with Director's Help</p> <p>177</p>	<p>In the above slides, we presented the different model tasks that need staffing. Realistically, different MPOs have different staff resources.</p> <p>(read from slide)</p>
 <p>Talent Management Framework</p> <p>Managing the TDM Development Process</p> <p>178</p>	<p>There is a lot of available research into staff retention and training, particularly in the field of non-governmental agencies, which tend to be small and have limited resources.</p>
 <p>Competency and Workforce Planning</p> <ul style="list-style-type: none"> ▪ Develop an inventory of required competences and available competences ▪ Prepare a workforce plan ▪ MPOs will benefit by: <ul style="list-style-type: none"> • Identifying competency inadequacy • Recognize existing talent • Seek appropriate training • Hire the right people (local more likely to stay) <p>Managing the TDM Development Process</p> <p>179</p>	<p>One suggestion is being strategic and thoughtful about staffing, approaching ones labor force like any other asset, to be maintained and planned for.</p>

<p>Recruitment</p> <ul style="list-style-type: none"> ▪ Augment the talent pipeline <ul style="list-style-type: none"> • Fellowship and internship programs ▪ MPO positioning and branding <ul style="list-style-type: none"> • Attract talent • Inspire current employees ▪ Screening system <ul style="list-style-type: none"> • Collaboration with TxDOT TPP and academia  <p style="text-align: right;">Managing the TDM Development Process 180</p>	<p>There are different recruiting strategies an MPO Director can employ to attract talent.</p>
<p>Learning Management</p> <ul style="list-style-type: none"> ▪ Two types of innate talents—actualized talent and potential talent ▪ Potential talent—development required to fully realize the MPOs investment in hiring someone  <p style="text-align: right;">Managing the TDM Development Process 181</p>	<p>As well, there are different approaches to developing staff talent.</p> <p>(read from slide)</p>
<p>Training Options</p>   <p style="text-align: right;">Managing the TDM Development Process 182</p>	<p>This matrix presents a different way of thinking about training options, some of which may be applicable to MPOs.</p> <p>(walk through slide)</p>

<h3>Outsourcing vs. In-House Training</h3> <table border="1"> <thead> <tr> <th>Outsourcing</th> <th>In-House Training</th> </tr> </thead> <tbody> <tr> <td> <ul style="list-style-type: none"> • Develops a broad and deep understanding of the issues. • Offers stronger diagnosis ability. • Provides a fresh and out-of-the-box perspective. </td> <td> <ul style="list-style-type: none"> • Integrity of information is maintained. • In line with the organization's core values and vision. </td> </tr> </tbody> </table> <p> Managing the TDM Development Process 183</p>	Outsourcing	In-House Training	<ul style="list-style-type: none"> • Develops a broad and deep understanding of the issues. • Offers stronger diagnosis ability. • Provides a fresh and out-of-the-box perspective. 	<ul style="list-style-type: none"> • Integrity of information is maintained. • In line with the organization's core values and vision. 	<p>Of particular relevance for MPOs is the question of outsourcing versus in-house training. This slide presents some general considerations. In Lesson 5, we will explore specific pros and cons of this issue.</p>
Outsourcing	In-House Training				
<ul style="list-style-type: none"> • Develops a broad and deep understanding of the issues. • Offers stronger diagnosis ability. • Provides a fresh and out-of-the-box perspective. 	<ul style="list-style-type: none"> • Integrity of information is maintained. • In line with the organization's core values and vision. 				

 **KEY CONCEPT:** MPOs, like any other small, funding-constrained organization, have to be flexible and creative to find and retain quality staff.

Partner Agency Staff

<h3>TxDOT Staff</h3> <ul style="list-style-type: none"> ▪ TPP model management ▪ TPP staff assigned to model ▪ TransCAD Help Desk <ul style="list-style-type: none"> • TPP-TRANSCAD-HELPPDESK@txdot.gov • 512/486-5177 ▪ TxDOT TPP planning staff ▪ TxDOT field planning staff <p> 184</p>	<p>The MPO is not limited to its own staff in considering how the model tasks will be accomplished. TxDOT staff is available and engaged as a cooperative partner in the process.</p>
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<h3>Other Staff Resources</h3> <ul style="list-style-type: none"> ▪ Local agency partners ▪ Temporary contractor staff ▪ Consultant contracts ▪ Universities doing research <p> 185</p>	<p>Other staff resources include: (read from slide)</p>
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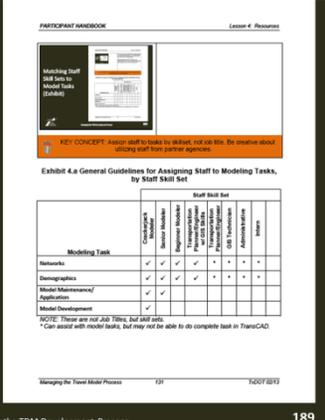
<p>What Is FHWA’s Role?</p> <ul style="list-style-type: none"> ▪ Federal Planning Team, including the Travel Model Improvement Program (TMIP) ▪ Travel Model Resource Center ▪ Texas division <ul style="list-style-type: none"> • Oversee MPO planning through certification review • In Texas, division staff tend to limit direct modeling input to non-attainment areas • Division staff have gotten involved in project studies in other areas upon request  <p style="font-size: small;">Managing the TDM Development Process 186</p>	<p>FHWA’s role is more an oversight role.</p> <p>(read from slide)</p>
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General Model Staffing Options by Model Stage

<p>General Model Staffing Options by Model Stage</p>  <p style="font-size: small;">Managing the TDM Development Process 187</p>	<p>Keep in mind that the MPO is not limited to its own staff.</p>
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<p>Identify Model Staffing Options</p> <p style="font-size: small;">188</p>	<p>This graphic shows the various approaches taken by MPOS across the state of Texas to staff their model activities.</p> <p>Identifying specific staffing options by model stage will be covered in Lesson 5.</p>
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Matching Staff Skill Sets to Model Tasks (Exhibit)



PARTICIPANT HANDBOOK Lesson 4: Resources

Matching Staff Skill Sets to Model Tasks (Exhibit)

KEY CONCEPT: Assign staff to tasks by skillset, not job title. Be creative about utilizing staff from partner agencies.

Exhibit 4.a General Guidelines for Assigning Staff to Modeling Tasks, by Staff Skill Set

Modeling Task	Staff Skill Set								
	Crackerjack Modeler	Senior Modeler	Beginner Modeler	Transportation Planner/Engineer w/ GIS Skills	Transportation Planner/Engineer	GIS Technician	Administrative	Intern	
Networks	✓	✓	✓	✓	*	*	*	*	
Demographics	✓	✓	✓	✓	*	*	*	*	
Model Maintenance/ Application	✓	✓							
Model Development	✓								

NOTE: These are not Job Titles, but skill sets.
* Can assist with model tasks, but may not be able to do complete task in TransCAD.

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The next exhibit presents the modeling tasks and staff skill sets that are most appropriate for each of the modeling tasks.

Note that these are NOT job titles, but existing skill sets. They should also not imply that someone can't learn a new skill set.

KEY CONCEPT: Assign staff to tasks by skillset, not job title. Be creative about utilizing staff from partner agencies.

Exhibit 4.a General Guidelines for Assigning Staff to Modeling Tasks, by Staff Skill Set

Modeling Task	Staff Skill Set								
	Crackerjack Modeler	Senior Modeler	Beginner Modeler	Transportation Planner/Engineer w/ GIS Skills	Transportation Planner/Engineer	GIS Technician	Administrative	Intern	
Networks	✓	✓	✓	✓	*	*	*	*	
Demographics	✓	✓	✓	✓	*	*	*	*	
Model Maintenance/ Application	✓	✓							
Model Development	✓								

NOTE: These are not Job Titles, but skill sets.

** Can assist with model tasks, but may not be able to do complete task in TransCAD.*

Topic 4.3 Data Resources

30 Minutes

Data Resources Overview

- Data needs
 - Network, TAZs, demographics
 - Other data for models
- Data resources
 - Public
 - Private

Typically MPO Responsibility



Managing the TDM Development Process 190

Here is the big picture of data needs for models. We will focus on the data needs for network, TAZs, demographics here, because those are the model inputs MPOs are typically responsible for.

Data to Support Model Inputs Typically Expected of MPOs

Data Base Year Network

- Previous base year network
- Recently constructed projects
 - Get with other local agencies
- Drive out the network
 - Two-person approach is best
 - Annotating hard-copy maps is typical approach
- Review aerial imagery



Managing the TDM Development Process 191

These slides summarize the data and approach to support each of the primary model inputs the MPO is responsible for. This slide presents the data sources to support base year network development.

Refer also to Chapter 3, where these model inputs were described, as well as the reference Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook, TxDOT and TTI, February 2007.

Data TAZ Geography

- Prior model traffic analysis zones
- Base year model network
- Forecast year model network
- Most recent census data block group geography
- Other helpful boundaries
 - Major water features
 - Rail



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And for the forecast year network.

<p>Data TAZ Geography</p> <ul style="list-style-type: none"> ▪ Prior model traffic analysis zones ▪ Base year model network ▪ Forecast year model network ▪ Most recent census data block group geography ▪ Other helpful boundaries <ul style="list-style-type: none"> • Major water features • Rail  <p style="font-size: small;">Managing the TDM Development Process 193</p>	<p>For TAZ geography.</p>
<p>Data Base Year Demographics</p> <ul style="list-style-type: none"> ▪ TAZ geography ▪ Population data estimates/control totals (Texas State Data Center) ▪ One-Stop Demographic Data Analysis Tool ▪ Most recent Census data by block group ▪ Other ways to account (building permits or septic system permits) ▪ Employment data (Texas Workforce Commission) ▪ Local knowledge  <p style="font-size: small;">Managing the TDM Development Process 194</p>	<p>For base year demographics.</p>
<p>Data Forecast Year Demographics</p> <ul style="list-style-type: none"> ▪ SDC forecast year control totals <ul style="list-style-type: none"> • MPO needs to choose • Recommendation ▪ Local plans/knowledge  <p style="font-size: small;">Managing the TDM Development Process 195</p>	<p>And for forecast year demographics.</p>

Data Package Typically Provided to MPOs by TxDOT

<p style="font-size: 1.2em; margin: 0;">Data Package Typically Provided to MPOs for Inputs Development (Exhibit)</p>  <p style="font-size: 0.8em; margin: 0;">Managing the TDM Development Process</p>	<div style="border: 1px solid black; padding: 5px;"> <p style="font-size: 0.8em; margin: 0;">INSTRUCTOR HANDBOOK Lesson 4: Resources</p> <p style="font-size: 0.8em; margin: 0;">Exhibit 4.b Data Package Typically Provided to MPO for Model Inputs Development</p> <p style="font-size: 0.8em; margin: 0;">Prior Model Network and TAZ Files in TransCAD Format</p> <p style="font-size: 0.8em; margin: 0;">Prior Model Network Hard-copy Plot, by Facility Type and Lanes for Mark-up</p> <p style="font-size: 0.8em; margin: 0;">2 copies: mark up both the same, then keep 1 at MPO, send other to TSP</p> <p style="font-size: 0.8em; margin: 0;">Texas Workforce Commission (TWC) Data</p> <p style="font-size: 0.8em; margin: 0;">Other GIS Data Sets</p> <ul style="list-style-type: none"> • County(ies) Boundary • MPO Boundary • Streets Layer • Bridges • Railroads • Rivers • Other Water Features <p style="font-size: 0.8em; margin: 0;">Managing the Travel Model Process 138 TxDOT 09/13</p> </div>	<p>The following exhibit lists the data typically provided to each MPO at an initial Model Coordination Meeting, for the purpose of Model Inputs Development.</p>
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Exhibit 4.b Data Package Typically Provided to MPO for Model Inputs Development

Prior Model Network and TAZ Files in TransCAD Format

Prior Model Network Hard-copy Plot, by Facility Type and Lanes for Mark-up

2 copies: mark up both the same, then keep 1 at MPO, send other to TPP

Texas Workforce Commission (TWC) Data

Other GIS Data Sets

- County(ies) Boundary
- MPO Boundary
- Streets Layer
- Bridges
- Railroads
- Rivers
- Other Water Features

Other Data Resources to Develop a Travel Forecasting Model

<p>Census Data Resources</p>  <p>Managing the TDM Development Process 197</p>	<p>Census data</p>
<p>State of Texas Data Resources</p>  <p>Managing the TDM Development Process 198</p>	<p>Texas-provided data</p>
<p>Activity: Other Potential Data Sources</p>  <p>Managing the TDM Development Process 199</p>	<p>Activity: Other potential data sources (ISDs, utilities, city permitting, etc.) (see exhibit)</p>



KEY CONCEPT: The information above is not exhaustive – be creative in thinking about data resources, especially as technology and communications facilitate data exchange.

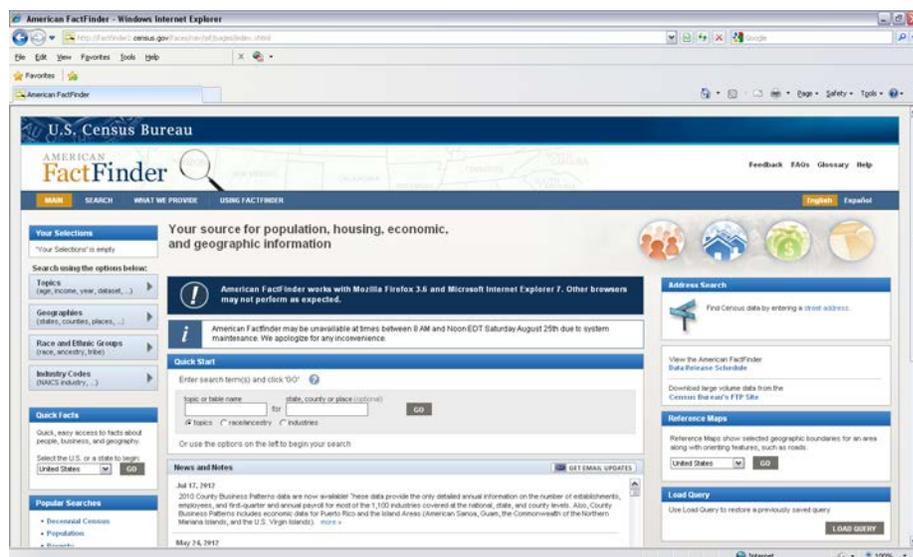
Exhibit 4.c U.S. Census Bureau Data Resources

These datasets and how to use them are explored in extensive detail in *Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook*, TxDOT and TTI, February 2007.

American Factfinder2

Source for population, households, and income data.

<http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>



Census 2010 Geographic Products and Information

Source for the GIS geography (shapes) to correspond to the data.

<http://www.census.gov/geo/www/2010census/>

Census Transportation Planning Products Home Page

Source for transportation planning data derived from Census data.

http://www.fhwa.dot.gov/planning/census_issues/ctpp/

Exhibit 4.d State of Texas Data/Analysis Resources Available to MPOs

- A. Population Data (Texas State Data Center)
<http://txsdc.utsa.edu/>
- B. Employment Data (Texas Workforce Commission)
(coordinate use agreement through TxDOT-TPP)
- C. Traffic Data and Analysis (TxDOT)
 - 1. Base Year Saturation Counts
 - 2. Counts for Freeway Facilities – mainlanes, ramps, frontage roads
 - 3. External Station Counts and Forecasts
 - 4. Vehicle Classification Data
- D. Travel Survey Data and Analysis (TxDOT)
 - 1. Trip production and attraction rates by trip purpose (vehicle and person)
 - 2. Average trip lengths
 - 3. External travel
 - 4. Commercial vehicles
 - 5. Special generator trip rates
 - 6. Auto occupancy factors
 - 7. Mode of travel
- E. Functional Classification Data (coordinated effort with District and MPO)
- F. Texas Statewide Analysis Model (TxDOT) (for externals in some cases)
- G. Air Quality Analysis for Non-Attainment and Maintenance Areas (TxDOT)

Activity 4.1 Other Data Resources

What are some other agencies, online, or other resources for data for modeling?

Think creatively!

Ideas for instructor:

Cities long-range planning

City/county development permitting

Local school districts

Septic tank permitting

Water resources management agencies (e.g., Texas Water Development Board, LCRA, local water resources agencies)

Utilities

Local developers

Texas Natural Resources Information System (TNRIS) at:

<http://www.tnr.is.org/>

Suggested Break Here

Topic 4.4 References and Guidelines

15 Minutes

Texas-Specific References & Guidelines (Exhibit)

Managing the TDM Development Process 200

Texas-Specific Guidelines and References Available to MPOs

See exhibit.

General References & Guidelines (Exhibit)

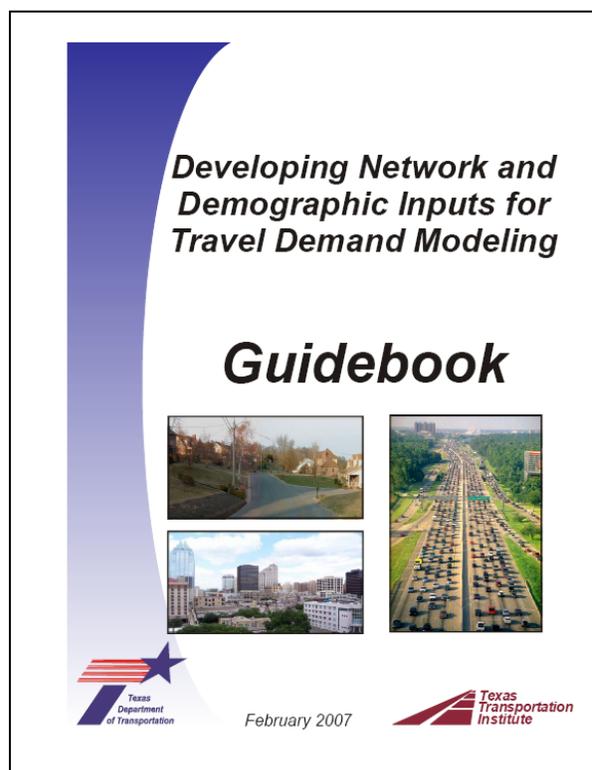
Managing the TDM Development Process 201

General Guidelines and References Available to MPOs

See exhibit.

Exhibit 4.e Texas-Specific Guidelines and References Available to MPOs

Developing Network and Demographic Inputs for Travel Demand Modeling Guidebook, TxDOT and TTI, February 2007.



Memo: Aggregating Census Data (January 2012)

Memo: Geo-coding TWC Data (January 2012)

Memo: Using Dataferret

Memo: Aggregating Census Data

ATOM2 User Manual, Texas Department of Transportation, February 2001.

Texas Travel Demand Model Applications Guidebook, Texas Department of Transportation, 2007.

TripCal5 Inputs Manual, Texas Transportation Institute, 1999.

TripCal5 User's Manual, Texas Department of Transportation, 1990.

Exhibit 4.f General Guidelines and References Available to MPOs

Library List

NCHRP 716 (Update to NCHRP 365 released in May 2012): Travel Demand Forecasting: Parameters and Techniques

General guide to travel forecasting

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_716.pdf

Other online references such as the Travel Forecasting Resource currently under development by TMIP/FHWA/FTA.

Online Community

TMIP Website

Various resources for transportation modeling

<http://tmiponline.org/Services.aspx>

Ask an Expert option

The image shows a screenshot of a web form titled "Ask an Expert" on the TMIP website. The form is overlaid on a background image of a train. The form fields include:

- Your email:** A text input field with an envelope icon.
- Your question:** A large text area for entering the question.
- Include a snapshot of the current page** (with a blue plus icon).
- Powered by **engage** logo.
- Email us** button.

 To the right of the form, there are three buttons with icons:

- Become a Member** (with a person icon and a green plus sign).
- Ask-an-Expert** (with a person icon and a blue question mark).
- Site Feedback** (with a person icon and a speech bubble).

TMIP Listserv: Discussion list for transportation planning

To subscribe, send mail to LISTSERV@LISTSERV.TMIPONLINE.ORG with the command (paste it!) in the e-mail message body: SUBSCRIBE TMIP-L

Topic 4.5 Training

30 Minutes

Training Available to MPOs on Modeling (Exhibit)



Managing the TDM Development Process

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Lesson 4: Resources INSTRUCTOR HANDBOOK

Exhibit 4.g Model Training Available to MPOs

- TxDOT (or under contract through Texas A&M Transportation Institute)
- A. General TransCAD Training (TT)
 - B. Introduction to Travel Demand Modeling (TT)
 - C. Model Inputs Development Training (TT)
 - D. Model Application/Alternatives Analysis Training (TT)
- Contact TxDOT TFP staff or the TransCAD Help Desk:
TFP_TRANSCAD_HELPDESK@txdot.gov, or 512/486-5177
- NIJ Introduction to Urban Travel Demand Forecasting Course
http://www.nhtsa.gov/training/course_detail.asp?courseID=151
- Free version of materials available, but for course to be offered in Texas, contact TxDOT TFP staff or the TransCAD help desk:
TFP_TRANSCAD_HELPDESK@txdot.gov, or 512/486-5177
- TMP Webinars
 See <http://transportmatters.com>
- Caliper Corporation (TransCAD software developer)
 Travel Demand Modeling with TransCAD and On-site Training Options
<http://www.caliper.com/>

TxDOT 2013 144 Managing the Travel Model Process

See exhibit. In Lesson 5, we discuss who of MPO staff should attend different types of training and when in the process.

Exhibit 4.g Model Training Available to MPOs

TxDOT (or under contract through Texas A&M Transportation Institute)

- A. General TransCAD Training (TTI)
- B. Introduction to Travel Demand Modeling (TTI)
- C. Model Inputs Development Training (TTI)
- D. Model Application/Alternatives Analysis Training (TTI)

Contact TxDOT-TPP staff or the TransCAD Help Desk:

TPP-TRANSCAD-HELPEDESK@txdot.gov or 512/486-5177

NHI Introduction to Urban Travel Demand Forecasting Course

http://www.nhi.fhwa.dot.gov/training/course_detail.aspx?num=FHWA-NHI-152054&topicnum=151

Free version of materials available, but for course to be offered in Texas, contact TxDOT-TPP staff or the TransCAD Help Desk:

TPP-TRANSCAD-HELPEDESK@txdot.gov or 512/486-5177

TMIP Webinars

See <http://tmiponline.org/Services.aspx>

Caliper Corporation (TransCAD software developer)

Travel Demand Modeling with TransCAD and On-site Training Options

<http://www.caliper.com/>

Topic 4.6 Model Software Licensing and Support

15 Minutes

Texas Package & TransCAD Licensing Explained (Exhibit)

Lesson 4: Resources

INSTRUCTOR HANDBOOK

Exhibit 4A The Texas Package and TransCAD Software

"Texas Package"

Trip Generation

Trip Distribution

Highway Assignment

Minimum Software Needs to Run the Texas Package

- TransCAD: The software should be loaded on one computer only, for the user most likely to do the modeling work.
 - Typically the person who does GIS work, if applicable
 - When the software is loaded, write down here:
 - TransCAD license serial number of the installation disk: _____
 - TransCAD USB Key serial number here: _____
 - TransCAD Version: _____ and Build Number: _____ (these are on the installation disc, or from the help menu)
- TransCAD USB Key
 - The TransCAD USB Key is VALUABLE and EASILY LOST
 - Find a large, highly visible key chain to attach to it
 - During times when TransCAD is not being used consistently, identify a location where it should be kept
- Texas Package Program Suite (ASD-on Menu)
 - (see next page for more info)

TxDOT 0913 148 Managing the Travel Model Process 203

Texas Package and TransCAD Software (explanation of need for both)

See exhibit

Other Texas Package Software Requests (Exhibit)

Lesson 4: Resources

INSTRUCTOR HANDBOOK

Exhibit 4: The Texas Package Software Request Forms (TripCal and ATOM2)

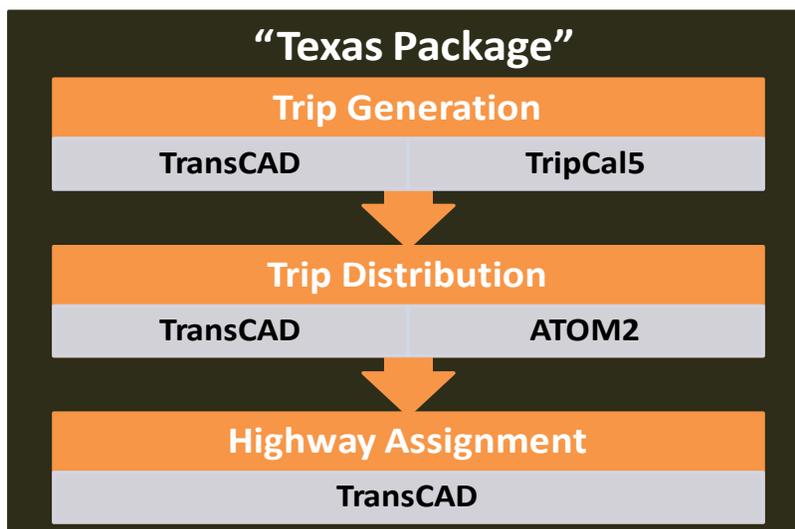
TripCal and ATOM software packages are proprietary to TxDOT. Their distribution is controlled through individual contract by user. Request contract forms from TxDOT 0913. These forms need to be completed and submitted in hardcopy format with signature of the MPO Director.

