Status report on the COG/TPB travel demand modeling consultant-assistance work program – FY 2015

presented to

Travel Forecasting Subcommittee

presented by

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Overview

- Overview of Task Orders – FY 2015

- Summary of Each Task Order

- Strategic Plan for Model Improvement (Task Order 15.2)
  - » Goals and Objectives
  - » Needs and Priorities
  - » Approach for Moving Forward
  - » Proposed Improvements and Schedule
  - » Discussion

- Next Steps

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Overview of Task Orders – FY 2015

- Task Order 15.1: Review of Consultant Recommendations from FY 2012-2014 of the COG/TPB Travel Demand Modeling Consultant-Assistance Project

- Task Order 15.2

  » Report 1: Identifying Potential Opportunities for Model Improvement

  » Report 2: Status of ABM and DTA at Peer MPOs

  » Report 3: Strategic Plan for Development of the COG/TPB Travel Demand Forecasting Procedures

- Task Order 15.3: Review of Transit Modeling with Respect to FTA Guidance.

- Task Order 15.4: Transit Modeling with Cube Public Transport (PT)

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Task Order 15.1: Review of Consultant Recommendations from FY 2012-2014

- COG/TPB consultant-assistance project since FY 2006

- Review of prior consultant recommendations FY 2012-FY 2014

- Issues grouped into software, model inputs, components/ structure, HOT/managed lane modeling, and transit modeling

- Recommendations were categorized by level of effort, importance to the region, and whether to proceed with implementation

  » Low, medium, and high ratings used for the level of effort and importance

  » Some recommendations identified as needing further refinement

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Task Order 15.2: Strategic Plan for Model Development – Report 1

- Identifying potential opportunities for model improvement

- Sources - stakeholder meeting, a web survey, TPB staff, and previous model improvement recommendations

- Best practice considerations
  - » Topics considered: land use modeling, multimodal modeling, highway assignment, transit modeling, freight modeling, visitor modeling, and road pricing/managed lanes

- Findings considered in the development of Report 3 (Strategic Plan for Model Development)

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Task Order 15.2: Strategic Plan for Model Development – Report 2

- Status of ABM and DTA at Peer MPOs

- 23 MPOs surveyed
  - » 20 largest by population, plus 3 additional known for use of innovative modeling methods
  - » Consisted of 20 questions - MPO characteristics, general travel demand modeling characteristics, land use modeling, and specific characteristics regarding activity-based and DTA modeling
  - » Questions were multiple-choice and open-ended

- Relevant ABM features explored

- Findings considered in the development of Report 3 (Strategic Plan for Model Development)

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Task Order 15.2: Strategic Plan for Model Development – Report 3

- Strategic Plan for Development of the COG/TPB Travel Demand Forecasting Procedures

- Considered findings from Reports 1 and 2, and previous recommendations on model improvement

- Discussed planned improvements, data requirements, computing resources, and institutional considerations

- Provides proposed timelines and high-level cost estimates

- We will discuss the report contents further in a few minutes

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Task Order 15.3: Review of Transit Modeling with Respect to FTA Guidance

- Objectives

  » To review documentation and memos for the latest version of the TPB model (Version 2.3.57)

  » To review the latest FTA guidance on ridership forecasting for New Starts and Small Starts

  » To review the use and applicability of Simplified Trips-on-Project Software (STOPS) model

  » To propose options and recommendations for addressing FTA guidance.

- Findings about the TPB model in the FTA guidance context

- Recommendations to improve the TPB model

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Task Order 15.4: Transit Modeling with Cube Public Transport (PT)

- Objectives
  - » Examine the validity and reasonableness of the transit skimming and transit assignment process, including model parameters and model results
  - » Adjust existing path-building parameters in PT based on analysis of observed travel data collected in the Metrorail passenger survey
  - » Refine and integrate the PT script files for within the existing TPB modeling process.