TxDOT 0913 148 Managing the Travel Model Process 204

Texas Package Software Request Forms (TripCal and ATOM2)

See exhibit

Exhibit 4.h The Texas Package and TransCAD Software



Minimum Software Needs to Run the Texas Package

- TransCAD: The software should be loaded on one computer only, for the user most likely to do the modeling work.

- Typically the person who does GIS work, if applicable
- When the software is loaded, write down here:

TransCAD license serial number off the installation disk:

TransCAD USB Key serial number here: _____

TransCAD Version: _____ and Build Number: _____ (these are on the installation disc or from the Help menu)

- TransCAD USB Key
 - The TransCAD USB Key is VALUABLE and EASILY LOST
 - Find a large, highly visible key chain to attach to it
 - During times when TransCAD is not being used consistently, identify a location where it should be kept



- Texas Package Program Suite (Add-on Menu)

(see next page for more info)

(exhibit continued)

If the user will be running ALL steps of the Texas Package (including Trip Generation and Trip Distribution), they will also need:

- TripCal5 Software (proprietary to TxDOT)
 - ATOM2 Software (proprietary to TxDOT)
-

Where to Get TransCAD and Other Texas Package Software

1. Typically, TxDOT allocates two (2) TransCAD licenses per District. District staff then work with the MPO to allocate the licenses to the appropriate local staff (District, MPO, local partner agency).
2. Check if it is already loaded. If so, find the USB key. Open up the Help menu and determine which version and build number you have. Contact the Help Desk with this information to determine if you are using the current version and build.
3. Contact TxDOT-TPP or the TransCAD Help Desk to verify or install the software. Installation is not immediate, as of 2012, installation involves someone traveling to your MPO to install the software. Please keep this potential delay in mind.

Help Desk: TPP-TRANSCAD-HELPDESK@txdot.gov

How to Get Help with TransCAD Software

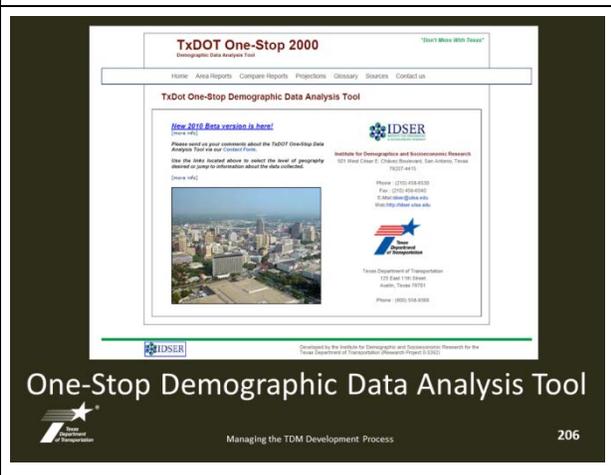
Contact the Help Desk: TPP-TRANSCAD-HELPDESK@txdot.gov

Topic 4.7 Other Resources/Assistance

10 Minutes

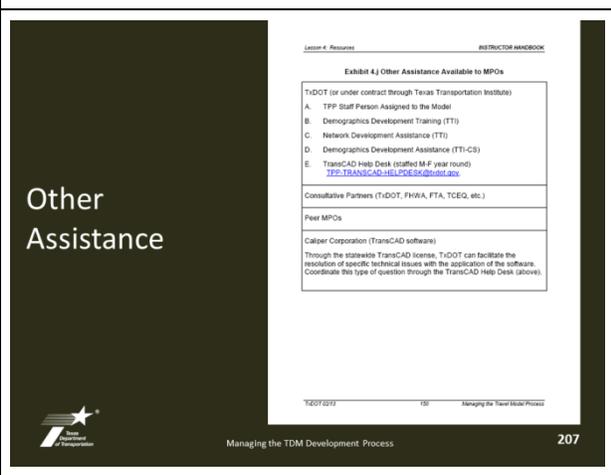


Outside of the categories covered above, there are other resources & assistance available to Texas MPOs for the development of their models.



One tool provided is the TxDOT One-Stop Demographic Data Analysis Tool (beta) is a tool designed at the University of Texas at San Antonio to give TxDOT and MPOs a one-stop location to derive general demographic information. It is one resource that TxDOT has developed to assist MPOs in this inputs development process.

A link to this tool is provided in the Helpful Resources section at the end of this Lesson.



And other assistance provided.

See exhibit.

Exhibit 4.j Other Assistance Available to MPOs

<p>TxDOT (or under contract through Texas Transportation Institute)</p> <ul style="list-style-type: none">A. TPP Staff Person Assigned to the ModelB. Demographics Development Training (TTI)C. Network Development Assistance (TTI)D. Demographics Development Assistance (TTI-CS)E. TransCAD Help Desk (staffed M-F year round) TPP-TRANSCAD-HELPDESK@txdot.gov.
<p>Consultative Partners (TxDOT, FHWA, FTA, TCEQ, etc.)</p>
<p>Peer MPOs</p>
<p>Caliper Corporation (TransCAD software)</p> <p>Through the statewide TransCAD license, TxDOT can facilitate the resolution of specific technical issues with the application of the software. Coordinate this type of question through the TransCAD Help Desk (above).</p>

Topic 4.8 Other Helpful Resources

TransCAD Help Desk

Provided by TxDOT, staffed M-F year round

TPP-TRANSCAD-HELPDESK@txdot.gov or 512/486-5177

TxDOT One-Stop Demographic Data Analysis Tool (beta)

Tool designed to give TxDOT and MPOs a one-stop location to derive general demographic information.

<http://www.txdot.gov/business/demographic.htm>

TxDOT Transportation Planning Manual

Guidelines for the planning process.

<http://onlinemanuals.txdot.gov/txdotmanuals/pln/pln.pdf>

***TxDOT-TPP Developing Network
and Demographic Inputs for
Travel Demand Modeling
Guidebook, TxDOT and TTI, February 2007.***



Topic 4.9 Lesson Wrap-Up

5 Minutes

On the previous page is a list of Other Helpful Resources that cover the topics in this lesson.

 <p>The diagram is titled "Lesson 4 Learning Objectives" and features a central blue box labeled "Resources" with a downward arrow pointing to a "Guidebook" icon. Below the "Guidebook" are four categories: "Staff" (with a photo of people in a meeting), "Data" (with a grid of numbers), "Guidelines/Instructions" (with a document icon), and "Training" (with a photo of people in a classroom). The bottom left corner has the Texas Department of Transportation logo and the text "Managing the TDM Development Process". The bottom right corner has the number "208".</p>	<p>At the beginning of this lesson, we set the following learning objectives. At this point, you would be able to: (read the objectives).</p> <p>Does anyone have any questions about this material?</p>
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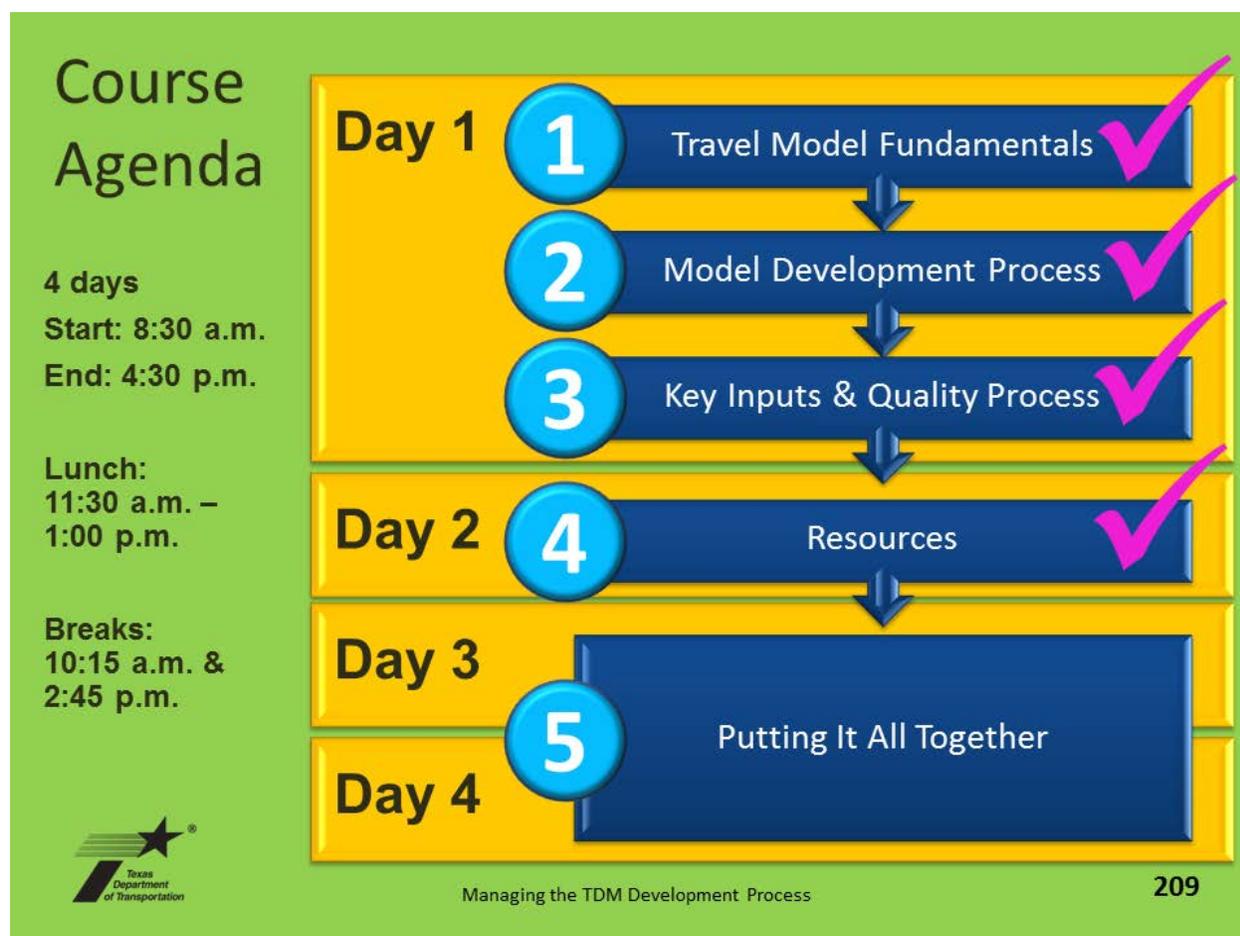
Suggested Break Here

Lesson 4 Reinforcement Questions

After break, before starting the next lesson, review these questions (and answers) as a group:

1. What types of staffing options do MPOs have available to them for completing model tasks? Answer: MPO staff, local partner agencies, consultants, and TxDOT-TPP in some instances for certain tasks)
2. What types of datasets are available for MPOs and what agencies are the primary sources? Answer: various, primarily U.S. Census products and TxDOT or other state agencies such as the Texas Workforce Commission and State Data Center.

Where Are We?



Lesson 5: Putting It All Together

Learning Objectives

Putting It All Together

Identify
Unique
MPO
Challenges

Map the
Critical
Path

Make It
Work

Lesson Materials Follow

Lesson Total Time: 3 Hours, 30 Minutes (in 3 parts)

At the end of this training course, participants will be able to:
(read from slide)

Topic 5.1 Lesson Overview

5 Minutes

(Describe the overall plan for 3, 4, 5.)

Remember the 3 Cs?

Deciding when to bring in TPP on these decisions is an important consideration. The MPO Director should work through some of these materials by themselves to think about MPO resources. Be sure to get TxDOT involved during the planning stages, however, in particular with regard to any expectations of TxDOT resources/commitments.

<p>Lesson 5 Components</p> <ul style="list-style-type: none"> ▪ One size does not fit all ▪ The model as a project <ul style="list-style-type: none"> • Choosing a project manager • Plan the work and work the plan (then check it) ▪ Best practice strategies ▪ Key talking points by audience  <p style="text-align: right;">Managing the TDM Development Process 212</p>	
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Topic 5.2 “One Size Does Not Fit All”

15 Minutes

<p>MPOs’ General Issues with Models</p>   <p style="text-align: right;">Managing the TDM Development Process 214</p>	
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<p>One Size Does Not Fit All</p> <ul style="list-style-type: none"> ▪ Largest MPOs <ul style="list-style-type: none"> • Independent with respect to model development • Work with TxDOT to gather travel surveys and count data ▪ Other large MPOs are developing models with TxDOT data resources and limited TxDOT help ▪ Some MPOs have staff resources/interest ▪ Some MPOs have little staff resources/interest  <p style="text-align: right;">Managing the TDM Development Process 215</p>	
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One Size Does Not Fit All, cont.

- Even among small and medium-sized MPOs, there is variation:
 - One MPO has a separate IAC with TTI to provide guidance on model inputs
 - Several MPOs use consultants to develop model inputs
 - Many of the MPOs develop their model inputs in-house with current staff



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Specific Issue

For small and medium-sized MPOs across the United States, there is a **well-documented resource constraint**, hence the necessity for other strategies—developing innovative methodologies, scaling efforts to the resources available, and prioritizing.



Managing the TDM Development Process 217

Discuss this general issue.

Now, transition to discussion of YOUR MPO with next activity.

What Are Your MPO's Unique Challenges? (Activity)



Managing the TDM Development Process 218

Work through activity in next exhibit.

<p>What Does Success Mean for You? (Activity)</p>  <p>Managing the TDM Development Process</p>	<p>Lesson 5: Putting It All Together PARTICIPANT HANDBOOK</p> <p>Activity 5.2 What Does a Travel Model Success Mean for YOU? (Discuss as group)</p> <div data-bbox="477 321 721 573" style="border: 1px solid black; height: 120px;"></div> <p>TxDOT 09/13 42 Managing the Travel Model Process</p> <p>219</p>	
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KEY CONCEPT: YOUR MPO's unique challenges today will change over time, but hopefully for the better.

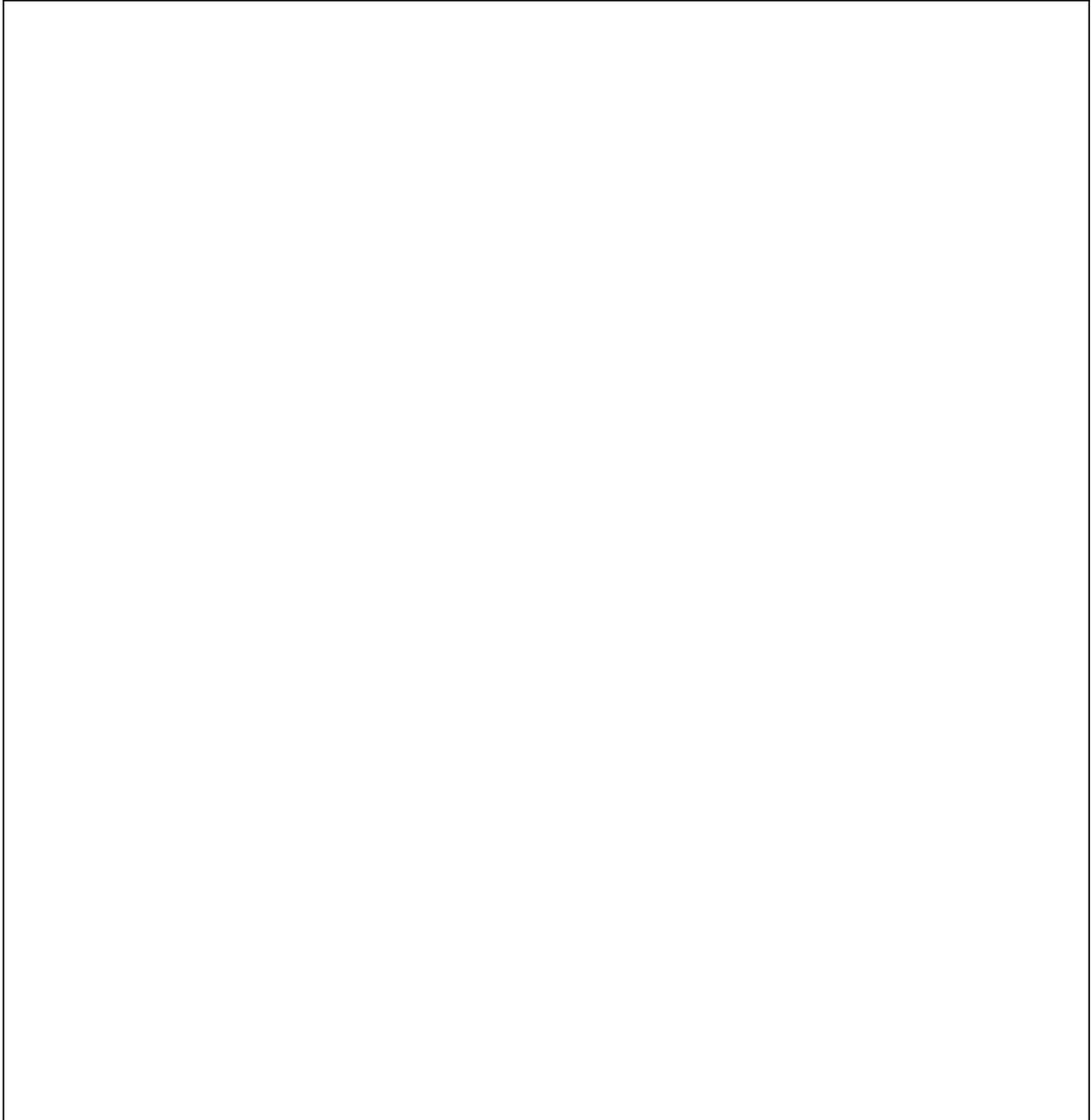
Activity 5.1 Identifying Your MPO's Unique Challenges

Process	Resource Constraints	Policy Board Understanding
Technical Complexity	Staff	Model Use
Multiple Players	Technical Expertise	Process Complexity

Process	Resource Constraints	Policy Board Understanding

Activity 5.2 What Does a Travel Model Success Mean for YOU?

(discuss as group)

A large, empty rectangular box with a thin black border, intended for group discussion or notes.

Topic 5.3 Challenge: Travel Model Scheduling

20 Minutes

Timelines for a Single Model under Development

In the two exhibits below, the count cycle (which drives the model development cycle) and the MTP cycle line up nicely. Note the compression in the second exhibit that allows the MPO to achieve the schedule.

Exhibit 5.a Ideal Timeline: 5-Year Count Cycle = 5-Year MTP Cycle

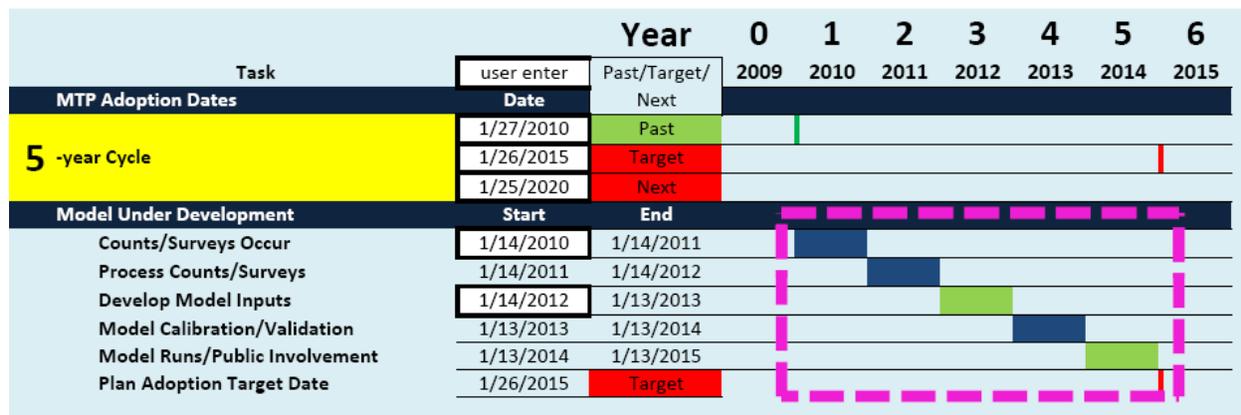
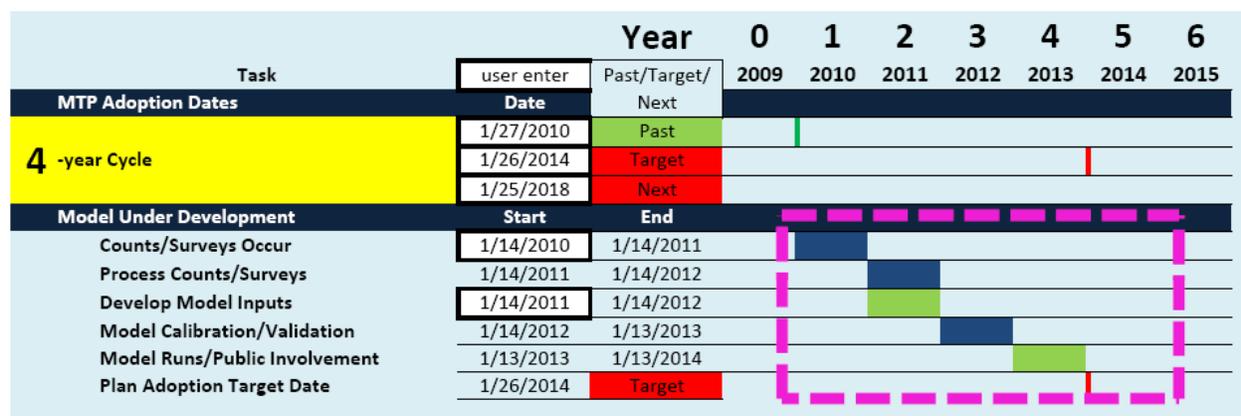
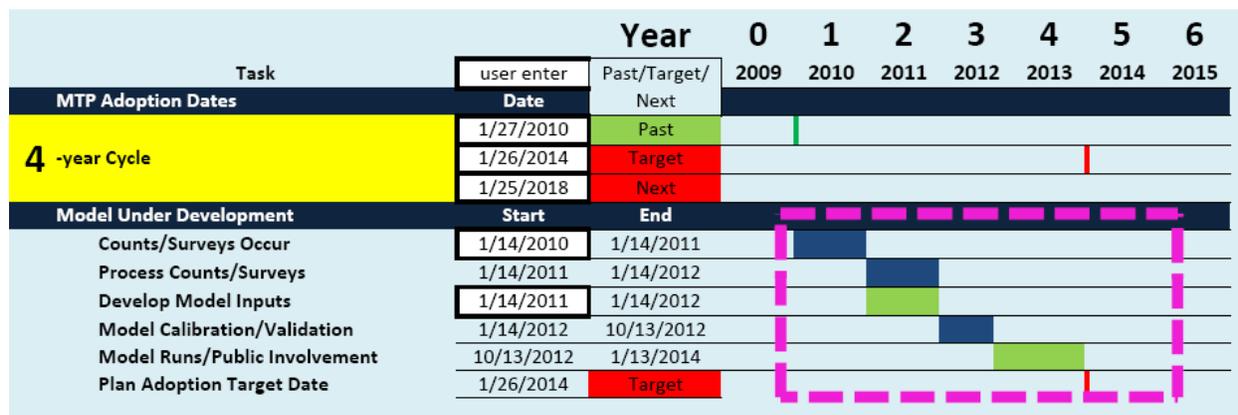


Exhibit 5.b Example Timeline: 5-Year Count Cycle, 4-Year MTP Cycle



The next exhibit even demonstrates areas of flexibility in the schedule, if some tasks are performed more aggressively.

Exhibit 5.c Example Timeline: 5-Year Count Cycle, 4-Year MTP Cycle, More PI Time Needed



Timelines Considering the “3 Models” Concept

The following exhibits demonstrate how quickly the timelines can get off-track, even when everyone is doing the model tasks according to the original 5-year schedule.

Exhibit 5.d Ideal Timeline: 5-Year MTP Cycle, 3 Models: In this example, the count cycle (which drives the model development cycle) and the MTP cycle line up nicely for all three models, current, under development, and next model.

Exhibit 5.e Example Timeline: 4-Year MTP Cycle, 3 Models: This example demonstrates how the 4-year MTP cycle quickly gets off track with the 5-year count/model cycle. The model under development is a candidate for accelerating tasks to still meet the MTP need.

Exhibit 5.f Example Timeline: 4-Year MTP Cycle, 3 Models, After: This example demonstrates that the next model, however, represents a seriously challenging schedule.

Exhibit 5.d Ideal Timeline: 5-Year MTP Cycle, 3 Models

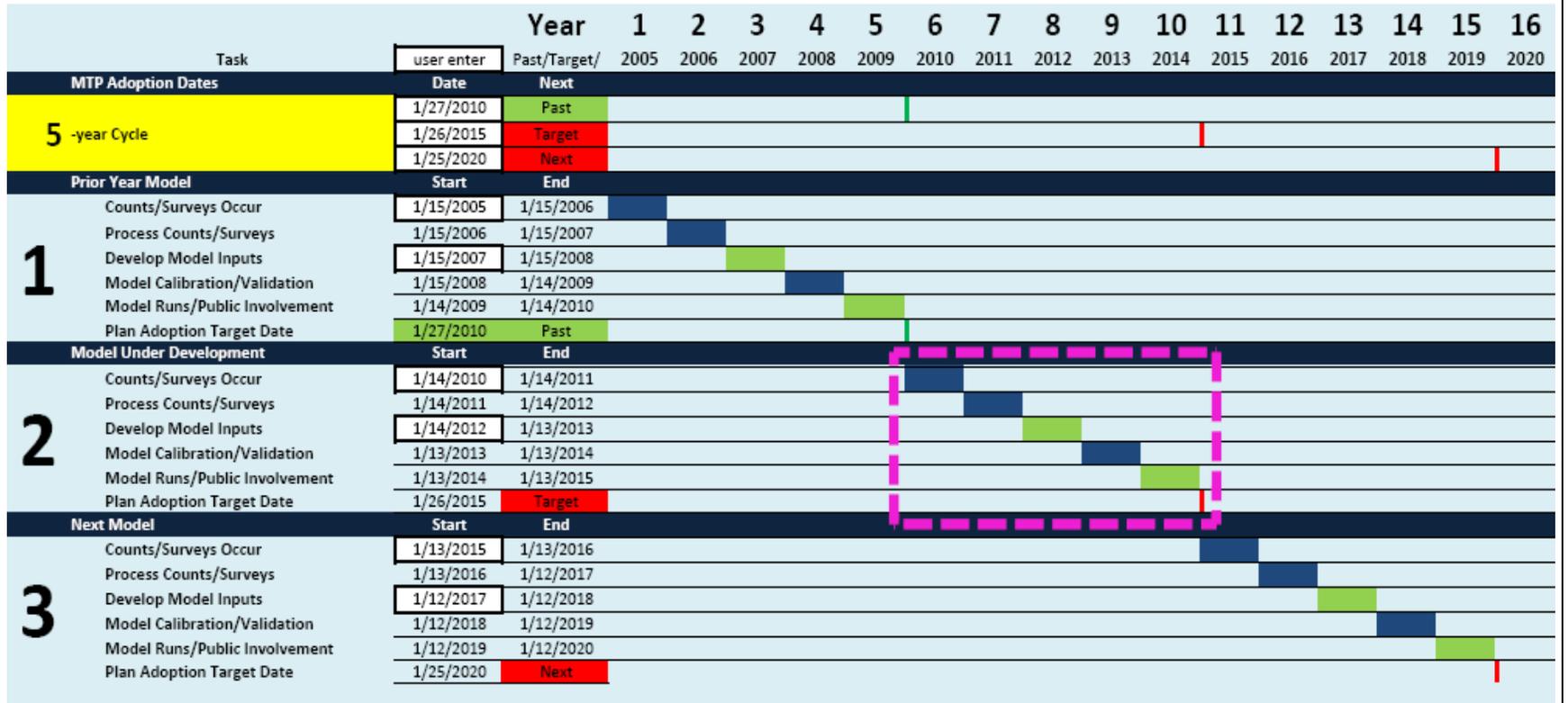


Exhibit 5.e Example Timeline: 4-Year MTP Cycle, 3 Models

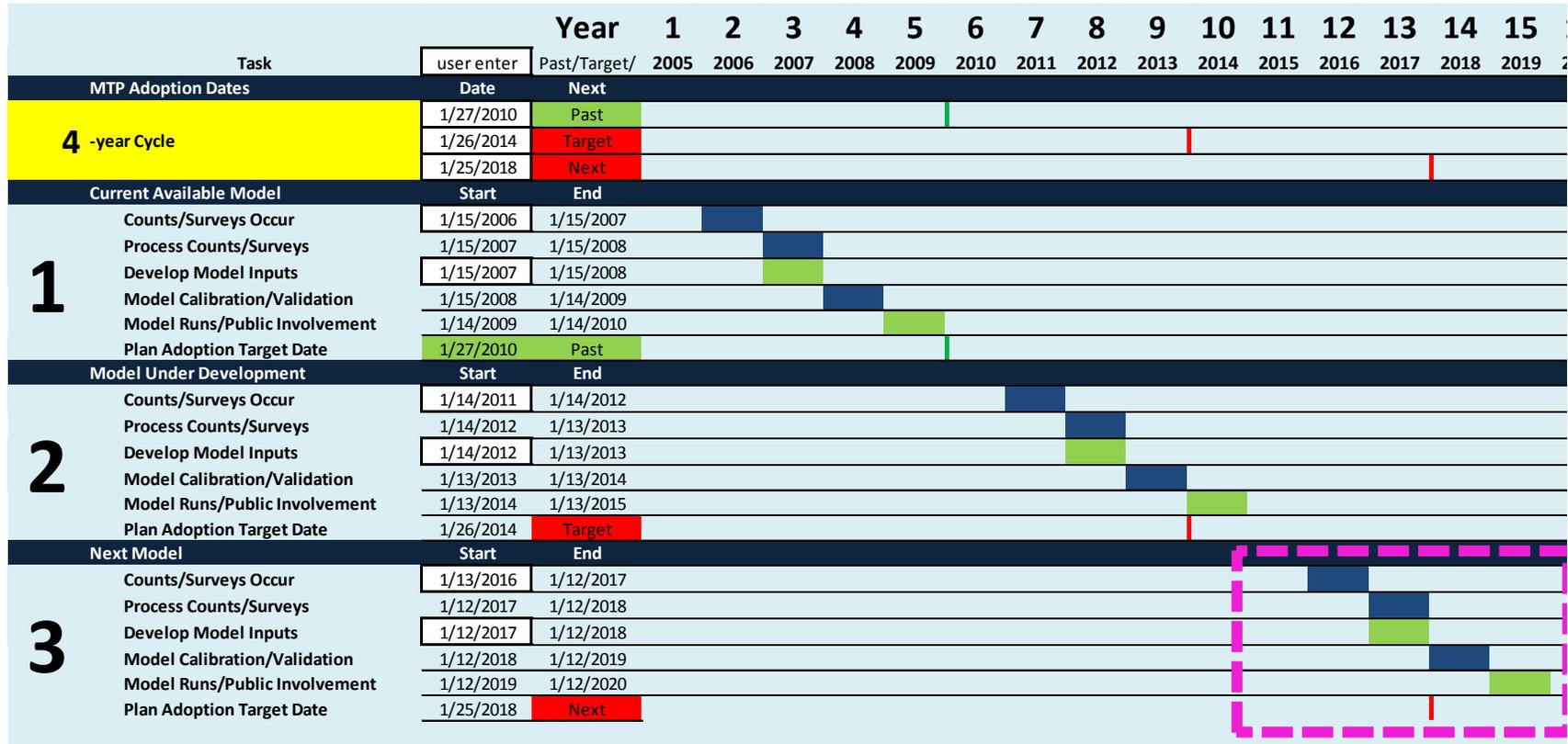
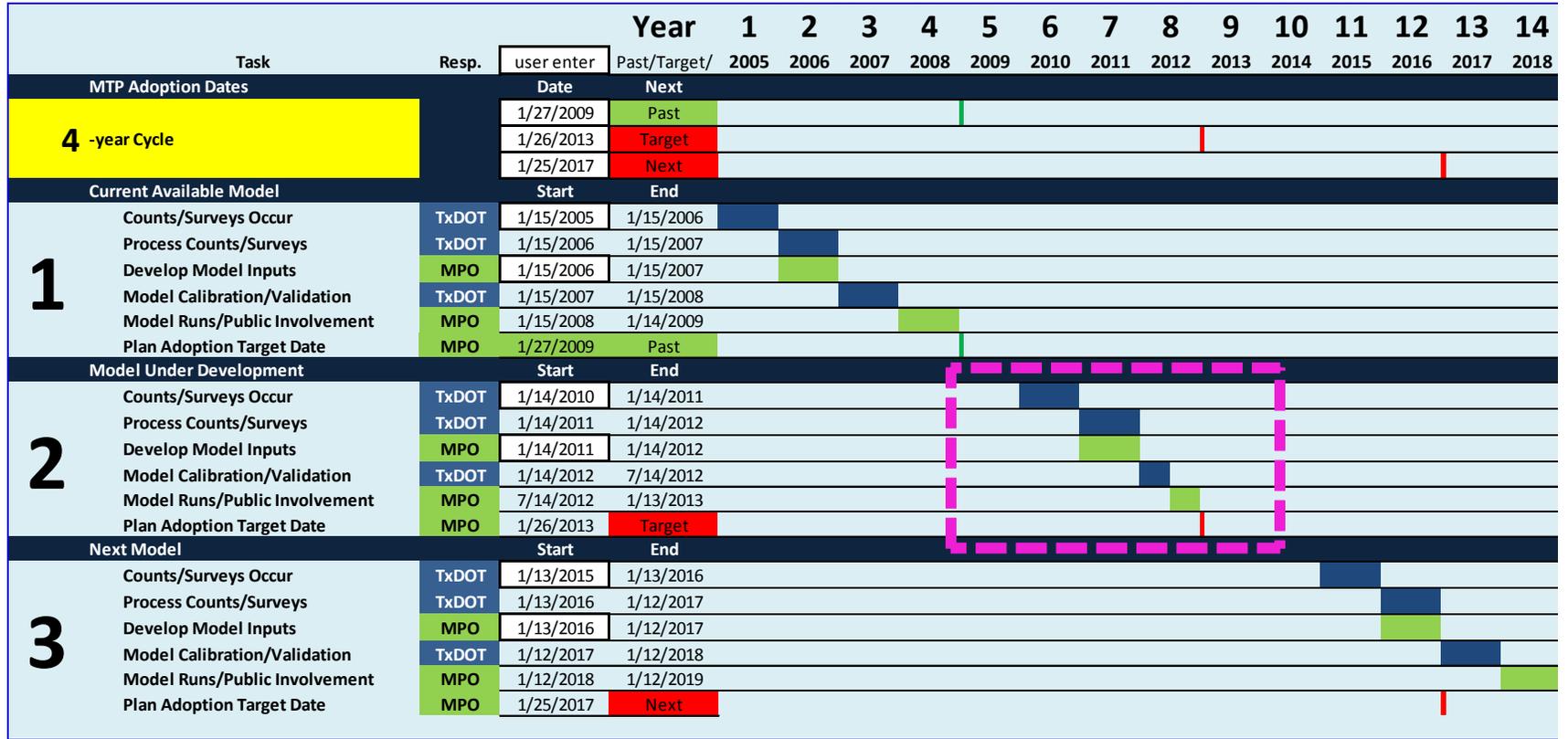


Exhibit 5.f Example Timeline: 4-Year MTP Cycle, 3 Models, After “Fix”



Topic 5.4 The Model as a Project

20 Minutes

What Is a Project?

A project is a one-time or cyclic endeavor involving:

- An established objective
- A defined life span with a beginning and an end
- Usually, the involvement of several departments and professionals
- Specific time, cost, and performance requirements



Managing the TDM Development Process

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The Model as a Project

MPO model development is cyclic, involving:

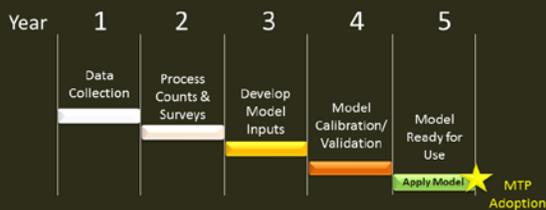
- An established objective—to apply for MTP
- A defined life span with a beginning and an end
- Usually, the involvement of several departments and professionals—and agencies
- Specific time, cost, and performance requirements



Managing the TDM Development Process

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Ideal MTP/Model Schedule

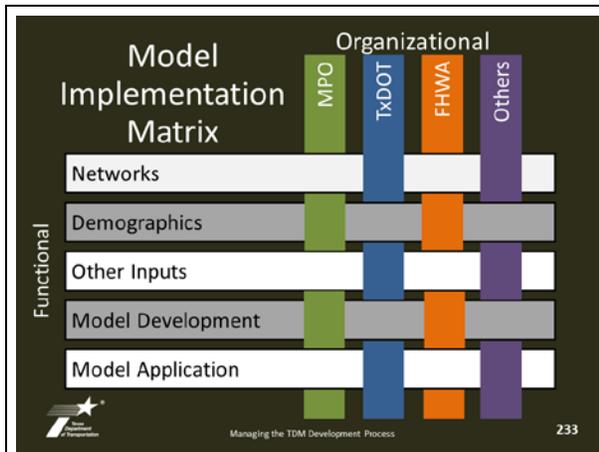


This idealized schedule incorporates time for schedule delays and still allows a model to be completed before the next cycle of saturation counts occurs. If the MTP is due for adoption soon after, the cycles align nicely.



Managing the TDM Development Process

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Walk through concept here:

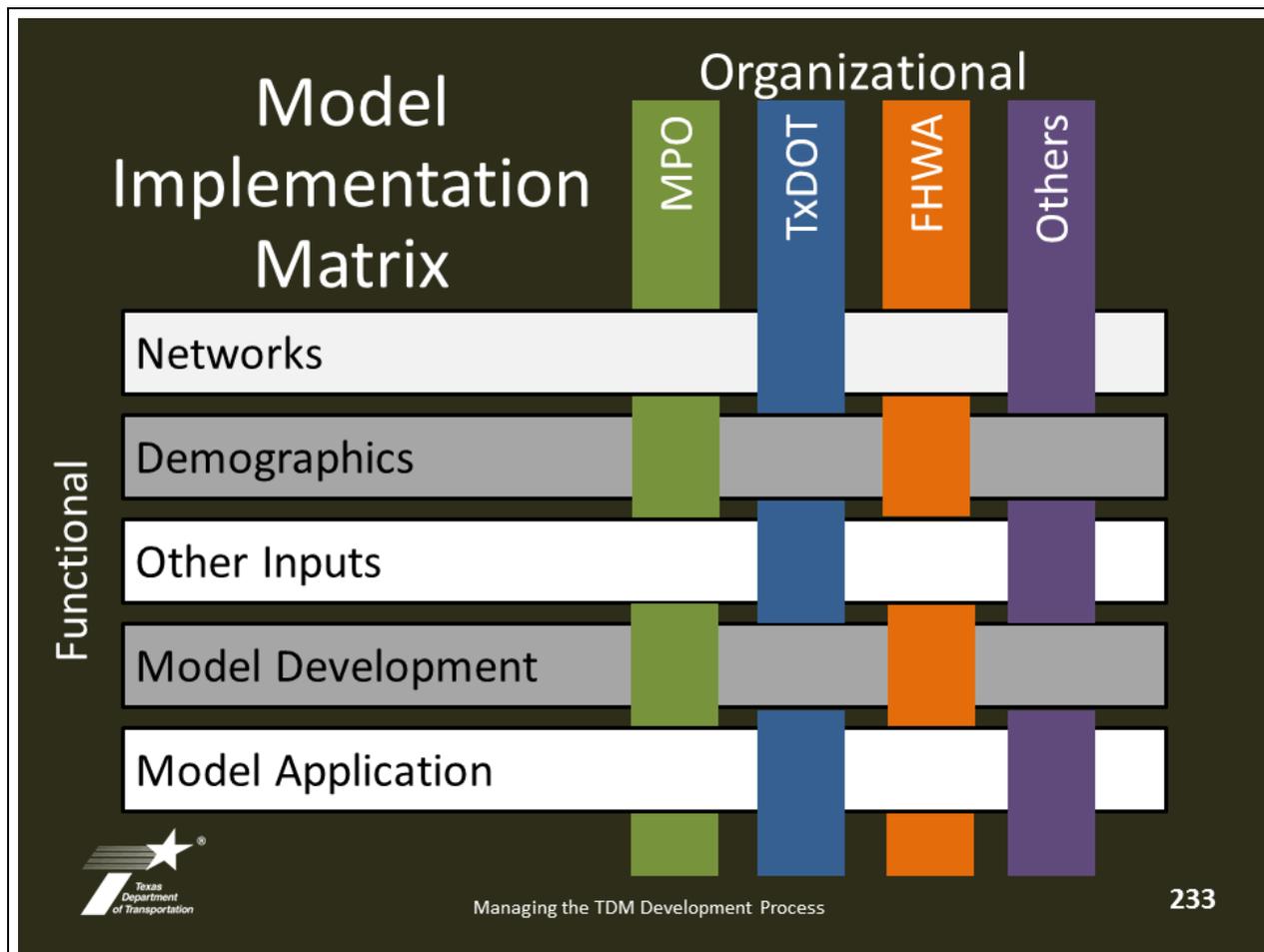
These interwoven nature of the model development process is a challenge.

Who Is the Project Manager for Your MPO's Model? (Activity)

Managing the TDM Development Process 234

See exhibit and activity.

Activity 5.3 Identifying a Project Manager for the Model



Let's discuss some considerations for choosing the Project Manager for the model...

Let's brainstorm the answers to the following questions as a group, but write-down names for your own MPO. Remember to not restrict yourself to MPO staff.

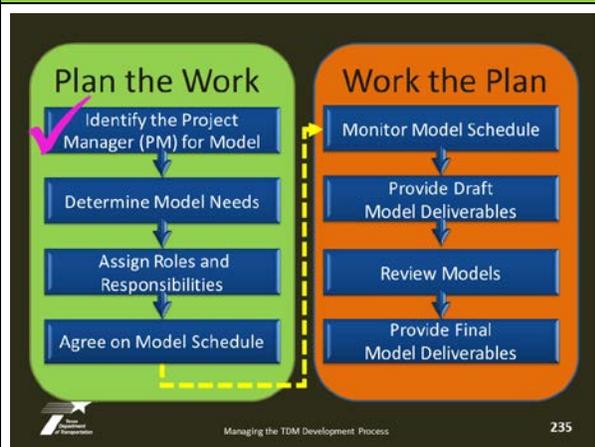
Who has the knowledge of how the model will be used as part of the MTP process?

Who has basic knowledge of a model purpose, use, and application, as well as basic knowledge of inputs?

What other relevant questions should we ask?

Who is most invested in a quality model being delivered on time for use to develop the MTP?

PLAN THE WORK



OK, now that we've identified the Project Manager, let's move forward with planning the work. Because after that, we will be able to discuss working the plan, which includes staying on top of all of the TDM activities necessary.

Information Needed to Make Modeling Decisions

Lesson 5: Putting It All Together PARTICIPANT HANDBOOK

Exhibit 5.g Information You Need to Know to Make Decisions

Decision Input/Description	Example Decision Input/Information	Your MPO Decision for Your MPO	Control for Data
Model Implementation or Maintenance	Yes		TADOT 899
TMA?	No		TADOT 899
When is the next LRP due?	1/12/2018		TADOT 899
Current Model Available for Use (last Date Year)	2018		TADOT 899
Model in Progress - Expected Completion Date	2019		TADOT 899
Model in Progress - Expected Completion Date	2018		TADOT 899
Model Recent Data Needs for Use in Model Development	2018		TADOT 899
Model Recent Data Needs for Use in Model Development	2019		TADOT 899
RFI Survey	11/15/2017		TADOT 899
RFI Survey (incl. \$G)	2/15/2018		TADOT 899
CV Survey	10/15/2017		TADOT 899
Est Survey	2018		TADOT 899
Additional Data Collection Efforts for Future Model Efforts	2019		TADOT 899
Additional Data Collection Efforts for Future Model Efforts	Planned		TADOT 899
RFI Survey	2018-2019		TADOT 899
RFI Survey (incl. \$G)	2018-2019		TADOT 899
CV Survey	2018-2019		TADOT 899
Est Survey	2018-2019		TADOT 899
Other Polls	2018-2019		TADOT 899

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In order to do the following exercises effectively, you need to know the information shown in Exhibit 5.g. There is Example information provided if you do not know these dates for your MPO. (Ideally, the instructor informs attendees ahead of time that they need this table filled out.)

Determine Model Need

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The steps to determine model need are presented in the next pages.

Exhibit 5.g Information You Need to Know to Make Decisions

Decision Input Description	Example	Your MPO	
	Decision Input Information		Contact for Data
	Example	Your MPO	
Non-Attainment or Maintenance	No		TxDOT ENV
TMA?	No		TxDOT-TPP
When is the next LRP due?	1/27/2015		TxDOT-TPP
Current Model Available for Use (list Base Year)	2005		TxDOT-TPP
Model In Progress (list Base Year)	2010		TxDOT-TPP
Model In Progress -- Expected Completion Date	2015 assumed		TxDOT-TPP
<u>Most Recent Data Ready for Use in Model Development</u>			
Most Recent Saturation Count Dates	2010 assumed		TxDOT-TPP
HH Survey	11/09-10/11		TxDOT-TPP
WP Survey (incl. SG)	9/10-8/12		
CV Survey	6/10-5/12		
Ext Survey	2005		
<u>Upcoming Data Collection Efforts for Future Model Efforts</u>			
Saturation Counts Scheduled or Planned?	2015 assumed		TxDOT-TPP
HH Survey	2020-ish?		TxDOT-TPP
WP Survey (incl. SG)	2020-ish?		
CV Survey	2020-ish?		
Ext Survey	2020-ish?		
<u>Other Notes</u>			

Topic 5.5 Determine Model Need, Models Available

30 Minutes

Defining Your MPO's Specific Modeling Objective

- Do you need a model?
- Determine the model you need
- Identify and describe the model you have available right now
- Describe the model under development and when it will be available



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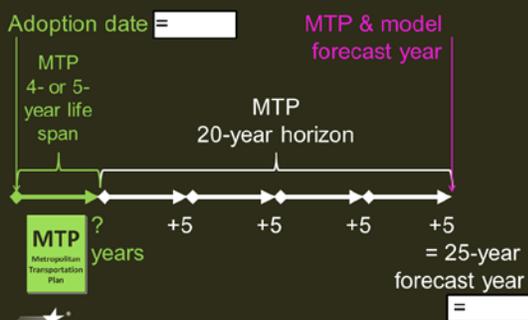
This section builds primarily upon Lesson 2.

Determine Model Objective:
MTP Adoption? This is the presumed base case in this course

MTP/TIP update? Includes:
to support a new project
correct the MTP/TIP

Other types of analysis? These are not currently covered in this course but can precipitate a need for a model (see TPP)

Determine MTP Forecast Year



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Determine MTP Forecast Year.

Determine the Model Needed (Exhibit & Activity)

Lesson 5: Putting It All Together PARTICIPANT WORKBOOK

Exhibit 5.1 Example: Determine the Model You Need

Is a Model Required for Your MTP Process? (Yes or No)

Is Your MPO in Non-Attainment?

Is Your MPO a TMA?

If the answer to either question is YES, then a model is required for your MTP process. Otherwise, a model is still recommended as "Best Practice".

Model Need (check one):

- Upcoming MTP Adoption
- MTP/TIP Update
- Project-level Analysis (not MTP)
- Other _____

Adoption or Update DATE: 1/26/2014

Required Forecast Year (see Lesson 2): = 2014 + 10 = 2024 (20+10)

Model Timing (MPO side):

How Much Time Does Your MPO Need to Have to Conduct Analysis with the TDM? 12 months

Date the Model is Needed to Start Analysis: 1/26/2013

(Subtracting the time needed for analysis from the date the product is needed (adoption, update, etc.), what date do you need a model in hand to start analysis?)

Remember to confer with consultative partners! (start with TxDOT-TPP)

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Determine the model needed to meet objective.

(see exhibit and worksheet)

Exhibit 5.h Example: Determine the Model You Need

Is a Model Required for Your MTP Process?

	(Yes or No)
Is Your MPO in Non-Attainment?	No
Is Your MPO a TMA?	No

If the answer to either question is yes, then a model is required for your MTP process. Otherwise, a model is still recommended as “Best Practice.”

Model Need:

(check one)

- Upcoming MTP Adoption
- MTP/TIP Update
- Project-level Analysis (not MTP)
- Other: _____

Adoption or Update DATE:

1/26/2014
=2014 + 25 = 2039 (2040)

Required Forecast Year (see Lesson 2):

Model Timing (MPO side):

How Much Time Does Your MPO Need to Have to Conduct Analysis with the TDM?