- Tested and validated with the Metrorail survey data

- Revisions and refinements of the PT script files, primarily related to the PNR access links

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Task Order 15.2: Strategic Plan for Model Development

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Strategic Plan Goals

◎ Guide the development of the regional model such that it will better meet the current and future needs of the TPB and its stakeholders

◎ The updated model should continue to support regional decision making in alignment with the TPB vision and its associated goals

◎ The plan will provide input across the areas of policy implications, data requirements, computing resources, and institutional considerations

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Strategic Plan Objectives

◉ Develop a seven-year roadmap for model development, considering the modeling needs of the region, including:

» Air quality conformity analysis

» Long range transportation plan evaluation

» Project planning

» Scenario analysis

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Strategic Plan Objectives (2)

◉ Identify improvements that allow future policy analysis for the region, including

  » Evaluation of peak spreading

  » Time of day related policies

  » Transit needs

  » Pricing and managed lanes

  » Travel time reliability

  » Non-motorized options

Strategic Plan Objectives (3)

◉ Ensure that the travel demand modeling process used by COG/TPB remains within the range of acceptable practice among peer MPOs

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Needs and Priorities

- Peak spreading and time of day behavior

- Road pricing and managed lanes

- Travel time reliability

- Transit modeling

- Non-motorized travel, especially access to transit

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Framework for Improvements

Version 2.5 – Four-Step Model Improvement

Version 3.0 – Activity-Based Model (ABM)

Version 3.2 – Enhanced ABM, with Updated Data

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Approach for Moving Forward

◉ Shift to an Activity Based Model framework

» Simulation of the population and its travel choices and behavior offers an opportunity to address the priority areas and needs

- Disaggregate framework allows for more refined treatment of populations' needs and decisions that lead to travel

- Clear potential for improved modeling of pricing, transit, and non-motorized travel

» Provides a framework for future investment that is aligned with the state of the practice; ABM is a mainstream approach for larger MPOs, as evidenced by the peer survey

» Opportunity exists to leverage the prior investment by BMC to kick-start the ABM implementation for MWCOG

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Phase 1: Version 2.5 – Four-Step Model Improvements

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Version 2.5 – Four-Step Model Improvements

- Improvements based on input from three sources

  » TPB staff who provide a unique perspective given their close involvement with the development and application of the model

  » Stakeholders, both through the stakeholder survey, as well as the February 27, 2015 stakeholder meeting

  » Recommendations from the report titled, *Review of Consultant Recommendations from FY 2012-2014 of the COG/TPB Travel Demand Modeling Consultant-Assistance Project*

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Schedule for Improvements to the Four-Step Model
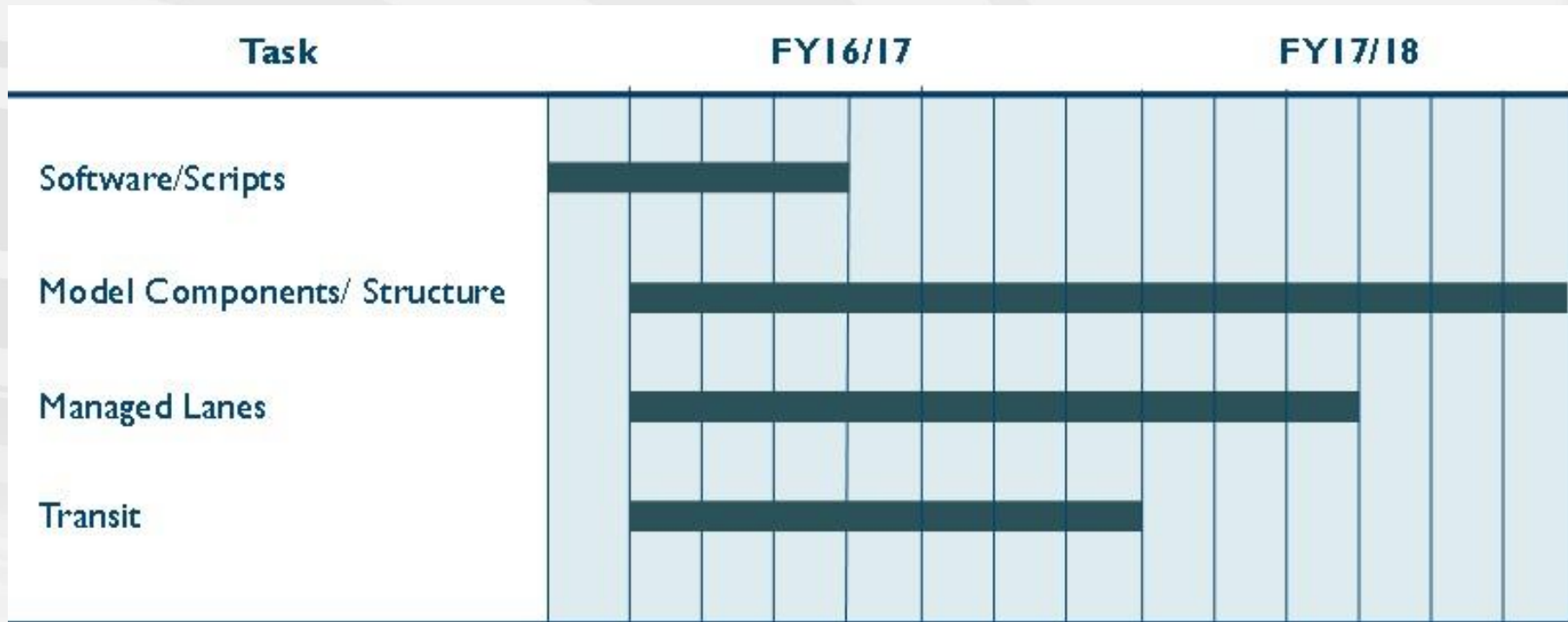
Phase 1 Level of Effort Estimate