12 months
1/26/2013

Date the Model is Needed to Start Analysis:

(Subtracting the time needed for analysis from the date the product is needed (adoption, update, etc.), what date do you need a model in hand to start analysis?)

Remember to confer with consultative partners! (start with TxDOT-TPP)

Activity 5.4 Determine the Model You Need

Is a Model Required for Your MTP Process?

(Yes or No)

Is Your MPO in Non-Attainment?

Is Your MPO a TMA?

If the answer to either question is yes, then a model is required for your MTP process. Otherwise, a model is still recommended as “Best Practice.”

Model Need:

(check one)

- Upcoming MTP Adoption
- MTP/TIP Update
- Project-level Analysis (not MTP)
- Other: _____

Adoption or Update DATE:

Required Forecast Year (see Lesson 2):

Model Timing (MPO side):

How Much Time Does Your MPO Need to Have to Conduct Analysis with the TDM?

--

Date the Model is Needed to Start Analysis:

--

(Subtracting the time needed for analysis from the date the product is needed (adoption, update, etc.), what date do you need a model in hand to start analysis?)

Remember to confer with consultative partners! (start with TxDOT-TPP)

Determine the Model Currently Available for Use

<div data-bbox="224 329 480 367" data-label="Section-Header"> <h3>3-Model Concept</h3> </div> <div data-bbox="224 401 675 504" data-label="List-Group"> <ul style="list-style-type: none"> ▪ Current model available ▪ Model under development ▪ Data collection for next model after that </div> <div data-bbox="224 667 282 716" data-label="Image"> </div> <div data-bbox="399 697 568 716" data-label="Page-Footer"> <p>Managing the TDM Development Process</p> </div> <div data-bbox="721 690 751 709" data-label="Page-Footer"> <p>243</p> </div>	<div data-bbox="787 294 1408 331" data-label="Section-Header"> <h3>What Model Is Currently Available for Use?</h3> </div> <div data-bbox="787 367 1414 478" data-label="Text"> <p>As mentioned previously, at any given time, there are 3 models the MPO Director needs to be aware of (read from slide)</p> </div>
<div data-bbox="220 825 734 861" data-label="Section-Header"> <h3>Identify and Describe Model “In Hand”</h3> </div> <div data-bbox="220 896 732 1060" data-label="List-Group"> <ul style="list-style-type: none"> ▪ What travel model do you have available right now? ▪ Does it meet above needs? ▪ What level of effort is necessary to get the model to meet above needs? </div> <div data-bbox="224 1165 282 1213" data-label="Image"> </div> <div data-bbox="399 1192 566 1209" data-label="Page-Footer"> <p>Managing the TDM Development Process</p> </div> <div data-bbox="717 1188 748 1207" data-label="Page-Footer"> <p>244</p> </div>	<div data-bbox="787 787 1094 827" data-label="Text"> <p>What base year is it?</p> </div> <div data-bbox="787 858 1411 898" data-label="Text"> <p>Refer to Section 2’s “Kick the Tires” Exhibit.</p> </div> <div data-bbox="787 932 1395 1010" data-label="Text"> <p>What are your options for using this model you already have in hand?</p> </div> <div data-bbox="787 1043 1440 1081" data-label="Text"> <p>This model is likely either Plan A or Plan B. 😊</p> </div>
<div data-bbox="203 1350 329 1583" data-label="Section-Header"> <h3>Describe YOUR Current Available Model (Activity)</h3> </div> <div data-bbox="443 1268 751 1675" data-label="Form"> <p><small>INSTRUCTOR HANDBOOK Lesson 5: Putting It All Together</small></p> <p>Activity 5.5 Describe the Current Model Available for Use and “Kick the Tires”</p> <p>Base Year of Model: <input type="text"/></p> <p>Forecast “Out” Year: <input type="text"/></p> <p>Midspan Years, if any? <input type="text"/></p> <p><input type="checkbox"/> Other: <input type="text"/></p> <p><small>Refer to the information you filled out for the previous Activity (the model you need to “kick the tires”) listed in Lesson 2. Describe the model.</small></p> <p>Will the Current Model Base Year be Stable by the Time of MTP Adoption? If So, Is a Refresh a Possibility?</p> <p>What is the Current Model Forecast Year and How Does that Compare to the Forecast Year You Need?</p> <p>What is Your Confidence in the Current Model Output?</p> <p>Generally, What is the Current Model’s Potential for Using for the MTP?</p> <p><small>Remember to confer with consultative partners (start with FAD02)</small></p> <p><small>Managing the Travel Model Process v1.0 FAD02-0213</small></p> </div> <div data-bbox="224 1650 282 1698" data-label="Image"> </div> <div data-bbox="399 1680 571 1696" data-label="Page-Footer"> <p>Managing the TDM Development Process</p> </div> <div data-bbox="725 1675 756 1694" data-label="Page-Footer"> <p>242</p> </div>	<div data-bbox="787 1266 1433 1415" data-label="Text"> <p>NOTE FOR INSTRUCTOR: This exercise is difficult, so it may help to go through this with each person for a small class or a single example for a large class.</p> </div> <div data-bbox="787 1449 1195 1486" data-label="Text"> <p>Time for activity: 20 minutes</p> </div>

Activity 5.5 Describe the Current Model Available for Use and “Kick Its Tires”

	Years
Base Year of Model	
Forecast “Out” Year	
Interim Years, if any?	
<input type="checkbox"/> Other: _____	

*Refer to the information you filled out for the previous Activity (the model you need) **and** the “Kick the Tires” Exhibit in Lesson 2. Describe findings:*

Will the Current Model Base Year be Stale by the Time of MTP Adoption? If So, Is a Refresh a Possibility?
What Is the Current Model Forecast Year and How Does that Compare to the Forecast Year You Need?
What Is Your Confidence in the Current Model Overall?
Generally, What Is the Current Model’s Potential for Using for the MTP?

Remember to confer with consultative partners! (start with TxDOT)

What about Moving the Finish Line?

“Moving the Finish Line”

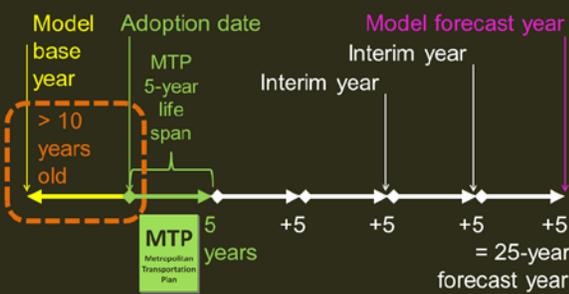


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So, you have an older model that will be stale by the time the MTP adoption date comes up, but is not stale yet. Is there time, with this model, to get your MTP adopted before the model becomes stale?

If so, Moving the Finish Line is something you should consider.

Reminder: “Stale” Model Concept

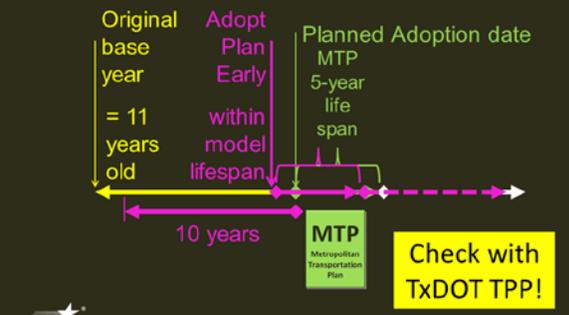


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As a reminder, here is the stale model concept we discussed in Lesson 2.

This is the time running out on your older model that you have in hand.

“Moving the Finish Line” Strategy



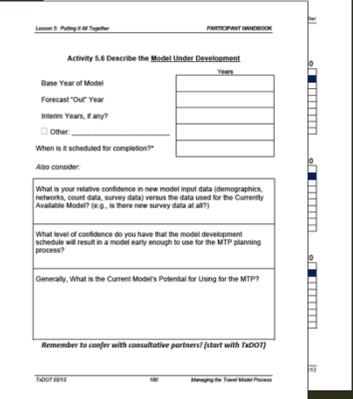
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The idea with the Moving the Finish Line Strategy is to get your MTP adopted before the model goes stale.

You still may need to perform a forecast year demographic forecast and code any relevant changes to the forecast year network.

QUESTION: Does this change your answers for the previous Activity?

Next: Describe the Model under Development

<p>3-Model Concept</p> <ul style="list-style-type: none"> ▪ Current model available ▪ Model under development ▪ Data collection for next model after that  <p>Managing the TDM Development Process 247</p>	<p>This is the second of the 3 models.</p> <p>This model is likely Plan A if it is feasible in the time you have.</p>
<p>Describe the Model Currently under Development</p> <ul style="list-style-type: none"> ▪ When it will be available for application? ▪ What is the risk that the model development schedule will not be achieved? ▪ Is the model under purview of TxDOT for model development? ▪ Model advantages compared to model currently available  <p>Managing the TDM Development Process 248</p>	<p>(read from slide)</p> <p>Suggestion to participants: refer to Section 2 as needed.</p>
<p>Describe YOUR Model under Development (Activity)</p>   <p>Managing the TDM Development Process 249</p>	<p>Refer to the next Activity for the information you'll need.</p> <p>NOTE FOR INSTRUCTOR: This exercise is difficult, so it may help to go through this with each person for a small class or a single example for a large class.</p> <p>Time for activity: 20 minutes</p>

Activity 5.6 Describe the Model under Development

	Years
Base Year of Model	
Forecast "Out" Year	
Interim Years, if any?	
<input type="checkbox"/> Other: _____	
When is it scheduled for completion?*	

Also consider:

<p>What is your relative confidence in new model input data (demographics, networks, count data, survey data) versus the data used for the Currently Available Model? (e.g., is there new survey data at all?)</p>
<p>What level of confidence do you have that the model development schedule will result in a model early enough to use for the MTP planning process?</p>
<p>Generally, What Is the Current Model's Potential for Using for the MTP?</p>

Remember to confer with consultative partners! (start with TxDOT)

**If needed, use one of these Rough Schedules for Determining Likely Model Completion:*

Task	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Model Under Development										
Counts Occur										
Surveys Occur										
Process Counts										
Process Surveys										
Develop Model Inputs										
Model Calibration/Validation										
Model Runs/Public Involvement										
Plan Adoption Target Date										

Task	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Model Under Development										
Counts Occur										
Surveys Occur										
Process Counts										
Process Surveys										
Develop Model Inputs										
Model Calibration/Validation										
Model Runs/Public Involvement										
Plan Adoption Target Date										

Task	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Model Under Development										
Counts Occur										
Surveys Occur										
Process Counts										
Process Surveys										
Develop Model Inputs										
Model Calibration/Validation										
Model Runs/Public Involvement										
Plan Adoption Target Date										

Consider Options (Activity)



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PARTICIPANT HANDBOOK Lesson 5: Putting It All Together

Activity 5.7 Consider Potential Model Options

Options (see Lesson 2):
 is a model required for updating your MPC's MTP? If so, then you need to find at least one option below. If not, one of the options below may still be chosen for Best Practice.

Yes (check one)	No	Options
<input type="checkbox"/>	<input type="checkbox"/>	Current Model Options (MPO model "in hand") Base Year is Not State & Model is OK Forecast Year Demographics are OK Might need to add projects to network and re-apply model for forecast year Base Year is Not State & Model is OK Need New Forecast Year Scenario Demographics plus Network Base Year is (is going to be) State, Model is OK Consider: • Non-traditional Base Year Model Refresh • Or Move to the Finish Line Need New Forecast Year Scenario Demographics plus Network Base Year is State, Model is OK Consider Non-traditional Base Year Model Refresh Need New Forecast Year Scenario Demographics plus Network
<input type="checkbox"/>	<input type="checkbox"/>	New Base Year Model & Forecast Year Full Base Year Model Development & Application

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In the next step, we consider our options, based on the previous activities.

Time for activity: 15 minutes

Identify Plans A and B (Activity)



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PARTICIPANT HANDBOOK Lesson 5: Putting It All Together

Activity 5.8 Identify Plans A and B

Here you will decide which are your desired (Plan A) and back-up model (Plan B) to use for your upcoming MTP planning process. Remember to consider what you filed out for these activities:

Activity 5.4 Determine the Current Model You Need

Activity 5.5 Describe the Current Model Available for Use and "kick its Tires"

Activity 5.6 Describe the Model Under Development

Activity 5.7 Consider Potential Model Options

In the checklist in Activity 5.7:

- Write "Plan A" to the left of your desired model option.
- Write "Plan B" to the left of your fallback model option.

In the next few pages, you will schedule both Plan A and Plan B activities. This way, you will be able to identify when you need to go to Plan B.

IMPORTANT! Consider what you need to do the next planning process based on these activities and options.

KEY CONCEPT: Identify whether necessary "Plan B" and describe "Plan A".

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Do you have a clear Plan A choice and Plan B choice?

<Ask participants to share.>

It is OK to change your mind later, because the next steps will provide additional perspective.

Activity 5.7 Consider Potential Model Options

Yes	No	Options (see Lesson 2)
(check one)		
<input type="checkbox"/>	<input type="checkbox"/>	Is a model required for updating your MPO’s MTP? If so, then you need to find at least one option below. If not, one of the options below may still be desired for Best Practice.
Current Model Options (MPO model “in hand”)		
<input type="checkbox"/>	<input type="checkbox"/>	Base Year Is Not Stale & Model Is OK Forecast Year Demographics Are OK <i>Might need to add projects to network and re-apply model for forecast year.</i>
<input type="checkbox"/>	<input type="checkbox"/>	Base Year Is Not Stale & Model Is OK Need New Forecast Year Scenario Demographics plus Network
<input type="checkbox"/>	<input type="checkbox"/>	Base Year is (is going to be) Stale, Model is OK Consider: <ul style="list-style-type: none"> • Non-traditional Base Year Model Refresh • Or Moving the Finish Line
<input type="checkbox"/>	<input type="checkbox"/>	Need New Forecast Year Scenario Demographics plus Network Base Year Is Stale, Model Is OK Consider: Non-traditional Base Year Model Refresh Need New Forecast Year Scenario Demographics plus Network
New Base Year Model & Forecast Year		
<input type="checkbox"/>	<input type="checkbox"/>	Full Base Year Model Development & Application

Activity 5.8 Identify Plans A and B

Here you will decide which are your desired (Plan A) and back-up model (Plan B) to use for your upcoming MTP planning process. Remember to consider what you filled out for these activities:

Activity 5.4 Determine the Model You Need

Activity 5.5 Describe the Current Model Available for Use and “Kick Its Tires”

Activity 5.6 Describe the Model Under Development

Activity 5.7 Consider Potential Model Options

In the checklist in Activity 5.7:

- Write “Plan A” to the left of your desired model option.
- Write “Plan B” to the left of your fallback model option.

In the next few pages, you will schedule both Plan A and Plan B activities. This way, you will be able to identify when you need to go to Plan B.

IMPORTANT!

Confer with TPP early in the MTP planning process to ensure the assumptions and information used for these decisions are correct.



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Use this handbook to think these decisions through, but don't make a final decision alone...give TxDOT a call to confer and confirm assumptions.



KEY CONCEPT: Distinguish between **necessary** (“Plan B”) and **desirable** (“Plan A”).

Topic 5.6 Schedule Model Activities

Identify Specific Plan A and Plan B Model Tasks

First, Identify Specific Model Tasks (Exhibit, Simple)

Lesson 5: Putting It All Together PARTICIPANT HANDBOOK

Exhibit 5.1 Technical Model Tasks by Model Option (Simple)

Checkmarks in the table indicate which model tasks are applicable for each model option.

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Keeping in mind the Plan A and Plan B we have, next we will look at the primary model activities which will be part of each plan.

Two exhibits are provided, a simple and a long form, to work with. Find your Plan A and Plan B on the simple form. This is the form we will work with today for the next activity.

Identify Specific Model Tasks (Tabloid)

Lesson 5: Putting It All Together

Exhibit 5.1 Technical Model Tasks by Model Option (Long)

Checkmarks in the table indicate which model tasks are applicable for each model option.

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The long form is provided next, for you to work with later for more in depth planning.

What do you notice about this form?

- More detailed
- Test scenarios
- +5 option
- Interim year options

Identify Plans A and B (Activity)

PARTICIPANT HANDBOOK Lesson 5: Putting It All Together

Activity 5.9 Identify Plans A and B

(15 minutes)

From the checklist in Activity 5.7, you should have already identified your Plan A and Plan B.

Simple Peek

In Exhibit 5.1 above:

- Write "Plan A" to the left of your desired model option.
- Write "Plan B" to the left of your fallback model option.

What do you notice about the tasks you need to complete that are the same or different?

Does this information make any difference to you in making you think one option is better or worse?

Longer Look

Next, for Exhibit 5.1 on the next page:

- Write "Plan A" to the left of your desired model option.
- Write "Plan B" to the left of your fallback model option.

What do you notice about Exhibit 5.1? Are there additional model activities that you may consider doing above the minimum shown?

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Let's do Activity 5.9, just the first "Simple Peek" part, for the simple form, looking closer at what is entailed for our Plan A versus our Plan B.

Exhibit 5.i Technical Model Tasks by Model Option (Simple)

Description of Model Option	Process BY Counts/Surveys	Create Base Year Network	Create Forecast Year Network	Create TAZ Geography	Estimate BY Demographics	Forecast FY Demographics	Calibrate Base Year Model	Validate Base Year Model	Apply Forecast Year Model*
Current Model Options (MPO model “in hand”)									
Base Year Is Not Stale & Model OK Forecast Year Demographics Are OK			✓						✓*
Base Year Is Not Stale & Model OK Need New Forecast Year Scenario Demographics plus Network			✓			✓			✓*
Moving the Finish Line: Need New Forecast Year Scenario Demographics plus Network			✓			✓			✓*
Non-Traditional Refresh, Apply	✓	✓	✓		✓	✓	✓	✓	✓*
New Base Year Model & Forecast Year									
Full New Model Development	✓	✓	✓	✓	✓	✓	✓	✓	✓*

* In most cases, application of the model represents multiple model runs to test various scenarios. Interim year or alternative demographics or network scenarios involve the development of different demographics or network inputs; typically these alternate scenarios are based upon the base case and do not represent the same amount of effort to develop as the base case. See next exhibit for expanded list of scenarios.

Exhibit 5.j Technical Model Tasks by Model Option (Long)

Directions: The checkmarks are the minimum necessary for each model option.

	Base Year						Forecast Year											Interim Years						+5 Year									
User Entry:																																	
Examples:	2010						2040											2015						2020		2025		2045					
Description of Model Option	Process BY Counts/Surveys	Create Base Year Network	Create TAZ Geography	Estimate BY Demographics	Calibrate Base Year Model	Validate Base Year Model	Develop FY Demographics	Develop E+C Network	Test E+C Scenario*	Test Scenario: FY Network	Test Scenario: FY Apply Model	Test Scenario: FY Network	Test Scenario: FY Apply Model	Test Scenario: FY Network	Test Scenario: FY Apply Model	Test Scenario: FY Network	Test Scenario: FY Apply Model	Final to Adopt: FY Network	Final to Adopt: FY Apply Model	Interim Year Demographics	Create Interim Year Network	Apply Interim Year Model	Interim Year Demographics	Create Interim Year Network	Apply Interim Year Model	Interim Year Demographics	Create Interim Year Network	Apply Interim Year Model	+5 Forecast FY Demographics**	Create +5 FY Network	Apply +5 Forecast Year Model**		
Current Model Options (MPO model "in hand")																																	
Base Year Is Not Stale & Model OK Forecast Year Demographics Are OK								✓*	✓*																								
Base Year is Not Stale & Model OK Need New Forecast Year Scenario Demographics plus Network							✓	✓*	✓*									✓	✓														
Moving the Finish Line: Need New Forecast Year Scenario Demographics plus Network							✓	✓*	✓*									✓	✓														
Moving the Finish Line: Need New Forecast Year Scenario Demographics plus Network	✓	✓		✓	✓	✓	✓											✓	✓														
New Base Year Model & Forecast Year																																	
Full New Model Development	✓	✓	✓	✓	✓	✓																											

* In most cases, application of the model represents multiple model runs to test various scenarios. A Best Practice first step is to apply future year demographics to an "Existing plus Committed" (E+C) network, which includes all projects in the base year plus any projects in the TIP as a committed project. Interim year or alternative demographics or network scenarios involve the development of different demographics or network inputs; typically these alternate scenarios are based upon the base case and do not represent the same amount of effort to develop as the base case.

**The "+5" scenario is a recommended best practice to develop forecast year demographics for a future model application. The choice to develop the +5 demographics and network for an additional model run is left to the discretion of the MPO Director if that model output might be useful for a future plan.

Activity 5.9 Looking Closer at Plans A and B

(15 minutes)

From the checklist in Activity 5.7, you should have already identified your Plan A and Plan B.

Simple Peek

In Exhibit 5.i above:

- Write “Plan A” to the left of your desired model option.
- Write “Plan B” to the left of your fallback model option.

What do you notice about the tasks you need to complete that are the same or different?

Does this information make any difference to you in making you think one option is better or worse?

Longer Look

Next, for Exhibit 5.j:

- Write “Plan A” to the left of your desired model option.
- Write “Plan B” to the left of your fallback model option.

What do you notice about Exhibit 5.j? Are there additional model activities that you may consider doing above the minimum shown?

Tools to Schedule Model Tasks (Both Plan A and Plan B)

Schedule Tasks for Plans A & B

Plan A

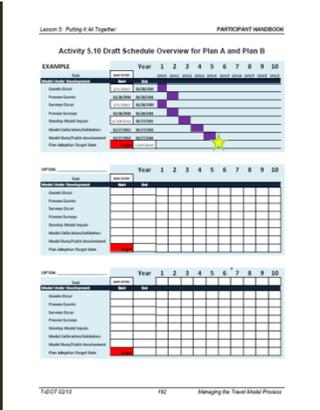
Plan B



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Next, we are going to make our first cut schedules for Plans A and B. We need to do both to the extent that we need to be able to decide where our “trigger point” is. That is, when we need to abandon Plan A and go to Plan B to ensure we have a model available for use for the MTP. They may even share several tasks, which helps minimize re-inventing the wheel later.

Draft Schedule Overview (Exhibit)



Managing the TDM Development Process 258

There are a variety of approaches for scheduling the model tasks. Some people prefer complex scheduling tools such as Microsoft Project, others prefer a hand-drawn version on their white board. Still others prefer something in between.

For this exercise, we will use a very simple schedule. Please refer to the next page.

Activity 5.10 Draft Schedule Overview for Plan A and Plan B

EXAMPLE

Task	user enter	Year	1	2	3	4	5	6	7	8	9	10
Model Under Development	Start	End	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Counts Occur	2/1/2010	11/28/2010	█									
Process Counts	11/28/2010	11/28/2011		█								
Surveys Occur	2/1/2010	11/28/2010	█									
Process Surveys	11/28/2010	11/28/2011		█								
Develop Model Inputs	11/28/2011	11/27/2012			█							
Model Calibration/Validation	11/27/2012	11/27/2013				█						
Model Runs/Public Involvement	11/27/2013	11/27/2014					█					
Plan Adoption Target Date	Target:	1/27/2015										

OPTION: _____

Task	user enter	Year	1	2	3	4	5	6	7	8	9	10
Model Under Development	Start	End										
Counts Occur												
Process Counts												
Surveys Occur												
Process Surveys												
Develop Model Inputs												
Model Calibration/Validation												
Model Runs/Public Involvement												
Plan Adoption Target Date	Target:											

OPTION: _____

Task	user enter	Year	1	2	3	4	5	6	7	8	9	10
Model Under Development	Start	End										
Counts Occur												
Process Counts												
Surveys Occur												
Process Surveys												
Develop Model Inputs												
Model Calibration/Validation												
Model Runs/Public Involvement												
Plan Adoption Target Date	Target:											

Activity 5.11 Draft Schedule Overview Extras

OPTION: _____

Task	user enter	Year	1	2	3	4	5	6	7	8	9	10
Model Under Development	Start	End										
Counts Occur												
Process Counts												
Surveys Occur												
Process Surveys												
Develop Model Inputs												
Model Calibration/Validation												
Model Runs/Public Involvement												
Plan Adoption Target Date	Target:											

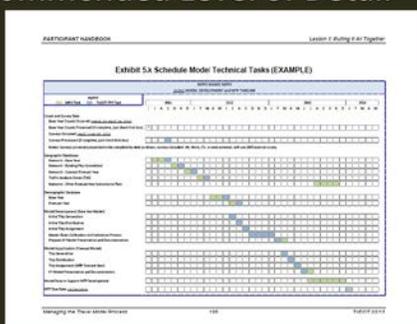
OPTION: _____

Task	user enter	Year	1	2	3	4	5	6	7	8	9	10
Model Under Development	Start	End										
Counts Occur												
Process Counts												
Surveys Occur												
Process Surveys												
Develop Model Inputs												
Model Calibration/Validation												
Model Runs/Public Involvement												
Plan Adoption Target Date	Target:											

OPTION: _____

Task	user enter	Year	1	2	3	4	5	6	7	8	9	10
Model Under Development	Start	End										
Counts Occur												
Process Counts												
Surveys Occur												
Process Surveys												
Develop Model Inputs												
Model Calibration/Validation												
Model Runs/Public Involvement												
Plan Adoption Target Date	Target:											

Recommended Level of Detail



Managing the TDM Development Process 259

The simple schedule we were just working with is helpful for the big picture. You can get very elaborate with scheduling modeling activities, but the best tool is likely somewhere in between.

For communicating with partners in the model development process, the timeline tool developed by TxDOT-TPP works well—it is not too complicated, but easily amended and distributed. It is on the next page.

Activities: Plan A and Plan B



Managing the TDM Development Process 260

The Activities on the pages following the exhibit provide blank forms to draft your Plan A and Plan B (with extra blank sheets) yourselves. We do not have the time today to get into the level of detail necessary to fill these out. However, looking at the timeline tool, what are some aspects you notice? (roles are identified)

Activity 5.12 Schedule Model Technical Tasks (Plan A)

MPO NAME MPO	
MODEL DEVELOPMENT and MTP TIMELINE	
<p style="text-align: center;"><i>Legend</i></p> <p style="margin: 0;"> MPO Task TxDOT-TPP Task </p>	
<p>Count and Survey Data</p> <p>Base Year Counts Occurred: <u>March 22-April 13, 2010</u></p> <p>Base Year Counts Processed (if complete, just check first box) <input checked="" type="checkbox"/></p> <p>Surveys Occurred: <u>April 1-Nov 15, 2010</u></p> <p>Surveys Processed (if complete, just check first box) <input type="checkbox"/></p> <p>Notes: Surveys processing expected to be complete by date as shown, surveys included: HH, Work, CV, no new external, will use 2005 external survey</p>	
<p>Geographic Databases</p> <p>Network - Base Year</p> <p>Network - Existing Plus Committed</p> <p>Network - Concept Forecast Year</p> <p>Traffic Analysis Zones (TAZ)</p> <p>Network - Other Forecast Year Scenarios to Test</p>	
<p>Demographic Database</p> <p>Base Year</p> <p>Forecast Year</p>	
<p>Model Development (Base Year Model)</p> <p>Initial Trip Generation</p> <p>Initial Trip Distribution</p> <p>Initial Trip Assignment</p> <p>Model Chain Calibration and Validation Process</p> <p>Prepare BY Model Presentation and Documentation</p>	
<p>Model Application (Forecast Model)</p> <p>Trip Generation</p> <p>Trip Distribution</p> <p>Trip Assignment (MTP Forecast Year)</p> <p>FY Model Presentation and Documentation</p>	
<p>Model Runs to Support MTP Development</p> <p>MTP Due Date:</p>	

Activity 5.13 Schedule Model Technical Tasks (Plan B)

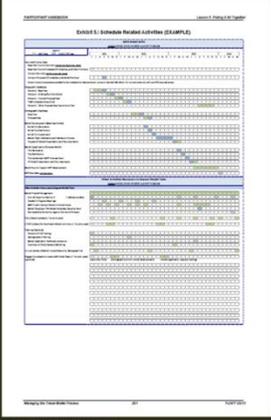
MPO NAME MPO																					
_____ MODEL DEVELOPMENT and MTP TIMELINE																					
<p style="text-align: center; margin: 0;"><i>Legend</i></p> <p style="margin: 0;"> MPO Task TxDOT-TPP Task </p>	<table border="1" style="width: 100%; height: 20px; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>																				
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<p>Geographic Databases</p> <p>Network - Base Year</p> <p>Network - Existing Plus Committed</p> <p>Network - Concept Forecast Year</p> <p>Traffic Analysis Zones (TAZ)</p> <p>Network - Other Forecast Year Scenarios to Test</p>	<table border="1" style="width: 100%; height: 20px; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table> <table border="1" style="width: 100%; height: 20px; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table> <table border="1" style="width: 100%; height: 20px; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table> <table border="1" style="width: 100%; height: 20px; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table> <table border="1" style="width: 100%; height: 20px; border-collapse: collapse;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>																				
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Deciding the Trigger Point

<p>Deciding a Trigger Point</p> <ul style="list-style-type: none"> ▪ Desirable (Plan A) ▪ Fall-back (Plan B) ▪ What triggers the fall-back? <ul style="list-style-type: none"> • Make decision now what/when trigger occurs • Decide whom you tell  <p style="text-align: right;">Managing the TDM Development Process 261</p>	<p>At this point, with Plan A and Plan B Activities scheduled, we can decide on a Trigger Point, that is, when we think that we need to move to Plan B to ensure we have a model for use for our MTP development phase.</p>
--	---

Related Activities That Should Be Scheduled

<p>Activities That Should Be Scheduled</p> <ul style="list-style-type: none"> ▪ Communication milestones/regular check-ins ▪ QA/QC activities ▪ Incorporating model tasks into UPWP ▪ Staff training prior to anticipated tasks ▪ Tasks related to engaging consultants ▪ Post-MTP retrospective (lessons learned)  <p style="text-align: right;">Managing the TDM Development Process 262</p>	<p>Moving forward from here, we only need to Plan for Plan A. If we need to go to Plan B later, we can re-assess at that point.</p>
--	---

<p>Schedule Related Activities (Example)</p>   <p style="text-align: right;">Managing the TDM Development Process 263</p>	<p>This example demonstrates the concept of the additional detail and activities that should be part of your schedule, building upon the schedule previously developed. On the pages following is an activity with a blank worksheet to schedule your own, including additional space for activities you wish to include.</p>
--	---

Suggested Break Here

Post-Break Reinforcement

Discuss previous material, any questions?

Topic 5.7 Roles & Responsibilities

Lesson Total Time: 45 Minutes

Typical Roles & Responsibilities for Texas Travel Model Development

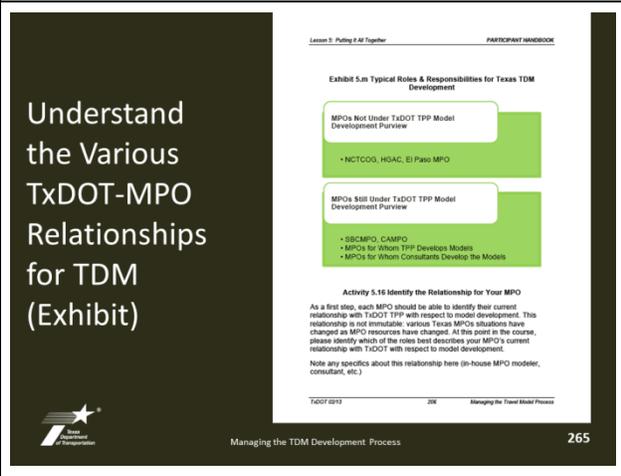
 <p>Determine & Agree to Roles & Responsibilities</p> <p>Managing the TDM Development Process 264</p>	<p>This section first walks through the steps to assess the various resources the MPO has to complete model tasks. Assigning the roles will occur at the end of the section.</p>
 <p>Understand the Various TxDOT-MPO Relationships for TDM (Exhibit)</p> <p>Managing the TDM Development Process 265</p>	<p>Determining roles and responsibilities in the TDM relationship between TxDOT and the MPO depends on the MPO, as shown in Exhibit 5.m.</p> <p>For Activity 5.14, identify which group your MPO is in.</p>

Exhibit 5.m Typical Roles and Responsibilities for Texas TDM Development

MPOs Not Under TxDOT-TPP Model Development Purview

- NCTCOG, HGAC, El Paso MPO

MPOs Still Under TxDOT-TPP Model Development Purview

- SBCMPO, CAMPO
- MPOs for Whom TPP Develops Models
- MPOs for Whom Consultants Develop the Models

Activity 5.16 Identify the Relationship for Your MPO

As a first step, each MPO should be able to identify their current relationship with TxDOT-TPP with respect to model development. This relationship is not immutable: various Texas MPOs situations have changed as MPO resources have changed. At this point in the course, please identify which of the roles best describes your MPO's current relationship with TxDOT with respect to model development.

Note any specifics about this relationship here (in-house MPO modeler, consultant, etc.)

Assess Internal MPO Resources to Meet Model Tasks

Matching Staff Skill Sets to Model Tasks (Exhibit from Lesson 4)



Managing the TDM Development Process 266

PARTICIPANT HANDBOOK Lesson 5: Putting It All Together

Assess Internal MPO Resources to Meet Model Tasks

Exhibit 5.m has been copied below from Lesson 4.

In previous activities, you identified which model activities need to occur for Plan A and Plan B. For your MPO, if TxDOT-TPP takes care of model development and application, don't worry about these. But do look at the various skill sets which can be applied to develop networks and demographics, which are an MPO input.

Exhibit 5.n General Guidelines for Assigning Staff to Modeling Tasks by Staff Skill Set

Modeling Task	Staff Skill Set							
	Crackerjack Modeler	Senior Modeler	Beginner Modeler	Transportation Planner/Engineer w/ GIS Skills	Transportation Planner/Engineer	GIS Technician	Administrative	Intern
Networks	✓	✓	✓	✓	*	*	*	*
Demographics	✓	✓	✓	✓	*	*	*	*
Model Maintenance/ Application	✓	✓						
Model Development	✓							

NOTE: These are not Job Titles, but skill sets.
* Can assist with model tasks, but may not be able to do complete task in TransCAD.

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Exhibit 5.n General Guidelines for Assigning Staff to Modeling Tasks by Staff Skill Set

Modeling Task	Staff Skill Set							
	Crackerjack Modeler	Senior Modeler	Beginner Modeler	Transportation Planner/Engineer w/ GIS Skills	Transportation Planner/Engineer	GIS Technician	Administrative	Intern
Networks	✓	✓	✓	✓	*	*	*	*
Demographics	✓	✓	✓	✓	*	*	*	*
Model Maintenance/ Application	✓	✓						
Model Development	✓							

NOTE: These are not Job Titles, but skill sets.

* Can assist with model tasks, but may not be able to do complete task in TransCAD.

Staff Skill Sets
"Crib Notes"
(Exhibit)

PARTICIPANT HANDBOOK Lesson 5: Putting It All Together

Exhibit 5.a "Crib Notes" for Identifying Staff Skill Levels with Regard to Modeling Tasks

These descriptions are provided as a courtesy perspective only, for the purpose of understanding the following exhibit and other information provided in this handbook. All other values are estimates in per centum for a Texas metropolitan area, printed on individual, individual results may vary.

<p>Modeling Program Manager</p>	<p>Typical Salary Range \$140,000-</p> <p>This individual typically has a minimum of 20 years of experience with travel demand modeling, at least 10 years of which is hands-on, managing the work of others and making generally transferable new hands-on experience at this level. They utilize leading a modeling team of less experienced staff and ensuring a quality operation on time and within budget. Expertise in communicating model results to non-modelers, the public, and decision-makers is likely a strength mine.</p>
<p>"Clockkeeper" Modeler</p>	<p>Typical Salary Range \$100,000 - 150,000</p> <p>This individual typically has a minimum of 15 years of hands-on experience with travel demand modeling, at least five years of which is with traditional, 4-step, trip-based models, some experience with hybrid-based or other advanced modeling practice is increasingly expected. Experience with developing each model component from original data sources, ideally in a TransCAD environment, GIS/CAD, expertise preferred. Capable of leading modeling projects with minimal guidance from manager and TDMOT, attending meetings with various agency staff, and overseeing modeling tasks, setting the manager informed of progress and/or technical issues as they arise. Expertise in communicating model results to non-modelers, the public, and decision-makers is plus.</p>

Managing the Travel Model Process 209 TDMOT (2013)

267

Managing the TDM Development Process

But how to assess the skill sets of different staff, MPO and otherwise? The Crib Notes on the next page may be helpful.

Exhibit 5.o “Crib Notes” for Identifying Staff Skill Levels with Regard to Modeling Tasks

These descriptions are provided as a cursory perspective only, for the purpose of understanding the following Exhibit and other information provided in this handbook. All dollar values are estimates in year 2012\$ for a Texas metropolitan area, private sector individual. Individual results may vary.

<p>Modeling Program Manager</p>	<p>Typical Salary Range: \$140,000+</p> <p>This individual typically has a minimum of 20 years of experience with travel demand modeling, at least 15 years of which is hands-on; managing the work of others and marketing generally translate into less hands-on experience at this level. Best utilized leading a modeling team of less expensive staffers and ensuring a quality deliverable on time and within budget. Expertise in communicating model results to non-modelers, the public, and decision-makers is likely a strength area.</p>
<p>“Crackerjack” Modeler</p>	<p>Typical Salary Range: \$100,000–150,000</p> <p>This individual typically has a minimum of 15 years of hands-on experience with travel demand modeling, at least five years of which is with traditional, 4-step, trip-based models; some experience with activity-based or other advanced modeling practice in increasingly expected. Experience with developing each model component from original data sources, ideally in a TransCAD environment. GISDK expertise preferred. Capable of leading modeling projects with minimal guidance from manager and TxDOT, attending meetings with partner agency staff, and coordinating modeling tasks, keeping the manager informed of progress and/or technical issues as they arise. Expertise in communicating model results to non-modelers, the public, and decision-makers a plus.</p>

Senior Modeler	<p>Typical Salary Range: \$75,000–110,000</p> <p>This individual has a minimum of 5 years of hands-on experience with travel demand modeling, most likely with traditional, 4-step, trip-based models. Experience with developing each model component from original data sources, ideally in a TransCAD environment. GISDK expertise preferred. Capable of leading modeling tasks with minimal guidance from project or program manager. Attending meetings with partner agency staff, and keeping the manager informed of progress and/or technical issues as they arise. Increasing opportunities for communicating model results to non-modelers, the public, and decision-makers.</p>
Transportation Planner/Engineer in Training (EIT) w/ GIS Skills	<p>Typical Salary Range: \$50,000–80,000</p> <p>This individual has a minimum of 5 years of hands-on experience with geographic information systems, most likely with ESRI Arc products, TransCAD or Maptitude (Caliper's version of GIS) proficiency a plus. Capable of leading GIS tasks with minimal guidance. Creativity in solving technical issues an advantage; expertise in documentation, data management including complex query tools a plus.</p>
Entry Level Modeler/ Transportation Planner/EIT	<p>Typical Salary Range: \$45,000–77,000</p> <p>This individual may be newly graduated from a Master's program with a concentration in transportation planning and technical traffic analysis tasks, travel demand modeling preferred. Capable of completing modeling tasks with appropriate guidance and feedback from manager. Strong technical skill set an advantage, including geographic information systems experience, statistics, and programming. Increasing technical opportunities.</p>
Administrative/Support Staff	<p>Typical Salary Range: \$20,000-45,000</p> <p>This individual may have priority tasks related to administrative support, but have the interest and detail-oriented enough to be very helpful in developing model inputs, in particular those related to the demographics, if using Excel. Capable of completing modeling tasks with appropriate guidance and feedback from manager.</p>

Staff Resource “Upgrade” (Training)

Exhibit 5.p Suggested Model Training for MPO Staff by Expected Modeling Duties

Training	Modeling Task							
	Networks Development	Networks Review	Demographics Development*	Demographics Review	Model Maintenance/ Application	Model Application Review	Model Development	Model Development Review
TxDOT Training								
General TransCAD Training	✓		✓		✓			
Introduction to Travel Demand Modeling	✓	✓	✓	✓		✓		
Model Inputs Development Training	✓	✓	✓	✓				
Model Application/Alternatives Analysis Training					✓	✓		
Other Training								
NHI Introduction to Urban Travel Demand Forecasting Course	✓	✓	✓	✓	✓			
TMIP Webinars							✓	✓
Caliper Travel Demand Modeling	✓		✓		✓		✓	

* Demographics development can be done in alternative GIS and imported to TransCAD.

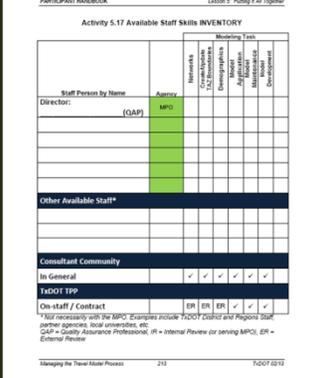
Staff Resource Assessment (MPO and Other)

Available
MPO Staff
for Model
Tasks
(Exhibit)



Managing the TDM Development Process 269

See Activity 5.15 Available Staff Skills



Directions for Filling Out Activity 5.15 Available Staff Skills on the next page. This is a brainstorming worksheet Activity. It is meant to encompass all staff resources potentially available to the MPO for modeling tasks.

Each person can have more than one skill set. Blank columns are provided for additional skill sets. Consider this approach:

1. Identify a preliminary “RP” (Responsible Person) and “IR” (Internal Reviewer) for each Model Task.
2. Use “✓” for anyone in the MPO or available to the MPO who can do the technical work or assist.

Ideas for “Other Potential Staff” include: Local Partner Agencies, University Partner Agencies, TxDOT District Staff, TxDOT Regions Staff, etc.

Activity 5.17 Available Staff Skills INVENTORY

Staff Person by Name	Agency	Modeling Task						
		Networks	Create/Update TAZ Boundaries	Demographics	Model Application	Model Maintenance	Model Development	
Director: _____ (QAP)	MPO							
Other Available Staff*								
Consultant Community								
In General		✓	✓	✓	✓	✓	✓	
TxDOT-TPP								
On-staff/Contract		ER	ER	ER	✓	✓	✓	

* Not necessarily with the MPO. Examples include TxDOT District and Regions Staff, partner agencies, local universities, etc.
 QAP = Quality Assurance Professional, IR = Internal Review (or serving MPO), ER = External Review

“Back of the Napkin” Peek

PARTICIPANT HANDBOOK Lesson 5: Putting It All Together

Exhibit 5.4 “Back of the Napkin” Estimating Consultant Effort

This exhibit is offered as an illustration to illustrate a quick approach for estimating the level of effort that may be expected during a consultant to perform similar tasks. This represents a simplified breakdown categorized only and as no way to predict the quality of effort, individual energy, productivity, or other things.

Role/Activity	Rate Annual	Hours	Months	Example Levels of Effort for Typical Project Amounts (Months)
Transportation Program Manager	150,000	1	1	12,000, 24,000, 36,000, 48,000, 60,000, 72,000, 84,000, 96,000, 108,000, 120,000
Technical Writer	80,000	1	1	8,000, 16,000, 24,000, 32,000, 40,000, 48,000, 56,000, 64,000, 72,000, 80,000
Transportation Planner/Analyst	90,000	1	1	9,000, 18,000, 27,000, 36,000, 45,000, 54,000, 63,000, 72,000, 81,000, 90,000
Total				29,000, 58,000, 87,000, 116,000, 145,000, 174,000, 203,000, 232,000, 261,000, 290,000

Role/Activity	Rate Annual	Hours	Months	Example Levels of Effort for Typical Project Amounts (Months)
Working Program Manager	150,000	1	1	12,000, 24,000, 36,000, 48,000, 60,000, 72,000, 84,000, 96,000, 108,000, 120,000
Technical Writer	80,000	1	1	8,000, 16,000, 24,000, 32,000, 40,000, 48,000, 56,000, 64,000, 72,000, 80,000
Transportation Planner/Analyst	90,000	1	1	9,000, 18,000, 27,000, 36,000, 45,000, 54,000, 63,000, 72,000, 81,000, 90,000
Total				29,000, 58,000, 87,000, 116,000, 145,000, 174,000, 203,000, 232,000, 261,000, 290,000

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Pros and Cons of Using Consultants (Activity)

Lesson 5: Putting It All Together PARTICIPANT HANDBOOK

Activity 5.18 What Are the Pros and Cons of Using Consultants?
(Discuss as group)

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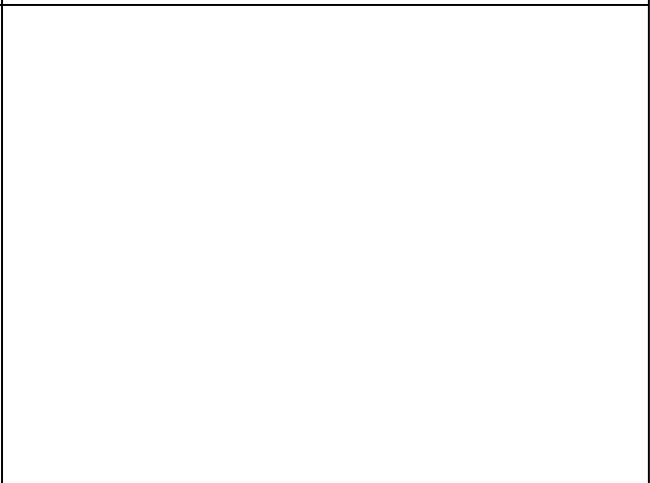


Exhibit 5.q “Back of the Napkin” Estimating Consultant Effort

This exercise is offered as a demonstration to illustrate a quick approach for assessing the level of effort that can be expected hiring a consultant to perform model tasks. This represents a simplified financial view point only and in no way implies the quality of effort individuals may provide. Individual results may vary.

Staff Skill Level	Avg. Annual Salary	Hourly Rate	Loaded Rate	Example Levels of Effort for Typical Project Amounts (Dollars)						
				\$1,000,000	\$500,000	\$250,000	\$100,000	\$75,000	\$50,000	\$30,000
Modeling Program Manager	\$ 160,000	\$ 77	\$ 231	\$36,000	\$36,000	\$18,000	\$15,360	\$7,680	\$5,760	\$2,880
"Crackerjack" Modeler	\$ 125,000	\$ 60	\$ 180	\$187,500	\$75,000	\$37,500	\$7,031	\$0	\$0	\$0
Senior Modeler	\$ 85,000	\$ 41	\$ 123	\$306,000	\$114,750	\$38,250	\$25,500	\$25,500	\$12,750	\$6,375
Transportation Planner/EIT w/ GIS Skills	\$ 60,000	\$ 29	\$ 87	\$468,000	\$271,800	\$154,800	\$50,400	\$41,400	\$30,600	\$19,800
TOTAL				\$997,500	\$497,550	\$248,550	\$98,291	\$74,580	\$49,110	\$29,055

Note: Travel/Other Directs not included in simple example!

	Example Levels of Effort for Typical Project Amounts (Weeks)						
	\$1,000,000	\$500,000	\$250,000	\$100,000	\$75,000	\$50,000	\$30,000
Modeling Program Manager	4	4	2	2	1	0.6	0.3
"Crackerjack" Modeler	26	10	5	1	0	0	0
Senior Modeler	62	23	8	5	5	3	1
Transportation Planner/EIT w/ GIS Skills	135	79	45	15	12	9	6
TOTAL	228	116	60	22	18	12	7

Activity 5.18 What Are the Pros and Cons of Using Consultants?

(discuss as group)

Don't neglect to consider:

the MPO staff effort for administrative effort

complications of requirements by fiscal agent if not MPO (e.g., City HUB/DBE requirements)

issues when required to select based on "low bid"

establishing an on-call consultant history can work

most likely a Texas-based individual due to travel considerations and knowing area. Need to get to know consultant community

<p>Reminder: Model Staffing Options</p> <p>272</p>	<p>Other alternatives for certain model tasks include TPP for model development, review, and oversight tasks, as well as data, guidelines, and training.</p>
<p>Developing Partnerships</p> <ul style="list-style-type: none"> ▪ With other local agencies <ul style="list-style-type: none"> • Data • Technical support ▪ Partnership with universities doing research ▪ On-call consultant advisors <p>Managing the TDM Development Process 273</p>	<p>Developing partnerships with other agency also offers an additional staff resource.</p>
<p>What Is MPO's Long-Term Strategy? (Activity)</p> <p>274</p>	<p>Finally, assess you MPO's long-term strategy with regard to modeling. See the activity on the next page.</p>

Activity 5.19 What Are Your MPO's Long-Term Modeling Goals?

(as large group, brainstorm 3 relevant questions)

(as small group, discuss for 5 minutes, then share)

Assigning Roles for the TDM Effort to Support Upcoming MTP



Deciding who to assign to each task involves a careful balance, considering:

- MPO's long-term strategy with regard to modeling
- Each person's skill set to accomplish task (or QC)
- Each person's availability (including commitment)
- Cost
- Risk of any of the above changing

See exhibits on next pages for this effort.

TPP Timeline Tool

Managing the TDM Development Process 276

There are a few items that should be prepared prior to and discussed with everyone involved.