Improvement Area	Description of Effort	Planning Estimate
Software/Scripts	2 months to plan; 5 months to execute	$50,000
Model Components/Structure	2 months to plan; implemented in coordination with other activities; completed within 5 months after managed lanes enhancements	$150,000
Managed Lanes	4 months to review and decide on path forward; complete implementation within 5 months after mode choice/transit enhancements	$150,000
Transit	3 months to plan and assemble data for enhancements; 9 months to implement	$150,000
Total		$500,000

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Phases 2 and 3: Development of Activity-Based Model

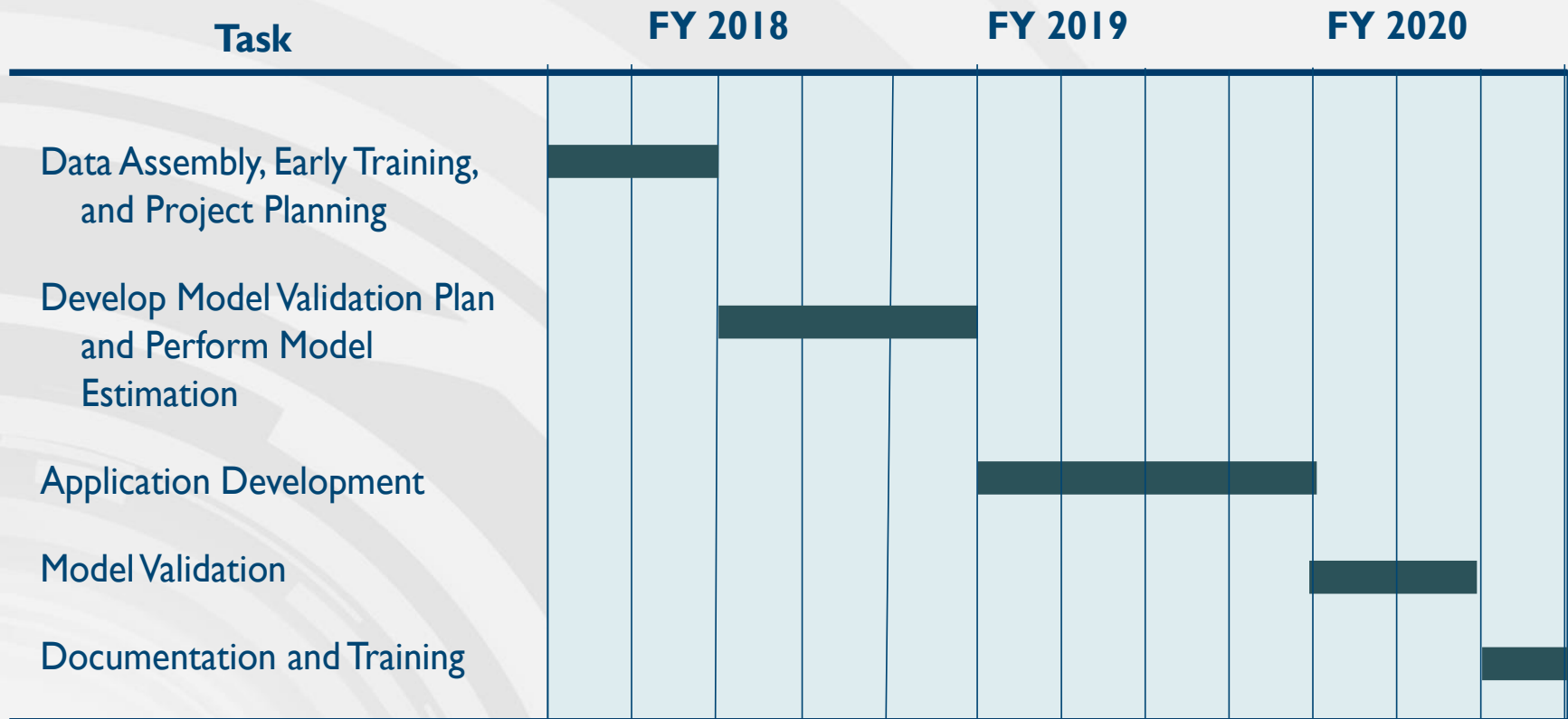# Phases 2 and 3: Development of ABM

Phase 2: Version 3.0 –
Activity-based model: initial development

Phase 3: Version 3.2 –
Activity-based model: re-estimation with new
household survey data

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Data Requirements

- Version 3.0 largely relies on leveraging existing data, albeit some of it not already assembled and ready for use

    » e.g., parcel land use data

- Version 3.2 would take advantage of new data collection

    » Upcoming surveys would be planned with ABM in mind

    » New household travel survey

    » New stated-preference survey for road pricing/value of time

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Version 3.0 Activity-Based Model

Task	FY 2018	FY 2019	FY 2020
Data Assembly, Early Training, and Project Planning	▬▬		
Develop Model Validation Plan and Perform Model Estimation	▬▬▬		
Application Development		▬▬▬▬	
Model Validation			▬▬
Documentation and Training			▬

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Version 3.0 Activity-Based Model Development Tasks

- Data Assembly, Early Training, and Project Planning are the Beginning Steps of the Effort
  - » Checks of network data and skims
  - » Prepare plans for any new data collection
  - » Data assembly and development – Socioeconomic/land use data