The TPP model timeline is a tool for visualizing these agreements. Some MPOs and state DOTs formalize their arrangements through contract documents.

Best Practice: Formalizing the Process

- Formalize agreements with agency partners, e.g.:
 - UPWP task agreement between MPO and TxDOT TPP(T)
 - Formal scope and schedule for TDM development process, including responsibilities for TxDOT and the MPO

Managing the TDM Development Process 277

One is formalizing the process through agreements with partner agencies involved in model tasks.

UPWP Staff Planning

Managing the TDM Development Process 278

The UPWP is one way that the MPO formalizes its commitment to staff certain model tasks.

This is where you would include inputs development tasks, QC activities, meetings, and process management.

Another item scheduled through the UPWP is commitments related to staff training to support model tasks. This is where you would plug in the training you've identified considering the modeling schedule and internal staff.

Exhibit 5.r TxDOT-TPP Timeline as a Tool to Manage Roles and Responsibilities

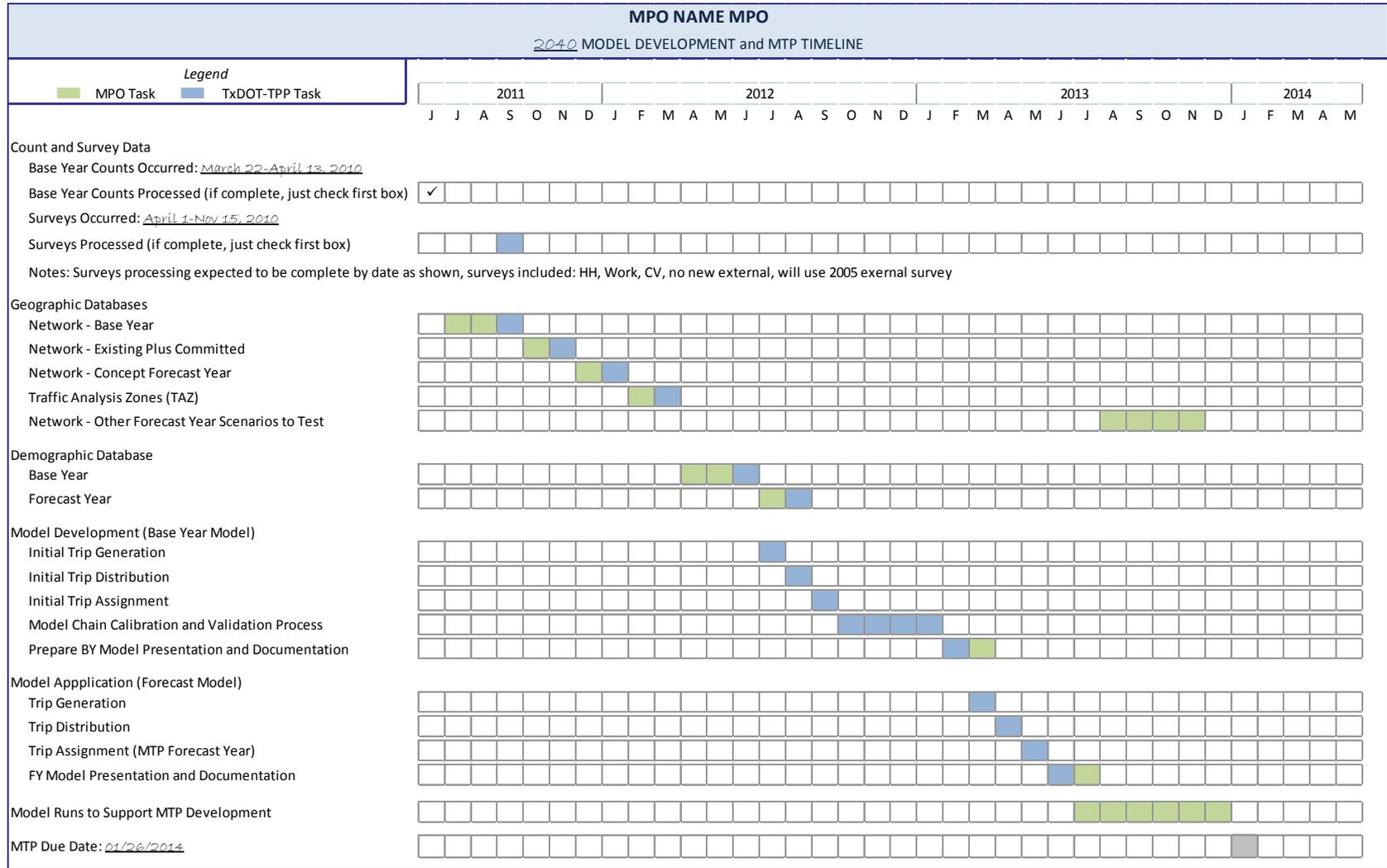


Exhibit 5.s UPWP Staff Planning

TASK	MPO as Lead Entity?	Participation by Non-MPO Staff	Participation by MPO Staff					Total Hours
			MPO Director	Planner	GIS	Technician	Adm Assistant	
Tasks on a 5-year Cycle								
<u>Metropolitan Transportation Plan</u>								
Demographic development	Y	Y						0
Demographic Updates (weekly)								
Coordination & meetings	Y	Y						0
Contract management	Y	N						0
Public involvement	Y	Y						0
Network development and review	Y	Y						0
Database maintenance	Y	N						0
Mapping	Y	N						0
Document development	Y	Y						0
TAZ								
"Learning Curve" (incl training courses & book)								
Model Evaluation (incl projection yrs)								
Review cordon boundary								
Saturation Count Map Mtg								
Saturation Count Map Review								
Model Kick-Off Meeting								

Suggested Break Here

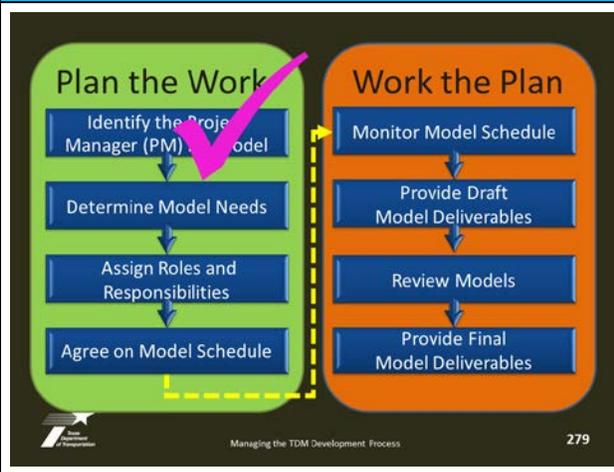
Post-Break Reinforcement Questions

Discuss previous material, any questions?

WORK THE PLAN

Topic 5.8 Managing the Schedule

1 hour, 20 minutes



It is critical to start any project off with realistic expectations clearly communicated to everyone involved. Having planned the work, there is still plenty to do working the plan.

This section provides tools for getting started, including a few items that should be prepared prior to and discussed with everyone involved.



Best Practice: Communication Protocol (Activity)

Lesson 5: Putting It All Together INSTRUCTOR HANDBOOK

Exhibit 5.1 Communication Protocol (Example)

What is a communication protocol?
Discuss elements of communication internal to the MPO: With staff
With Policy Board
Other?
Discuss elements of communication external to the MPO: With TriDOT
With other agency partners
With consultants
With public

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A protocol for communication is a helpful tool to manage communications and ensure those who need to know, do.

Exhibit 5.t Communication Protocol (Example)

<p>What is a communication protocol?</p>
<p>Discuss elements of communication internal to the MPO:</p> <p>With staff</p> <p>With Policy Board</p> <p>Other?</p>
<p>Discuss elements of communication external to the MPO:</p> <p>With TxDOT</p> <p>With other agency partners</p> <p>With consultants</p> <p>With public</p>

Monitoring the Schedule – Using a Checklist of Deliverables

Monitoring Deliverables

Task	Start Date	Due Date	In Progress In Review Complete	Responsible Agency	Responsible Agency
Base Year Network			Complete	MPO	TFF
Forecast Network(s)			Complete	MPO	TFF
Traffic Analysis Zones			Complete	MPO	TFF
Base Year Demographics			In Review	MPO	TFF
Forecast Year Demographics			In Progress	MPO	TFF
B'Y Trip Generation (Initial)			In Progress	TFF	n/a
B'Y Trip Distribution (Initial)			Not Started	TFF	n/a
B'Y Traffic Assignment (Initial)			Not Started	TFF	n/a
B'Y Calibration/Validation			Not Started	TFF	MPO
B'Y Model Presentation to MPC			Not Started	TFF	MPO
FY Model Setup and Runs			Not Started	TFF	MPO
FY Model Presentation to MPC			Not Started	TFF	MPO

Another option is to develop and monitor a stage-gate checklist for model tasks.

Ensure regular check-ins and status reports:

- At key milestones and
- Minimum: monthly

Exhibit 5.v MTP Model Plan Stage-gate Checklist (Example)



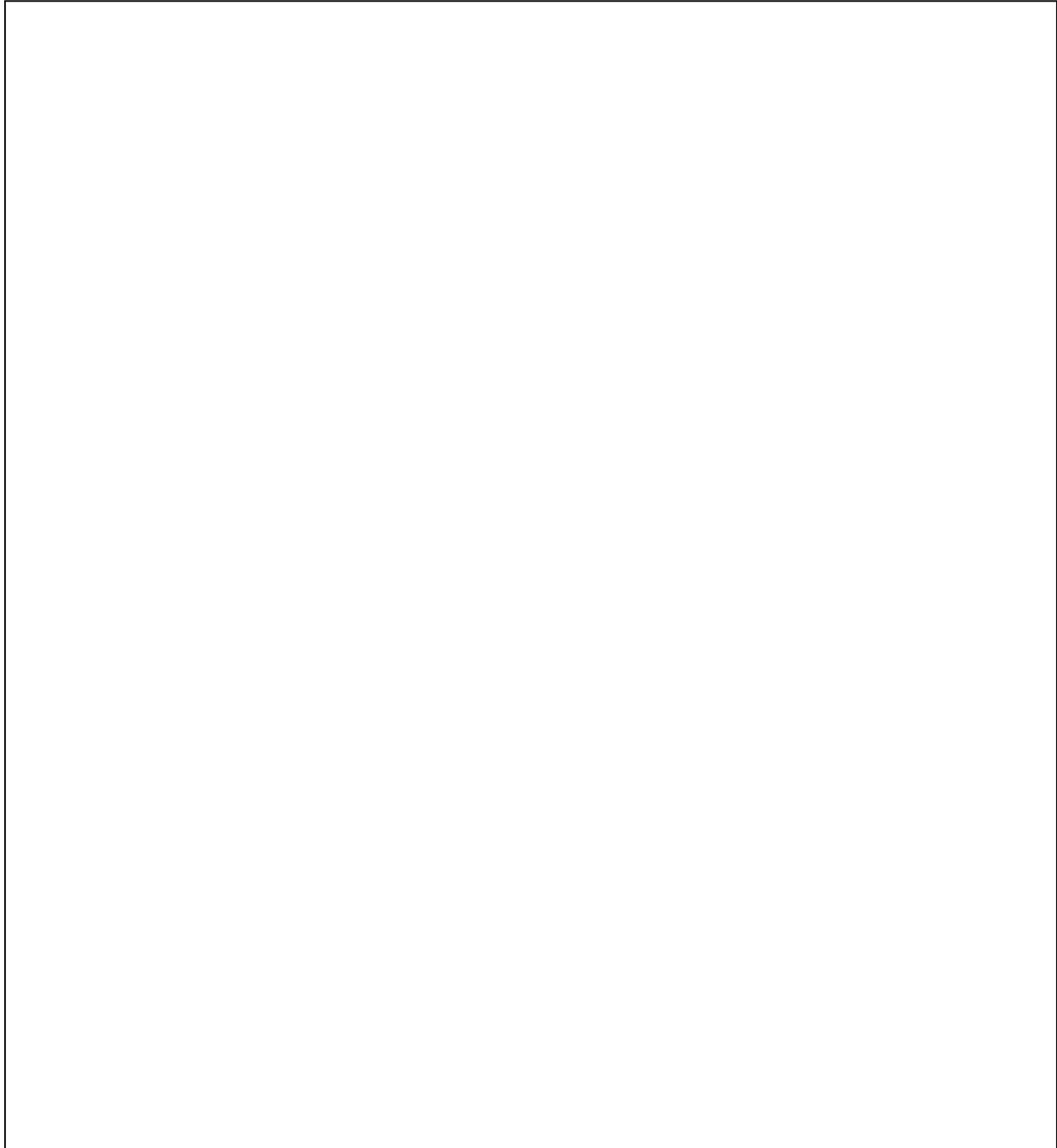
Task	Start Date	Due Date	In Progress/ In Review/ Complete	Responsible Agency	Reviewing Agency
Base Year Network			Complete	MPO	TPP
Forecast Network(s)			Complete	MPO	TPP
Traffic Analysis Zones			Complete	MPO	TPP
Base Year Demographics			In Review	MPO	TPP
Forecast Year Demographics			In Progress	MPO	TPP
BY Trip Generation (Initial)			In Progress	TPP	n/a
BY Trip Distribution (Initial)			Not Started	TPP	n/a
BY Traffic Assignment (Initial)			Not Started	TPP	n/a
BY Calibration/Validation			Not Started	TPP	MPO
BY Model Presentation to MPO			Not Started	TPP	MPO
FY Model Set-Up and Runs			Not Started	TPP	MPO
FY Model Presentation to MPO			Not Started	TPP	MPO

Other Schedule Management Strategies

<p>Strategies for Managing the Process Effectively (Activity)</p> 	<p>Let's discuss as a group some strategies for staying on top of the schedule when being pulled in multiple directions.</p>
---	--

Activity 5.20 What Strategies Might You Employ to Manage the Model Development Schedule?

(discuss as group, 5 minutes)

A large, empty rectangular box with a thin black border, intended for group discussion or notes during the activity.

Managing Challenges

<p>Keeping in Touch Strategies</p> <p>MPO Director is the Model Champion</p> <ul style="list-style-type: none"> • Advocates for timeline • Manages deadlines <p>MPO Coordinates with TxDOT TPP Regularly</p> <ul style="list-style-type: none"> • Identify and resolve issues early • Monthly model update meetings during longer tasks • If TPP staff is involved, copy the help desk on emails <p>Managing the TDM Development Process 285</p>	<p>What are some keeping in touch strategies that have been identified as working well for Texas MPOs in getting their models developed by TxDOT-TPP?</p> <p>These include recommendations by MPO staff as well as TPP staff.</p>
<p>What Types of Challenges Do You Anticipate? (Activity)</p> <p>Lesson 5: Putting It All Together PARTICIPANT HANDBOOK</p> <p>Activity 5.21 What Challenges do You Anticipate with Managing the Model Development Schedule? (discuss as group, 5 minutes)</p> <p>Managing the Travel Model Process 286</p>	<p>Activity: One of the biggest challenges for any project manager is advocating for your project.</p>
<p>How Do You Plan to Manage Non-performers? (Activity)</p> <p>PARTICIPANT HANDBOOK Lesson 5: Putting It All Together</p> <p>Activity 5.22 How Do You Manage Non-Performers? (within MPO and outside it) (discuss as group)</p> <p>Managing the Travel Model Process 287</p>	<p>Activity: What strategies do we have to managing non-performers?</p>

Activity 5.21 What Challenges do You Anticipate with Managing the Model Development Schedule?

(discuss as group, 5 minutes)

Instructor:

Some challenges:

- Unexpected technical complications
- Staff skills for assigned tasks were over-estimated
- Length of time planned for a task underestimated
- Managing unresponsive partner agencies responsible for input, tasks, or review
- Etc.

Activity 5.22 How Do You Manage Non-Performers? (within MPO and outside it)

(discuss as group)

How do you ID non-performers early enough in the process to do something about it? (checking in, QA/QC, etc.)

Spot-checking

Converse: How to you incentivize folks doing a great job?

Topic 5.9 Draft and Final Model Deliverable Items

5 Minutes

Items Typically Provided to an MPO upon Completion of Model Development and Application:

- **All files necessary to run the model** except proprietary software (e.g., TransCAD, TripCal5, ATOM2), these are each available through the means described in Lesson 4.
- A complete base model run, if the model task was calibration and validation of a base model.
- A complete application run or runs, if the model task included this expectation.
- **Documentation** of how to run the model and any additional needs to run it (proprietary software, for example).

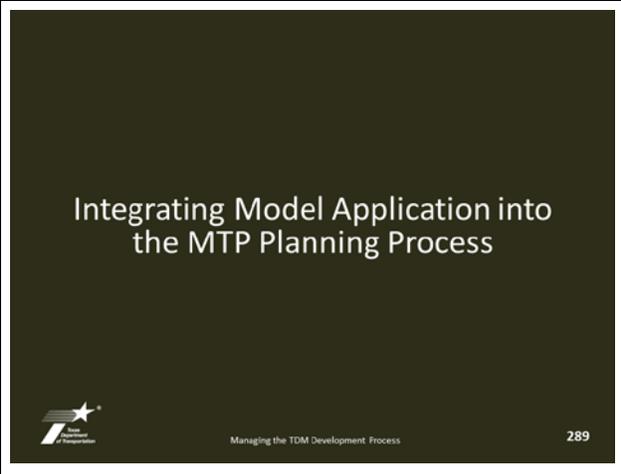
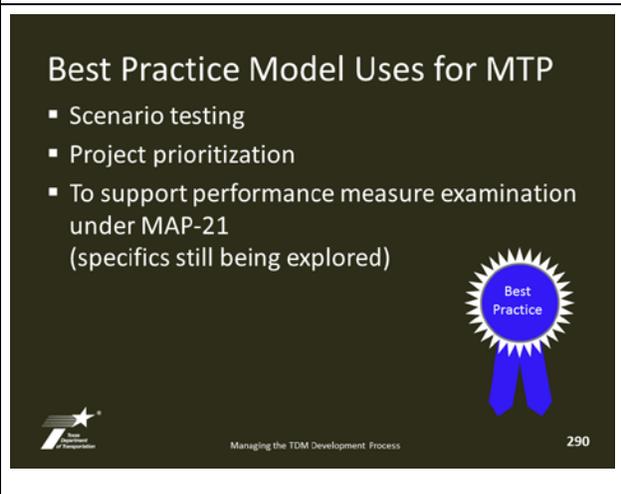
If contracting out model tasks to a private consultant, **be sure to specify in the contract language the following:**

- Expectations above for draft and final model deliverables within the timeframe specified.
- Ownership of the model products, including any model code written to implement the MPO's model, belongs to the MPO.
- Specify any protocols wanted with regard to use of the MPO's model for other analysis purposes, e.g., for studies for other parties. The CAMPO MPO, for instance, has developed a protocol requesting return of any model products developed from their regional model, and have additionally specified appropriate citation of the model to differentiate alternate applications of the CAMPO model from the adopted plan run.

Topic 5.10 Best Practice Strategies

Lesson Total Time: 25 Minutes

Integrating Model Application into the MPO's Planning and Public Involvement Process

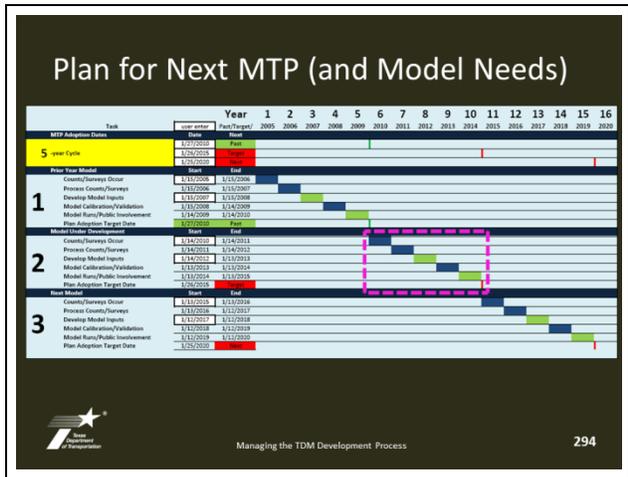
 <p>Integrating Model Application into the MTP Planning Process</p> <p><small>Managing the TDM Development Process 289</small></p>	
 <p>Best Practice Model Uses for MTP</p> <ul style="list-style-type: none"> ▪ Scenario testing ▪ Project prioritization ▪ To support performance measure examination under MAP-21 (specifics still being explored) <p>Best Practice</p> <p><small>Managing the TDM Development Process 290</small></p>	<p>Model results DO NOT replace the roles of decision-makers, professional planners, or the public in making decisions. The model can, however, be used to test projects (with a 3-step model, these will be roadway projects) for decision-makers to consider quantitative results alongside other factors.</p> <p>Lesson 2 included Best Practice Model Uses to Support Describe example process of model runs and public involvement.</p>

<p>Performance Measures</p> <ul style="list-style-type: none"> ▪ More to come as MAP-21 is interpreted ▪ One possible approach: <ul style="list-style-type: none"> • MPO, with public, identifies goals to meet • Performance measures are used to evaluate how well the MTP meets those goals <ul style="list-style-type: none"> ○ Total regional delay reduction ○ Hot spots addressed ○ More people using sustainable modes • Other goals/measures not from a travel model   <p style="font-size: small;">Managing the TDM Development Process 291</p>	<p>We know that MAP-21 has some performance measure aspects, but at the time of handbook publication, the regulations for this aspect were not yet finalized. Here is our best guess of a possible approach.</p>
<p>EXAMPLE (described)</p>	<p>For example: One Texas MPO actively engages their public by regularly presenting progress on a prioritized project list for their area based on the MTP. This allows the public to see what the area has accomplished and what the MPO plans to do once identifying funding. The MPO encourages the public to comment on proposed projects and to submit ideas of their own. Over the years, the Policy Board awarded funding to several key projects including transit, bicycle, and pedestrian, and new facility (highway and bridge) simply because they rose to the top based on importance to the community. In this scenario, a model would not replace this public engagement process, but could complement it; a model can be used to test the highway projects to provide quantitative data to show individual project or scenario (groups of projects) effectiveness.</p>

Looking in the Rearview Mirror: Retrospective Review

<p style="text-align: center;">Looking Backward and Forward</p>  <p style="text-align: center;">Managing the TDM Development Process</p> <p style="text-align: right;">292</p>	<p>Post-MTP and Model Development (after the heat is off), a project retrospective is a Best Practice to apply lessons learned (this is the backward part) to the next round of model activities (the forward part).</p>
<p style="text-align: center;">Retrospective Review (concept)</p> <ul style="list-style-type: none"> ▪ Pre-planned, systematic ▪ Reassurance to all that focus is on future ▪ Format established prior, possibly including: <ul style="list-style-type: none"> • Independent facilitator • Simple questionnaire to participants • Discussion format if appropriate • Follow-up by facilitator if necessary ▪ Summary of actionable items for future  <p style="text-align: center;">Managing the TDM Development Process</p> <p style="text-align: right;">293</p>	<p>A project retrospective analysis is the process of gathering the project team at the end of a project to review and learn from the experience. This involves a systematic approach, often including finding an independent facilitator, and can be either a meeting or conducted through individual interviews or a survey. Alternatively, in a discussion approach, the facilitator walks participants through a process to arrive at a productive outcome.</p>

Looking Ahead to the Next Model



We mentioned this Best Practice strategy already, but it exemplifies a bigger strategy: choosing interim here forecast models strategically.

Even if NOT a full interim year model run, when coding the forecasting year network, try to be cognizant of the likely base years for future models.

See Exhibit.



KEY CONCEPT: Learn from today's lessons to avoid seeing the same issues for the next model.

Topic 5.11 Key Talking Points by Audience

Lesson Total Time: 30 Minutes



The next few pages provide an opportunity for open brainstorming and discussion of the different ways to communicate about travel models by different audiences.

When Talking with TxDOT Staff

- Agree on expectations at the outset.
- Investigate upcoming and available training opportunities.
- Verify that the resources provided by TxDOT and listed below are the latest versions.
- Inquire about any newly developed initiatives or resources.
- Protocol in contracting with consultants to assist MPO staff with model inputs development.
- Protocol and potential challenges in contracting with consultants to assist MPO staff with model development, application, interpretation, and training.

Activity 5.23 Discuss Best Practices for Communicating with TxDOT Staff

(discuss as group)

See the Communication Protocol in Exhibit 5.s. Good idea to outline expectations for who talks to whom about milestones and TDM decisions ahead of time.

When Talking with MPO Staff

- Set clear expectations for tasks clear and provide regular feedback on progress.
- Reiterate mission-critical inputs and deadlines.
- If appropriate, set internal deadlines ahead of critical path deadlines.
- Share quality assurance procedure ahead of time and schedule quality control procedure as part of the delivery schedule.
- Training and travel plans.