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Data Development

- Determine base year for new model

- Develop zone level socioeconomic data

- Develop forecast year data

- Household survey data processing

- Other surveys

- Other data (CTPP/ACS, validation data/counts, costs, etc.)

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Model Design Plan

- Overall structure of model

- Data requirements

- Networks/travel impedance specifications

- Accessibility measures to be used

- Synthetic population generation

- Model components

- Incorporation of nonactivity-based components

- Highway and transit assignment

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Model Validation Plan

- Validation process and concepts (validating of all components, types of checks, etc.)

- Accuracy requirements and guidelines

- Validation data assessment

- Input data validation

- Specifics on model component checks

- Sensitivity tests

- Temporal validation (e.g., forecasting, backcasting)

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Model Estimation

For each model component

- Examine data to determine model structure

- Statistical model estimation

- Internal checking and validation

- Coordination between consultant and MWCOG

- Documentation

Model Application Development

◉ Probably will adapt existing software framework

◉ Define requirements and specifications

- » Hardware configuration

- » Model interface

- » Licensing

- » Access to source code

- » Run times

- » How users outside MWCOG will access model (if applicable)

◉ Develop MWCOG-specific application

◉ Documentation/training

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Model Validation and Sensitivity Testing

Per validation plan…

- ◎ Validate input data

- ◎ Perform model component validation

- ◎ Perform sensitivity tests

- ◎ Perform temporal validation

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Phase 2 Level of Effort Estimate