Activity 5.24 Discuss Best Practices for Communicating with MPO Staff

(discuss as group)

- See the Communication Protocol in Exhibit 5.s. Good idea to outline expectations for who talks to whom ahead of time.

When Talking with Policy Board Members

- Identify your policy board's expectations...some don't want to be involved with the details at all, some want more detail, for example being able to demonstrate accountability for their decisions, concise non-technical explanations of findings, no surprises.
- For policy board members interested in the planning process, an excellent resource is the *Briefing Book* (see Helpful Resources at the end of Lesson 2).
- Key communication milestones before and during the model development process.
- Be clear on which model (referred to by its forecast year, e.g., 2035 or 2040) will be used for the upcoming MTP.
- Set expectations early for how long the model development process takes and what date the MPO needs to have a final model to begin making MTP runs.
- Provide advance communication about training and travel needs.
- Justify MPO staff expertise to manage and review contractor work, if applicable.

Activity 5.25 Discuss Best Practices for Communicating with Policy Board Members

(discuss as group)

- Completely unique by MPO and individual – the Director’s job is to figure this out for each Member
- General tips offered by MPO Directors: keep things simple, much simpler than was referred to in this training, and refer to the model by its forecast year, not its base year, which is confusing to most lay persons.
- Set expectations early for the schedule and inputs, and try to avoid having the Board adopt model inputs prior to model validation, in case some errors are discovered under the model development process.

How might communicating with Technical Committee members be different?

- Again, also depends on the Technical Committee members. This group tends to want to see more details.

Talking Model-ese with Non-Modelers Generally (including the Public)

- Define varied expectations of different members of the public—transparency, accountability, clear, concise, more details available for informed audiences.
- Prepare materials that relate modeling key concepts.
- Provide measures from model in support of decisions made.
- Always refer to the model by its forecast year, not its base year.

Activity 5.26 Discuss Best Practices for Communicating Model Concepts and Results with the Public

- Keep it simple, refer to the model by the forecast year only.
- Be clear that the model merely provides information for decision-making, not the decision itself, which weighs many factors.

Topic 5.12 Lesson Wrap-Up

5 Minutes

On the previous page is a list of Other Helpful Resources that cover the topics in this lesson.



Lesson 5 Learning Objectives

Putting It All Together

- Identify Unique MPO Challenges
- Map the Critical Path
- Make It Work

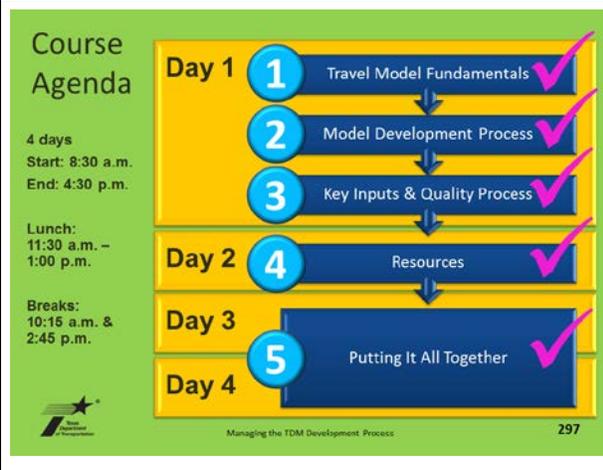
Managing the TDM Development Process 296

At the beginning of this lesson, we set the following learning objectives. At this point, you would be able to: (read the objectives).

Does anyone have any questions about this material?

Course Conclusion

10 Minutes



Course Agenda

4 days
Start: 8:30 a.m.
End: 4:30 p.m.

Lunch: 11:30 a.m. – 1:00 p.m.

Breaks: 10:15 a.m. & 2:45 p.m.

- Day 1: 1 Travel Model Fundamentals ✓
- 2 Model Development Process ✓
- 3 Key Inputs & Quality Process ✓
- Day 2: 4 Resources ✓
- Day 3: 5 Putting It All Together ✓
- Day 4

Managing the TDM Development Process 297

Over the past several days, we completed five lessons, as shown.

Learning Objectives

Managing the TDM Development Process 298

At the beginning of this course, we set the following learning objectives. At this point, you would be able to: (read the objectives).

Course Premise

Managing the TDM Development Process 299

Remind participants of the original course premise from the introduction.

It is expected that they will use and further develop the tools here to best suit their individual MPO challenges and situations.

Managing the TDM Development Process 300

The intent of the course was to provide to those involved with the TDM development process in Texas, especially MPO directors and planning managers, greater understanding, tools, tips, and strategies, so that the TDM process is not a maze, but a path.

Appendix A: Other Types of Models

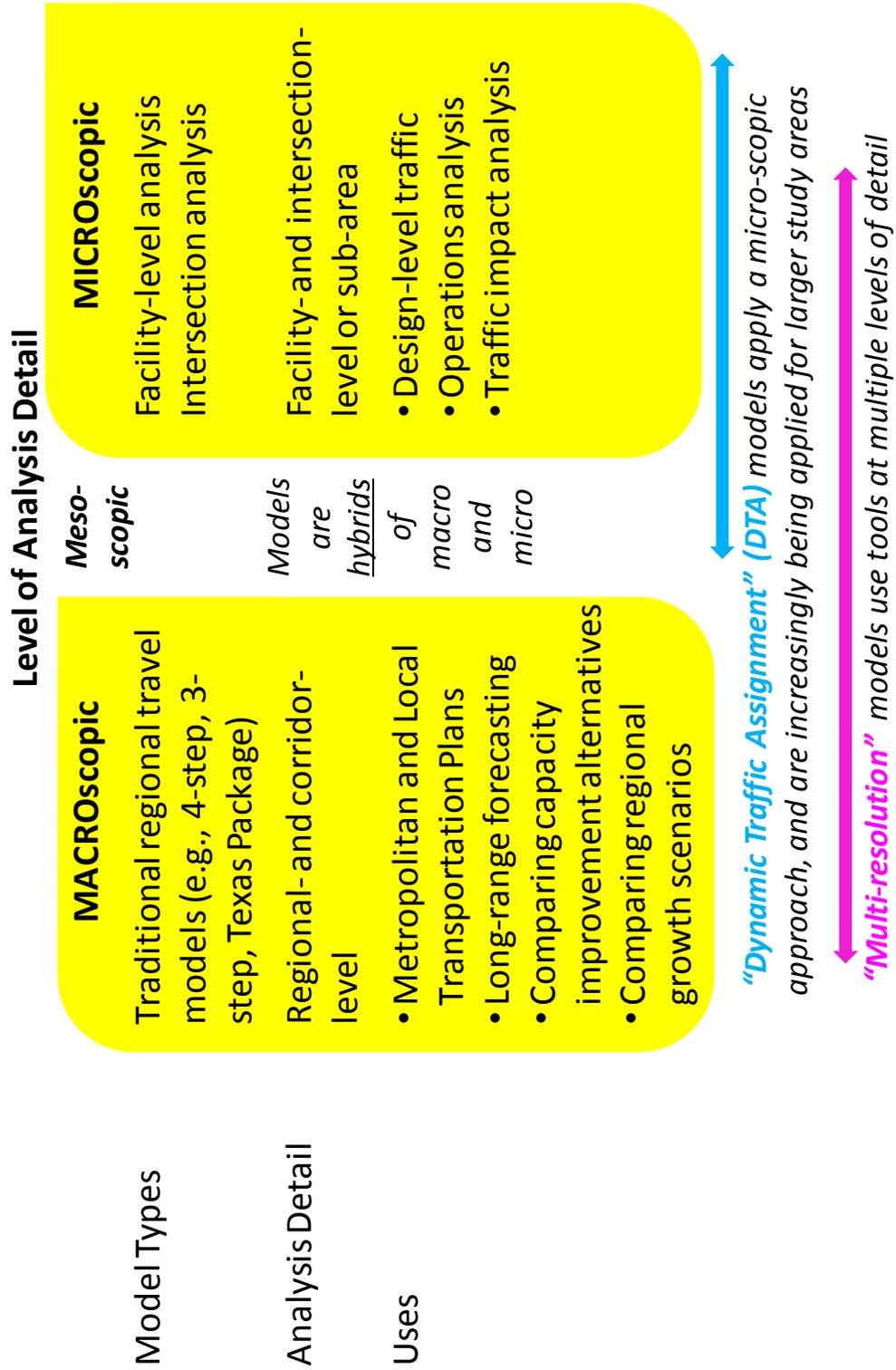
Texas Package in the Context of Other Types of Models

This section is provided to give a general understanding of the different analysis tools available for travel and traffic analysis, not as a comprehensive resource. Please see page 31 in Lesson 1 for other resources on this topic.

Macro-, Meso-, Micro-Models, and Other Forms

The Lesson 1 section on model limitations provides an example of intersection analysis as something people frequently ask if travel models can do. That type of analysis is best conducted at the “micro” level of analysis. Exhibit A.a shows general differences between the macro (travel demand model) and micro levels of analysis. Note as well: meso-models, multi-resolution models, and hybrids.

Exhibit A.a Macroscopic, Mesoscopic, and Microscopic Model Tools



Trip-Based, Tour-Based, and Activity-Based Models

The Texas Package is a traditional “trip-based” approach. This means that trips are each considered separately: home to dry cleaner, school to coffee shop, coffee shop to work, etc. The entire home-to-home travel is called a “tour.” Many advanced models, in various approaches, link the individual trips, at least for trips starting and ending at the same location (i.e., tours).

Travel, Trips, and Tours

- “Travel” is the behavior
- A “trip” has
 - One origin
 - One destination
- “Tour” refers to a connected group of trips

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The exhibits on the next pages in the handbook provide a very general summary of traditional models (the Texas Package falls in this group) and approaches that industry experts consider advanced practice. As covered in the Course Introduction, of MPOs nationwide, a few don’t use models at all. Of the majority that do, most are using traditional models with enhancements (all 25 MPOs in Texas currently base their MTPs on a traditional model). Many MPOs with the resources to do so are exploring advanced practice models, including the largest MPOs in Texas.

This course is not intended to address advanced model practice. However, the current thinking is to consider models generally “suites” of tools, and therefore advances can often be implemented and integrated as components. At the end of both exhibits is the description of this component approach, called hybridization. Another way to consider this suite of model tools is as a toolbox, as shown in the graphic here.

Modern Travel Model = Toolbox

Texas Package TDM Options	Hybridization & Enhancements Examples	Advanced Model Practices
<ul style="list-style-type: none"> • Traditional application • Post-processing (typical corridor analysis) • Additional modules (mode choice, tolling, etc.) • Apply diurnal factors to convert to peak period 	<ul style="list-style-type: none"> • Texas Package trip tables → diurnal factors → dynamic traffic assignment • Texas Package trip tables → subarea window → microscopic analysis • Feedback 	<ul style="list-style-type: none"> • Tour and activity based • Other advanced sub-models <ul style="list-style-type: none"> • Visitor • Commercial vehicle • Combined models

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Exhibit A.b Traditional (Trip Based) Model Approach

Typical Components	Demographic allocation of control totals Trip Generation Trip Distribution Mode Choice or Shares Equilibrium Traffic Assignment
Typical Enhancements	Land use models Feedback loops: assignment to distribution Truck models Toll models Special purposes (airport, university, etc.) Post-processing (air quality models, etc.) Time-of-Day models
Model Characteristics	For most trip purposes: <ul style="list-style-type: none"> - Modeling of TAZ groups (aggregate) - Sequential model step application
Distinguishing Features of Approach	Traditional and sufficient for most regional planning needs for autos and trucks <ul style="list-style-type: none"> - Supported by Texas statewide data collection activities - Professional familiarity - Enhancements can supplement the approach for particular analysis needs Daily total volumes along roadways are familiar to Texas transportation professionals.
Example MPOs	All Texas MPOs as of 2012, majority of MPOs nationwide. HGAC and NCTCOG are in different stages of developing an ABM approach.
Hybrid Approaches Combine Some Advanced Elements into Traditional Models	

Exhibit A.c Advanced Practice Approaches

<p>Typical Components</p>	<p>Population synthesis Long term Choice model (work/school location, vehicle availability/ownership) Activity-based or tour-based models: list of all the activities, tours, and stops generated over a day Choice modeling: tour generation (including school escorting & joint travel), tour destination, time-of-day and mode choice, tour stop generation, stop destination and mode choice, etc.</p>
<p>Typical Enhancements</p>	<p>Urban growth simulation models Dynamic Traffic Assignment (DTA) integration Greater interaction between individuals' travel decisions Extensive space-time interactions over the day</p>
<p>Model Characteristics</p>	<p>For most trip purposes:</p> <ul style="list-style-type: none"> - Modeling of individuals' or households' activity/travel (disaggregate) - Greater spatial and temporal detail - Greater person and household attributes and detail - Linkage between trips - Logical trip chains - Feedback to ensure any sequentially applied models are consistent - Upward and downward integration of model components, so that model components at all level of hierarchy can be informed by other model components. <p>Trip purposes such as commercial vehicles and external and visitor demand are often still addressed using a trip-based approach</p>
<p>Distinguishing Features of Each Approach</p>	<p>Enable examination of behavioral changes in response to a variety of system changes More explicitly accounts for and evaluate the effect of transportation system characteristics, improvements, and/or policies on specific sub-groups Disaggregate/detailed form enables tighter integration w/ simulation/operational analysis</p>
<p>Example MPOs</p>	<p>Atlanta (GA), Columbus (OH), Denver (CO), New York (NY), Portland (OR), Sacramento (CA), San Francisco (CA), Tahoe (CA), Houston (under development)</p>
<p style="text-align: center;">Hybrid Approaches Combine Some Advanced Elements into Traditional Models</p>	

Matching Model to the Context

The Transportation Research Board SR 288 provides an excellent discussion on the topic of matching the model tool to the analysis need, called “Matching the Model to the Context”. The following exhibit was extracted from SR 288 for additional study.

Exhibit A.d Matching the Model Approach to the Context

		Level of detail required for analysis					
		Aggregate		Disaggregate			
Typical transportation issues		Roadway sizing	Transit New Starts	Land use effects on mode choice	Air quality analysis/tolls	High-occupancy travel lanes, variable tolls	Corridor studies, peak spreading, saturated networks
Typical land use issues		Transportation analysis methods					
		Three-step	Four-step	Five-step (automobile availability) with land use variables	Population synthesis	Household activity-based	Traffic microsimulation
Slow to moderate growth	Spreadsheets, geographic information systems						
Fast growth, growth impact analysis	Lowry-type accessibility-based models ^a						
Growth, housing costs, environmental justice	Real estate market models						
Economic development	Markets and input/output models						
Economic development and environmental justice	Disaggregate business and residential location models						

■ = Reasonable combination of models

^a The Lowry-type accessibility-based model was first developed by Ira S. Lowry for Pittsburgh. Such models estimate the location and scale of (a) employment for basic industries and services whose clients are outside the region, (b) employment for retail activities serving the region, and (c) the resident population of the region (Chapin and Kaiser 1979).

Source: SR 288, Metropolitan Travel Forecasting: Current Practice and Future Direction, TRB, 2007, Figure 4-3.

Appendix B: Draft Contract Language to Contract Out Model Inputs Development

SAMPLE REQUEST FOR PROPOSAL

This document provides a sample request for proposal that may be used by MPOs who wish to have a consultant prepare the demographic data required for use in developing their travel demand forecast. This sample RFP is provided as guidance for MPOs to ensure that the appropriate data and work is outlined in the RFP. It does not include all contracting or other administrative requirements that may need to be included with any RFP.

Following the sample RFP is a sample work plan which outlines the basic tasks that MPOs should look for when reviewing and ranking technical work proposals submitted in response to the Request For Proposal. Additionally, a list of technical or methodological items that MPOs should look for when reviewing the RFPs is included. These items are provided to assist MPOs in the review of proposals. It is **NOT** intended that they be included in the RFP as a consultant that understands the project should be knowledgeable enough to know the basic tasks and methods required to complete the work.

**SAMPLE REQUEST FOR PROPOSAL
FOR
DEVELOPING DEMOGRAPHIC AND EMPLOYMENT INPUTS
FOR TRAVEL DEMAND FORECAST**

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**SAMPLE REQUEST FOR PROPOSAL
FOR
DEVELOPING DEMOGRAPHIC AND EMPLOYMENT INPUTS
FOR TRAVEL DEMAND FORECAST**

PART I - SCOPE OF SERVICES

Introduction

Transportation planning in the (*name*) urbanized area is performed by (*MPO name*), the designated MPO for the area, in close cooperation with the Texas Department of Transportation (TxDOT). The travel demand forecast for the (*name*) urbanized area is a traditional four-step model. The trip generation model, TRIPCAL5, requires population, number of households, average household size, median household income, total employment and total employment by type (basic, retail, service, and education) for the base year and the forecast years as inputs. The (*name of agency*) is seeking a qualified consulting firm to assist in conducting the necessary data collection and analysis to develop this data for the 20?? base year and the (*list all forecast years for which data is needed*) travel forecasts.

Background

[*A description of the urban area should be provided here. In general this description should be sufficient to adequately describe the area so that the consultants can more accurately estimate the manhours required to complete the work. Examples of items that should be included are:*

Existing population and historic and current growth patterns

Size of the area in terms of square miles, number of travel analysis zones. A map should be included that illustrates the area that will be defined as the study area for the project.

A description of changes to the urban area since previous forecast and changes to the traffic analysis zone structure

Date of last travel demand forecast

Number and type of special generators in the area

Description of major and minor cities

Any local political concerns that may affect forecasts

Any unusual concerns or developments]

Preliminary Scope of Work

This section describes the basic services and deliverables required to complete the project. Firms submitting proposals should ensure that the work described herein is included in their proposed work program, but other tasks may be included if the consultant feels they are appropriate and they are justified. The consultant should recognize that the work requested here is to prepare the population, household, income and employment estimates and projections required as inputs into

the TRIPCAL5 trip generation program. The motivation for this work is primarily to prepare a new travel demand forecast for use in developing an update to the area's long-range transportation plan. **Specific work to be completed by the consultant is described in the following sections.**

Technical Work Required by Proposal

The work required to complete this study includes the following:

Task 1. Develop Base Year and Forecast Year Control Totals

Develop 20?? base year and (*list all forecast years for which data is needed*) forecast year control totals for population, number of households, average households size, median household income (in base year dollars), total employment, and total employment by type (basic, retail, service, and education) for the county and the Metropolitan Area Boundary (MAB). Additionally, the base year major group quarters populations will be identified by type and population. A brief technical report describing the methodology used to develop the base year and forecast year estimates of population, number of households, average household size, median household income, and basic, retail, service, and total employment will be prepared. This report should include sufficient analysis of historic data and anticipated trends to enable the MPO to assess the reasonableness of the base and forecast year control totals.

Task 1 Deliverables: Control Total Technical Report

Task 2. Develop Base Year TAZ Data

Develop 20?? base year estimates for population, number of households, average household size, median household income (in base year dollars), employment by type (basic, retail, service, and education), total employment, and special generator information for each traffic analysis zone (TAZ). Additionally, in the data set identify the 20?? major group quarters data (type and population) for each traffic analysis zone. The group quarters data will be input into the data file for that zone and identified in the comment section of the data file.

The data for employment will be the 20?? Texas Workforce Commission (TWC) employment for the base year and will be provided to the consultant. The type of employment (basic, service, retail, and education) will be consistent with the North American Industrial Classification System (NAICS) codes as shown in Table 1. The TWC file provided will have the employment type already identified for each establishment.

There are several issues with the TWC data that will need to be considered for this work:

- The majority (but, not all) of the employer records contain a geographic or X/Y coordinate which provides the opportunity to associate business sites to traffic analysis zones using a GIS platform. However, the underlying geography used to create the coordinate information for each employment location address is not always consistent with the underlying geography used by TxDOT to create travel demand model networks. Additionally, some of the X/Y coordinates are not consistent with the actual business site,

SAMPLE

Table 1. Basic, Retail, and Service Employment NAICS Codes

Employment Type	NAICS Code	Employment Description
Basic	11	Agriculture, Forestry, Fishing & Hunting
	21	Mining
	22	Utilities
	23	Construction
	31-33	Manufacturing
	42	Wholesale Trade
	48-49	Transportation & Warehousing (Except 491 – Post Offices)
	5111	Newspaper/Book/Directory Publishers
	5112	Software Publishers
	512	Motion Picture/Sound Recording (Except 51213- Motion Picture Theaters)
	5151	Radio & TV Broadcasting
	5173	Telecommunications Resellers
	5175	Cable and Other Program Distribution
	Retail	44-45
71		Arts, Entertainment & Recreation
722		Food Services & Drinking Places
491		Post Offices
Service	51213	Motion Picture Theaters
	516-5172	Internet Publishing & Telecommunications
	5179	Other Telecommunications
	518-519	Internet Service Providers and News Syndicates
	52	Finance & Insurance
	53	Real Estate, Rental & Leasing
	54	Professional, Scientific & Technical Services
	55-56	Company Management & Administrative Support
	62	Health Care & Social Assistance
	721	Accommodation
	81	Other Service, Repair & Maintenance
	92	Public Administration
	6117	Educational Support Services
9999	Unknown	
Education	6111	Elementary & Secondary Schools
	6112-6113	Junior Colleges, Colleges, Universities & Professional Schools
	6114-6116	Business, Technical, Trade & Other Schools

but, are coded to the zip code centroid. These issues may ultimately result in the erroneous placement of employment sites within traffic analysis zones.

- The TWC data may not include all information for each business (i.e. addresses and/or number of employees may be missing). The contractor will be required to update this data to extent possible in order to place the correct number of employees in the correct zone.
- The TWC data for some establishments represents the location and employment for the parent company. The most common example is where public school employment is provided at the school district administration location rather than the individual school and/or facility location. School employment needs to be at the individual school or facility site. Any other establishment listed at the parent location will need to be located at the local site with local site employment only.

Develop required special generator information for the base year. Special generators in the *(name of MPO area)* include: *(List special generators by name)*. Data required for special generators according to type of generator is given in Table 2. Special generator data is contained in the file with other demographic data (see Table 3 and Table 4) with separate files for the base year and the forecast year.

Table 2. Special Generator Data Requirements

Type of Special Generator	Data Required
Educational (Universities, colleges, junior colleges, high schools, and major technical schools)	Number of employees Number of students Number of students living on campus
Hospitals	Number of employees Number of beds
Airports	Number of employees Number of annual deplaning passengers
Military Bases	Number of military personnel Number of civilian employees Number of military living on base
Major Special Attractions/Event Centers (This should include only those special attractions that are open most of the year. For example Six Flags, Fiesta Texas, Sea World, AstroWorld, etc.)	Number of employees
Industrial sites	Number of employees
Regional Malls	Number of employees

Task 2 Deliverables: A completed Excel file of base year TAZ population, households, group quarters population, median household income, total employment, basic employment, retail employment, service employment, education employment, special generator population, special generator employment, and appropriate comments. This data should be in the format illustrated in Table 3 and Table 4.

Task 3. Develop Forecast Year TAZ Data

Develop *[list all forecast years here]* forecast year estimates for population, number of households, average household size, median household income (in base year dollars), employment by type (basic, retail, service, and education), and total employment for each TAZ. The TAZ data should be consistent with the forecast year control totals previously developed. Additionally, in the data set identify the forecast year major group quarters data (type and population) for each traffic analysis zone. The group quarters data will be input into the data file for that zone and identified in the comment section of the data file.

Develop required special generator information for the same forecast year(s). Special generators are the same as those listed for the base year. Data required for special generators according to type of generator is given in Table 2. Special generator data is contained in the file with other demographic data (see Tables 3 and 4) with separate files for each forecast year.

The MPO, in cooperation with TxDOT TPP, will have one month to review the demographic data. The consultant will be responsible for addressing any comments and/or making needed revisions.

Upon approval of the zonal data, an Excel data file in the format described in Table 3 will be provided. A separate file will be prepared for each forecast year.

Task Deliverables: A completed Excel file for each forecast year containing TAZ population, households, group quarters population, median household income (in base year dollars), total employment, basic employment, retail employment, service employment, education employment, special generator population, special generator employment, and appropriate comments. This data should be in the format illustrated in Table 3 and Table 4 examples.

Table 3. Format of Demographic Submittal

TAZ	POP	HH	Group Quarters Pop.	Median Income	Total Emp.	Basic	Retail	Service	Edu.	Spec. Gen. Pop	Spec. Gen. Emp.	Comment/Type

Table 4. Example of Completed Demographic Data File

TAZ	POP	HH	Group Quarters Pop.	Median Income	Total Emp.	Basic	Retail	Service	Edu.	Spec. Gen. Pop	Spec. Gen. Emp.	Comment/Type
1	100	52	0	26,501	20	0	10	10	0	0	0	
2	0	0	500	0	60	0	0	10	0	0	50	500 Grp. Qtr. Pop. is located in county jail, which has 50 empl.
3	0	0	0	0	21	21	0	0	0	0	0	
4	25	10	0	26,501	35	5	10	20	0	0	0	
5	3	1	0	36,133	45	25	10	10	0	0	0	
6	44	34	0	26,501	50	0	0	0	50	0	0	High school XYZ
7	191	112	0	26,501	77	0	37	10	30	0	0	Middle school XYZ
8	0	0	0	0	312	0	0	0	0	0	312	County hospital
9	0	0	1,000	26,501	210	0	10	0	0	0	200	University Dorm Pop/College Emp (175 full-time, 25 student workers).
10	300	110	0	26,501	0	0	0	0	0	0	0	One of the HH's is a sorority house with 25 people living in house (the 25 are a part of the 300 Pop. total)
11	0	0	10,000	19,910	400	0	0	0	0	0	400	10K Pop. in military barracks; Of the 400 employees, 100 are military personnel and 300 are federal employees
12	0	0	0	19,910	0	0	0	0	0	500	0	500 Pop. for officer quarters not living barracks in 250 HH's

Data and Information To Be Provided By MPO

This section lists the items available to the consultant from the area MPO, TxDOT or other local agencies. *[This list provides examples of data that the consultant might need. The MPO should list what they have and will make available to the consultant, either free or at cost, to better enable the consultant to estimate the manhours required and the cost of the work.]*

- Reproducible base maps for the urbanized area.
- Reproducible base map of the traffic analysis zones for the urbanized area.
- Maps of census tracts and block group maps
- Transportation Network map
- Any recent population estimates developed by local agencies.
- Texas Workforce Commission data for the base year. Businesses will be listed by NAICS codes for basic, service and retail employment. The consultant will be required to sign a letter ensuring the confidentiality of this data prior to receipt.
- The most current land use and zoning maps, including proposed future land use.
- List of special generators with contact name for special generator.
- Available recent aerial photography for the area.
- A table of equals providing the census block/block groups for each traffic analysis zone.
- Available GIS files that may expedite the work at the zonal level.

Required Disciplines

Knowledge and experience in several fields are deemed necessary for completion of this project. Of most importance is demonstrated knowledge and experience in the development of socio-economic data for transportation planning and in the development of demographic, income and employment forecasts. Additionally, knowledge of the development of the transportation network and traffic analysis zone structure is required.

[Depending on the specific MPO, other knowledge may be needed and should be specified].

Required Schedule

This project must be completed no later than *[date]*. Sufficient time must be allowed for agency review and for adoption of the base year and forecast year control totals by the MPO.

Reporting Requirements

On or before the 10th of each month the consultant shall submit a brief progress report describing the work accomplished and technical decisions made during the previous reporting period, and highlighting the work to be completed during the next period. A percentage estimate of the work completed for each task shall be provided and an estimate of the total percentage of

the project completed versus the manhours expended should be made. A total of 10 percent of each billing will be withheld until all work has been completed to the satisfaction of the MPO.

Available Funding (Optional)

This update of the (*area's name*) travel demand model is being prepared with a portion of the federal transportation planning funds made available to the MPO. At the present time \$ has been budgeted for completion of the project.

SAMPLE

PART II - PROPOSAL REQUIREMENTS

Technical Proposal

The required contents and limitations for preparation of the technical proposal are described in this section. Failure to provide the requested information or adhere to any stated limitations may result in disqualification of the submitted proposal. A total of ___ copies of the Technical Proposal should be submitted to the address given in the cover letter.

Contents

The required contents for the Technical Proposal are presented below in the order they should be incorporated into the submitted document.

Understanding of the Proposed Project - This section should demonstrate the consultant's understanding of the project need, the work required, and any local issues or concerns. This description should be concise, candid and not a mere duplication or rephrasing of the RFP's scope of services. Limited to 3 pages in length.

Proposed Work Plan - The consultant should present the proposed work plan necessary to complete the work itemized under the scope of services. The proposed work plan should address each of the specific work elements described in the scope of services, but consultants may propose additional work beneficial to completing the work specified. Where appropriate the methodology to be used to accomplish a specific task should be described. All proposed meetings and/or reviews should be included under each task. Any data or assistance anticipated to be required from the MPO staff should be specified. All final products should be described. There is no page limitation for this section, but consultants are encouraged to be succinct.

Schedule - A proposed schedule for completing each task proposed should be provided. For each review proposed by the consultant, the schedule shall reflect the maximum allowable review time available to maintain the schedule as proposed. The schedule shall also reflect expected dates for deliverables and anticipated timing for review and approval by the MPO and TxDOT.

Firm Qualifications - This section should include a description of the firm's qualifications for performing the proposed work. This description is limited to 2 pages. A brief description of the firm's most recent or applicable demographic forecasting projects shall be provided. For each project a client contact name and phone number should be included for reference purposes. Additionally, the names of the personnel proposed for this project that participated in the projects listed should be provided. This project list is limited to 5 pages.

Personnel and Staffing - The consultant should provide an organization chart for the project; an estimate of the manhours by personnel by task; and, a summary paragraph of the project work to be performed by each proposed staff member. Biographic summaries that highlight

the experience relevant to the specific project responsibilities should be provided for all proposed personnel. There is a 1 page limitation for each biographic summary provided.

Required Certifications and Submittals - [*This section will contain any certifications and assurances as required by TxDOT, the MPO and the FHWA.*] .

Cost Proposal

The required contents and format for preparation of the Cost Proposal are presented in this section. Failure to provide the requested information may result in disqualification of the submitted proposal. A total of ___ copies of the Cost Proposal should be sealed in a package separate from the Technical Proposal and submitted to the address given in the cover letter.

Contents

An Estimate of Personnel Hours by Task - The table provided under the staffing section of the Technical Proposal providing the personnel hours by task should be included in the Cost Proposal.

Cost Estimate - Estimated costs for completing the work described in the proposed work plan shall be provided. Separate detailed cost estimates should be provided for each task. A cost summary sheet for the entire project should be provided. This cost summary sheet should include the total estimated costs for each major phase of the project. Any assumptions used to estimate the costs for the proposed services should be explained in this section, but should be on pages separate from the required tables.

PART III - SELECTION PROCEDURES AND SCHEDULE

Selection Procedures

Technical Proposals shall be the basis for selection of the consultant. Technical Proposals shall be ranked by a committee of individuals representing the MPO and TxDOT using the selection criteria and weights described below. At the same time that the Technical Proposals are being ranked, the Cost Proposals shall be evaluated independent of the Technical Proposal for reasonableness of manhour rates, overhead rates, travel rates and other usual cost items. After the Technical Proposals have been ranked, the result of the Cost Proposal review and evaluation shall be presented to the proposal evaluation committee. If the Cost Proposal for the top-ranked Technical Proposal is considered reasonable and acceptable, contract negotiations shall be initiated with that consultant. If no agreement can be reached with the first consultant, negotiations shall be terminated. Negotiations shall then be opened with the consultant having the next highest ranked Technical Proposal with an acceptable and reasonable Cost Proposal. This process shall continue until a consultant has been selected.

The MPO has the right to reject any and all proposals if they do not meet the needs and/or budget of the MPO.

Selection Criteria and Weights

Demonstrated Experience in Performing Similar Work

Personnel Experience	25%
Firm Experience	20%

Demonstrated Knowledge of the Work Requirements 20%

Quality of the Proposed Work Plan 20 %

Ability to Meet the Required Schedule 10%

Conciseness of Proposal 5%

Consultant Selection Schedule

[This section should outline the schedule for selecting the consultant. Included should be the date by which Technical Proposals shall be ranked, the date by which Cost Proposals shall be reviewed, the date by which the selection shall be made, the date by which it is desired that work begin on the project, etc.]

SAMPLE REQUEST FOR PROPOSAL

This document provides a sample request for proposal that may be used by MPOs who wish to have a consultant prepare the base and forecast year networks and traffic analysis zone (TAZ) geography required for use in developing their travel demand model and travel forecast. This sample RFP is provided as guidance for MPOs to ensure that the appropriate work is outlined in the RFP. It does not include all contracting or other administrative requirements that may need to be included with any RFP.

**SAMPLE REQUEST FOR PROPOSAL
FOR
DEVELOPING THE BASE AND FORECAST YEAR NETWORKS AND TRAFFIC
ANALYSIS ZONE GEOGRAPHY**

Scope of Work

Task 1. Develop the Base Year Network

The current base year network will be developed by the consultant. This work will include the following:

- Review previous base year network maps as provided to determine that:
 - The network contains only collector streets or higher.
 - The network does not include facilities that no longer exist.
 - All network facilities are aligned properly.
 - The functional class of the facility is correct.
 - All facility types on the existing network are correct.
 - The number of lanes on the existing network is correct.
 - Ramp locations and orientation is correct.
 - The posted speed is complete and correct (please annotate a posted speed that represents the majority of the link).
 - The directionality is correct.

- Identify regionally significant facilities that have been built, expanded, or modified since the previous model base year network. Only the changes that were completed by the time of the current base year traffic saturation counts should be included.

- All needed changes to the network (revisions to existing network and addition of new network) will be noted on the network maps using the TxDOT standard facility type and color definitions (see Figure 1), and the following editing conventions:
 - The correct facility type number code will be noted above the mid-point line of the facility and the correct number of lanes noted below the mid-point of the line.
 - One-way facilities will be marked with an arrow and the beginning and ending points of the one-way facility noted on the maps.
 - Roadway links that are to be removed will have an X placed through the line and the word “Remove” added above the link.
 - For links that need to be realigned, place an X through the link, add the word “Move” above the link and draw the link in the proper place.
 - New links will be drawn using the TxDOT functional class/facility type color definitions.

- If network plots are not provided, edits involving physical changes to the network geography (i.e., new links, alignments, removals) will be made using the following conventions:

- All new links will be annotated with the current year in the EDITS_YEAR attribute field (i.e., if the network represents a 2008 base year, the new network link will be annotated with a 2008 in the EDITS_YEAR field as a means to identify new links).
- The appropriate attributes will be annotated using the appended fields in the network dataview as noted in the next major bullet (e.g., OK/EDIT, FTYPE_EDIT, LANES_EDIT, etc.). These fields are listed last in the pending network geography. Do not populate the traditional fields that have existing data. The missing values will be one more indicator that the link represents a physical edit.
- Removals will be provided in a list file (e.g. excel) that include the link ID, A-Node, B-Node, facility type, number of lanes, and roadway name.
- “Stub” links or include facilities will not be accepted.
- Network removals will not create “stub” links.
- Additional centroid connectors, unless absolutely necessary to locate potential new zones, will be the responsibility of TPP.
- The COMMENT field should be utilized as much as possible to describe the suggested change.
- Non-freeway level facilities should not be detail coded (e.g. directional links) unless there are supporting directional counts (e.g. divided principal arterials should not have directional links).
- Auxiliary acceleration and deceleration lanes should not be coded as through-lanes.
- Regionally insignificant roads, such as residential loop roads, should not be included in the network inventory. This will eventually lead to an incompatibility between the network and the traffic analysis zone geography.
- As noted earlier, please annotate the posted speed that best represents the length of the link between the a-node and b-node. This is especially true if there are a number of speed link transitions that are occurring over the length of the link. Please select the speed limit most encountered by drivers of that facility.
- Roads that are realigned should be accompanied with a corresponding comment in the COMMENTS field (e.g., link realigned).
- The pending network and pending zone geographies need to be as compatible as possible. The primary means of defining zone boundaries is the network. The pending network must be reviewed and accepted prior to initiating edits to the pending zone geography.
- For external station links, any detail coding should merge to a single non-directional link. The A-Node of this links should be the external station number.

A CD will be provided containing pending network geography (i.e., the previous base year network renamed to pending_year), pending zone geography, and the latest available StratMAP streets geography for *[insert county name]*. The CD will also contain the base year network editing guidelines and socio-economic development guidelines. Contained within the network editing guidelines are the standard editing conventions as well as facility type presentation.

- Changes to existing link attributes (i.e., facility type, number of lanes, speed, direction) will be made in the TransCAD highway/streets dataview layer which will be provided. The highway/streets dataview includes the following fields:

OK/EDIT
 FTYPE_EDIT
 LANES_EDIT
 POSTED_SPEED_EDIT
 DIRECTION_EDIT
 MPO_EDIT_DESCRIPTION

For each link the following editing conventions will be followed:

- For each non-centroid connector link that is correct, type in “OK” in the OK/EDIT field.). For each non-centroid connector link that requires changes, type in “EDIT” in the OK/EDIT column. Each non-centroid connector link will have either an “OK” or “EDIT” in this field. Networks that are not completely populated with either an OK or EDIT for non-centroid connector links will be returned for further review.
- Type in the correct attribute(s) in the appropriate field. (See Figure 2).
- For edits that will occur on the network mark-up plots provided by TxDOT-TPP, information for each new link noted on the base year network maps the following information will be input into the New Link dbase file that will be provided: (See Figure 3)
 - Street name –name of the street the link is part of
 - From street and To street- the beginning and end point of the facility
 - Facility type (FTYPE) – The correct facility type (See Figure 1)
 - Total number of lanes
 - Posted speed
 - Directionality – (0= two-way, 1= one-way, or -1 for a one-way link where the topology is different than the direction of flow)
 - Map sheet number – Map sheet number on which the new facility is drawn
- The MPO and TxDOT Transportation Planning and Programming will have 1 month to review edited maps, edited highway/street TransCAD dataview, and the New Link file.
- Subsequent to the TxDOT review, the consultant will make any required changes to the maps (or network geography), edits to the highway/street TransCAD dataview file, and the New Link file.

Deliverables:

Two sets of existing network maps with changes and edits marked as required (or a pending network geography if plots are not provided)

One edited TransCAD highway/streets dataview

One completed New Link dbase file

One completed list of links removed (as defined above) if edits are made directly to the pending network geography

Task 2. Develop Traffic Analysis Zones

The current base year traffic analysis zone geography will be developed by the consultant. This work will include:

- Upon review and approval of the base year network, the consultant will develop a suggested TAZ geography using TransCAD. The TAZ geography should consider the need for future zone splits based on anticipated area growth and location of planned highway/street facilities.
- The numbering convention is sequential without any gaps (i.e.. 1 to n).
- For zones that are joined, the lower TAZ number should probably be preserved and the merged zone number (or number that is dropped) should be used elsewhere where a new zone is to be created. A comment should be included in the dataview to note that the zone number was moved.
- All zone splits will preserve the historical zone number in at least one of the polygons.
- For new zones, the numbering will begin after the last internal zone number from the previous model to maintain sequential zone numbering (if an existing zone number is not available from a previous zone edit).
- For new zones, an EDIT column should be created and annotated with a “NZ” for new zone.
- The zone numbering convention will be preserved as much as possible to assist with monitoring demographic changes from one base year to the next.
- The MPO and TxDOT TPP will have 1 month to review the proposed TAZ geography.
- Subsequent to MPO and TxDOT TPP review and comment, the consultant will make needed revisions to the TAZ geography. Once the TAZ geography has been accepted, the network will have to be revised to include the zone changes and necessary revisions to centroid connector placement.

Deliverables:

A pending TransCAD TAZ layer geographic file.

Figure 1. Facility Type Codes and Color Description

Functional Class Code	Facility Type Code	Facility Types Descriptions	General Color Description	Detailed Color Description
1		INTERSTATE FREEWAYS	Yellow	
	1	Radial IH Freeways - Mainlanes Only		
	2	Radial IH Freeways - Mainlanes & Frontage Roads		
	3	Circumferential IH Freeways (Loops) - Mainlanes Only		
2		OTHER FREEWAYS	Orange	
	4	Circumferential IH Freeways (Loops) - Mainlanes & Frontage Roads		
	5	Radial Other Freeways - Mainlanes Only		
	6	Radial Other Freeways - Mainlanes & Frontage Roads		
3		EXPRESSWAYS	Purple	
	7	Circumferential Other Freeways (Loops) - Mainlanes Only		
	8	Circumferential Other Freeways (Loops) - Mainlanes & Frontage Roads		
4		PRINCIPAL ARTERIALS	Blue	
	9	Radial Expressways		Dark
	10	Circumferential Expressways (Loops)		Light
5		MINOR ARTERIALS	Dark Green	
	11	Principal Arterial - Divided		Dark
	12	Principal Arterial - Continuous Left Turn Lane		Medium
	13	Principal Arterial - Undivided		Light
6		COLLECTORS	Brown	
	14	Minor Arterial - Divided		Dark
	15	Minor Arterial - Continuous Left Turn Lane		Medium
7		FRONTAGE ROADS	Mustard	
	16	Minor Arterial - Undivided		Light
8		RAMPS	Gray	
	17	Collector - Divided		Dark
	18	Collector - Continuous Left Turn Lane	Medium	
	19	Collector - Undivided	Light	
	20	Frontage Road		
	21	Ramp (Between Frontage Road and Mainlanes)		Dark
	22	Interchange Ramp (Freeway-to-freeway Interchange Ramps)		Light

Figure 2. Example of Highway/Street Dataview with Edits

ID	Length	Dir	[OK/EDIT]	FTYPE_EDIT	LANES_EDIT	POSTED_SPEED_EDIT	DIRECTION_EDIT	MPO_EDIT_DESCRIPTION
317	0.28	0	OK	--	--	--	--	
6758	0.15	0	OK	--	--	--	--	
327	0.18	0	OK	--	--	--	--	
328	0.16	0	EDIT	--	6	--	--	-- Widened from 4 to 6 lanes in 2009
331	0.17	0	OK	--	--	--	--	
332	0.27	0	EDIT	--	--	--	--	1 Frontage Rd converted from 2-way to 1-way
333	0.17	0	EDIT	11	--	--	--	-- Upgraded from undivided to divided
334	0.32	0	OK	--	--	--	--	
376	0.18	0	OK	--	--	--	--	
377	0.22	0	EDIT	--	--	50	--	
382	0.27	0	OK	--	--	--	--	
383	0.20	0	OK	--	--	--	--	
408	0.19	0	OK	--	--	--	--	
410	0.22	0	OK	--	--	--	--	
5611	0.39	0	EDIT	16	4	--	--	
412	0.37	0	OK	--	--	--	--	
422	0.33	0	EDIT	16	4	--	--	
446	0.32	0	OK	--	--	--	--	
7260	0.29	0	OK	--	--	--	--	
475	0.13	0	OK	--	--	--	--	
499	0.15	0	OK	--	--	--	--	
612	0.23	0	OK	--	--	--	--	

Figure 3. Example of New Link Dbase File

Street	From Street	To Street	FTYPE	Lanes	Posted Speed	Direction (Dir)	Sheet Num
1st St	Hewitt Dr (FM 1695)	Old Temple Rd	19	2	25	0	3
Airline Rd	Concord Rd	Crest Rd	19	4	35	1	1

*** Please note the "New Link Listing" file will have this format, but will be empty. TxDOT-TPP requests that the database files be updated in TransCAD.

Task 3. Develop Forecast Year Network(s)

The consultant will develop the forecast network. This work will include:

- Subsequent to completion of the base year demographic inventory, the consultant will develop forecast year networks for the year(s) (*list here all forecast years*). A CD will be provided containing the latest available StratMAP streets geography for [*insert county name*], the pending forecast network geography and a New Link dbase file. Additionally, a set of draft forecast year network maps/plots which represent the final base year network will be provided for markup.
- The consultant will include in the forecast year network(s) the modifications to the network geography consistent with the planned improvements found in the current, financially constrained long-range Metropolitan Transportation Plan (MTP). Interim year forecast networks (if any) should reflect only the planned improvements reasonably expected to be completed by each specific forecast year.
- The pending forecast network plots will be used to identify all changes (MTP planned improvements/revisions to existing network and addition of new network). These changes will be noted on the network maps using the TxDOT standard facility type and color definitions (see Table 1) and the following editing conventions:
 - The correct facility type number code will be noted above the mid-point line of the facility and the correct number of lanes below the mid-point of the line.
 - One-way facilities will be marked with an arrow and the beginning and ending points of the one-way facility noted on the maps.
 - Roadway links that are to be removed will have an X placed through the line and the word “Remove” added above the link.
 - For links that need to be realigned, place an X through the link, add the word “Move” above the link and draw the link in the proper place.
 - New links will be drawn using the TxDOT facility type and color definitions.
- If network plots are not provided, edits involving physical changes to the network geography (i.e., new links, alignments, removals) will be made using the following conventions:
 - All new links will be annotated with the current year in the EDITS_YEAR attribute field (i.e., if the network represents a 2040 forecast year, the new network link will be annotated with a 2040 in the EDITS_YEAR field as a means to identify new links).
 - For non-attainment areas, the project number will be annotated to the ANNOTATION year.
 - A project list file containing a list of the financially constrained long-range projects will be provided for cross-reference purposes.
 - The appropriate attributes will be annotated using the appended fields in the network dataview as noted in the next major bullet (e.g., OK/EDIT,

FTYPE_EDIT, LANES_EDIT, etc.). These fields are listed last in the pending network geography. Do not populate the traditional fields that have existing data. The missing values will be one more indicator that the link represents a physical edit.

- Removals will be provided in a list file (e.g. excel) that include the link ID, A-Node, B-Node, facility type, number of lanes, and roadway name.
- “Stub” links or include facilities will not be accepted.
- Network removals will not create “stub” links.
- Additional centroid connectors, unless absolutely necessary to locate potential new zones, will be the responsibility of TPP.
- The COMMENT field should be utilized as much as possible to describe the suggested change.
- Non-freeway level facilities should not be detail coded (e.g. directional links) unless there are supporting directional counts (e.g. divided principal arterials should not have directional links).
- Auxiliary acceleration and deceleration lanes should not be coded as through-lanes.
- Regionally insignificant roads, such as residential loop roads, should not be included in the network inventory. This will eventually lead to an incompatibility between the network and the traffic analysis zone geography.
- As noted earlier, please annotate the posted speed that best represents the length of the link between the a-node and b-node. This is especially true if there are a number of speed link transitions that are occurring over the length of the link. Please select the speed limit most encountered by drivers of that facility.
- Roads that are realigned should be accompanied with a corresponding comment in the COMMENTS field (e.g., link realigned).
- The pending forecast network and pending zone geographies need to be as compatible as possible. The primary means of defining zone boundaries is the network. The pending network must be reviewed and accepted prior to initiating edits to the pending zone geography.
- For external station links, any detail coding should merge to a single non-directional link. The A-Node of this links should be the external station number.

A CD will be provided containing pending network geography (i.e., the previous base year network renamed to pending_year), pending zone geography, and the latest available StratMAP streets geography for *[insert county name]*.

Two marked sets of plots are required for each forecast year.

- Changes to existing link attributes (facility type, number of lanes, speed, and direction) will be made in the TransCAD highway/streets dataview layer as provided. The highway/streets dataview includes the following fields:

OK/EDIT
FTYPE_EDIT

LANES_EDIT
POSTED_SPEED_EDIT
DIRECTION_EDIT
MPO_EDIT_DESCRIPTION

For each link the following editing conventions will be followed:

- For each non-centroid connector link that is correct, type in OK in the OK/EDIT field. For each non-centroid connector link that requires changes, type in EDIT in the OK/EDIT column. Each non-centroid connector link will have either an “OK” or “EDIT” in this field. Networks that are not completely populated with either an OK or EDIT for non-centroid connector links will be returned for further review.
-
- Type in the correct attribute(s) in the appropriate field. (See Figure 2).

A separate highway/street dataview edit file is required for each forecast year. Additionally, each subsequent forecast year should build on the previous forecast year.

- For edits that will occur on the network mark-up plots provided by TxDOT-TPP, information for each new link noted on the forecast year network maps the following information will be input into the New Link dbase file that will be provided: (See Figure 3)
 - Street name –Name of the street the link is part of
 - From street and To street- the beginning and end point of the facility
 - Facility type (FTYPE) – The correct facility type (See Figure 1)
 - Total number of lanes
 - Posted speed
 - Directionality – (0= two-way, 1= one-way , or -1 for a one-way link where the topology is different than the direction of flow)
 - Map sheet number – Map sheet number on which the new facility is drawn

A separate New Link dbase file will be required for each forecast year.

- The MPO and TxDOT Transportation Planning and Programming will have 1 month to review edited maps, edited highway/street TransCAD dataview, and the New Link file.
- Subsequent to the MPO and TxDOT review and comments, the consultant will make any required changes to the maps (or network geography), edits to the highway/street TransCAD dataview file, and the New Link file.

Deliverables:

Two sets of forecast network maps with changes and edits marked as required. One set of plots for each forecast year. Or, a pending network geography honoring the requested guidelines and formats.

One edited TransCAD highway/streets dataview for each forecast year.

One completed New Link dbase file for each forecast year.

One complete list of removed links.