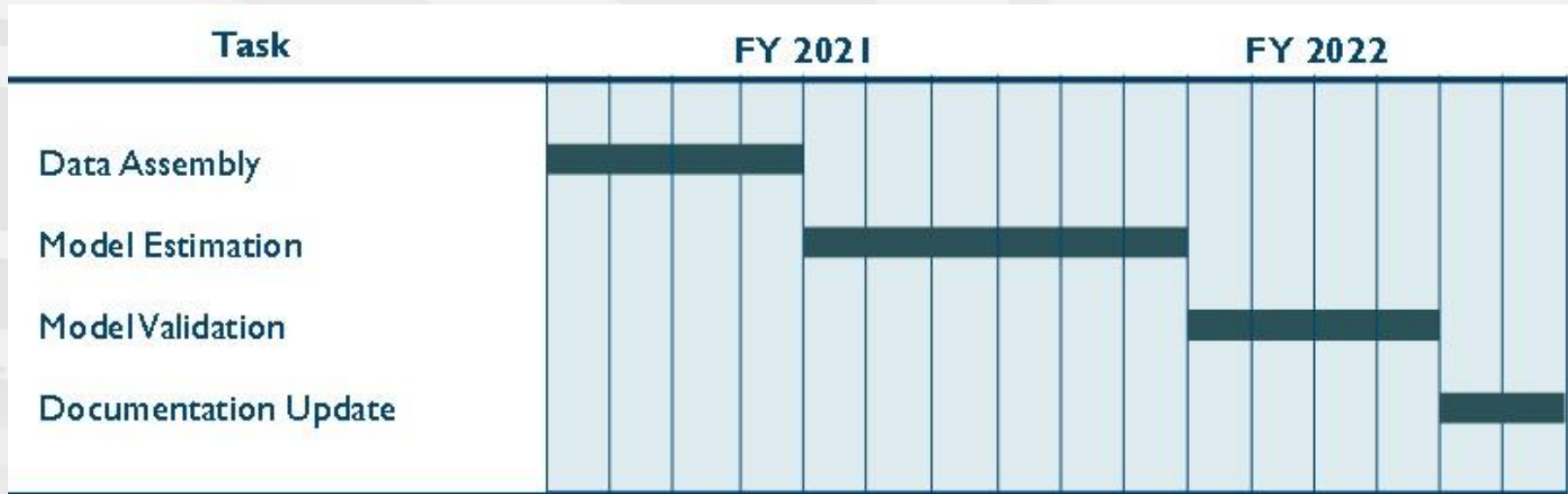| Improvement Area	Description of Effort	Planning Estimate
Data Assembly, Early Training, and Project Planning	Data assembly can begin earlier (even concurrently with Version 2.5 work program); Approximately 6 months for these activities	$225,000
Develop Model Validation Plan and Perform Model Estimation	Approximately 9 months for these activities (mostly for model estimation)	$275,000
Application Development	Approximately 12 months for this activity	$450,000
Model Validation	Approximately 6 months for this activity; may be performed in conjunction with extended application development	$100,000
Documentation and Training	Approximately 3 months for this activity	$50,000
Total		$1,100,000

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Development of ABM

Version 3.2 –
Activity-based model: re-estimation with new
household survey data

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Version 3.2 Tasks – ABM Re-Estimation with New Household Survey Data

1. Checks of network data and skims *(for new base year)*

2. ~~Prepare plans for any new data collection~~

3. Data assembly – Socioeconomic/land use data *(for new base year)*

4. Data assembly (continued) – Data sets for model estimation *(new survey data)*

5. ~~Develop model design plan~~

6. ~~Develop model validation plan and validation data~~

7. Model estimation

8. ~~Model application development~~

9. Model validation and sensitivity testing

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Version 3.2 Activity-Based Model

Task	FY 2021								FY 2022						
Data Assembly	▬▬▬▬▬														
Model Estimation			▬▬▬▬▬▬▬▬												
Model Validation									▬▬▬▬						
Documentation Update												▬▬			

Phase 3 Level of Effort Estimate

Improvement Area	Description of Effort	Planning Estimate
Data Assembly	Data assembly effort will vary depending on the choice of base year	$50,000 to $225,000
Model Estimation	Re-estimation of relevant models using the newer regional travel survey data	$275,000
Model Validation	Approximately 6 months for this activity	$100,000
Documentation Update	Approximately 3 months for this activity	$50,000
Total		$650,000

Work Summary

Summary of Activity by Year
Strategic Plan

Year	Activity	Planning Estimate
1 – FY 2016	Version 2.5 – refine model improvement plan and begin execution	$150,000
2 – FY 2017	Version 2.5 – continue testing of enhancements to managed lane and transit modeling	$175,000
3 – FY 2018	Version 2.5 – complete and deliver Version 3.0 – begin data assembly, early training, and project planning; initiate model design plan and validation plan	$425,000
4 – FY 2019	Version 3.0 – complete model estimation and begin application development	$425,000
5 – FY 2020	Version 3.0 – complete application development, model validation, documentation and training	$425,000
6 – FY 2021	Version 3.2 – data assembly, begin model reestimation	$425,000
7 – FY 2022	Version 3.2 – complete model reestimation, validation, and documentation update	$225,000
Total		$2,250,000

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Considerations for Resource Requirements

- Roles and responsibilities (e.g., consultant versus staff)

- Hardware and software requirements

- Annual model improvement budget

- Agency/UPWP budget cycles

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Next Steps

- Gather Feedback on Draft Strategic Plan

- Finalize Strategic Plan

- Begin Work Under the Plan

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