Travel Demand Modeling for a Small MPO Using TRANSIMS

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Study Background

- The study was funded by the Federal Highway Administration (FHWA)
- The study started in November 2008 and completed on November 2009
- This study was a complimentary study to another project titled *Illinois Travel Demand Modeling Technical Support Group*, funded by the Illinois Department of Transportation through Illinois Center for Transportation, ICT.

Study Objectives

- To promote better understanding of travel behavior and transportation systems through development, calibration, validation, and analysis of a travel demand model for a small sized MPO using TRANSIMS.

- To develop methods for applying TRANSIMS modules to evaluate the transportation policies and issues related to planning agencies (especially small MPOs) as identified in SAFETEA-LU 5512.

- To extend TRANSIMS technology by identifying issues and opportunities of using TRANSIMS for a small sized MPO.

Key Parts of the Study

- Evaluating Travel Demand Modeling status in small MPOs in Illinois.
- Determining functional requirements for TRANSIMS Track 1 implementation in a small MPO.
- Data requirements and conversion steps for Track 1 implementation of TRANSIMS.
- Model calibration and validation steps.
- TRANSIMS model sensitivity analysis with highway network changes.
- Comparing Four-Step Travel Model and TRANSIMS use issues for a small MPO

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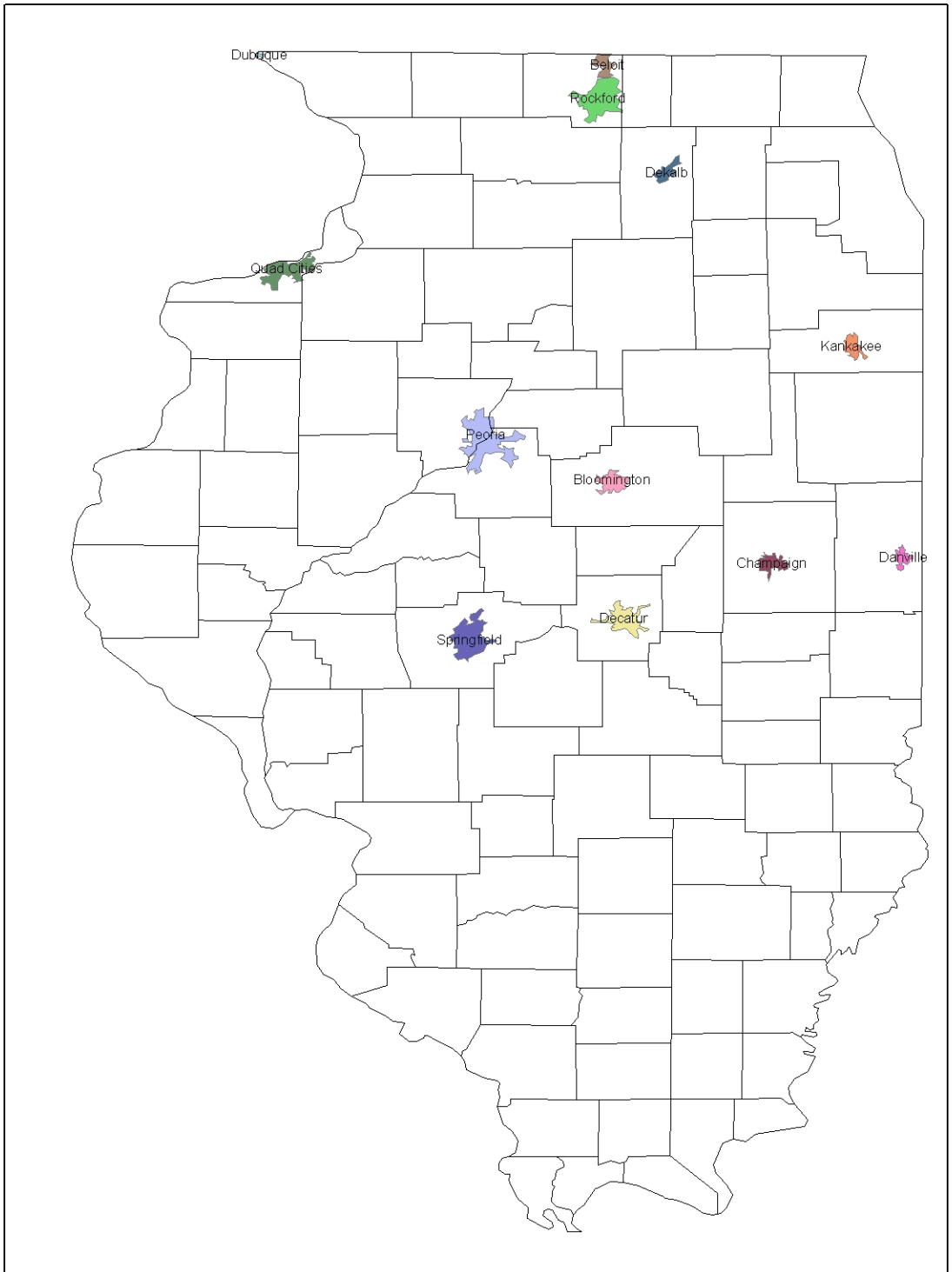

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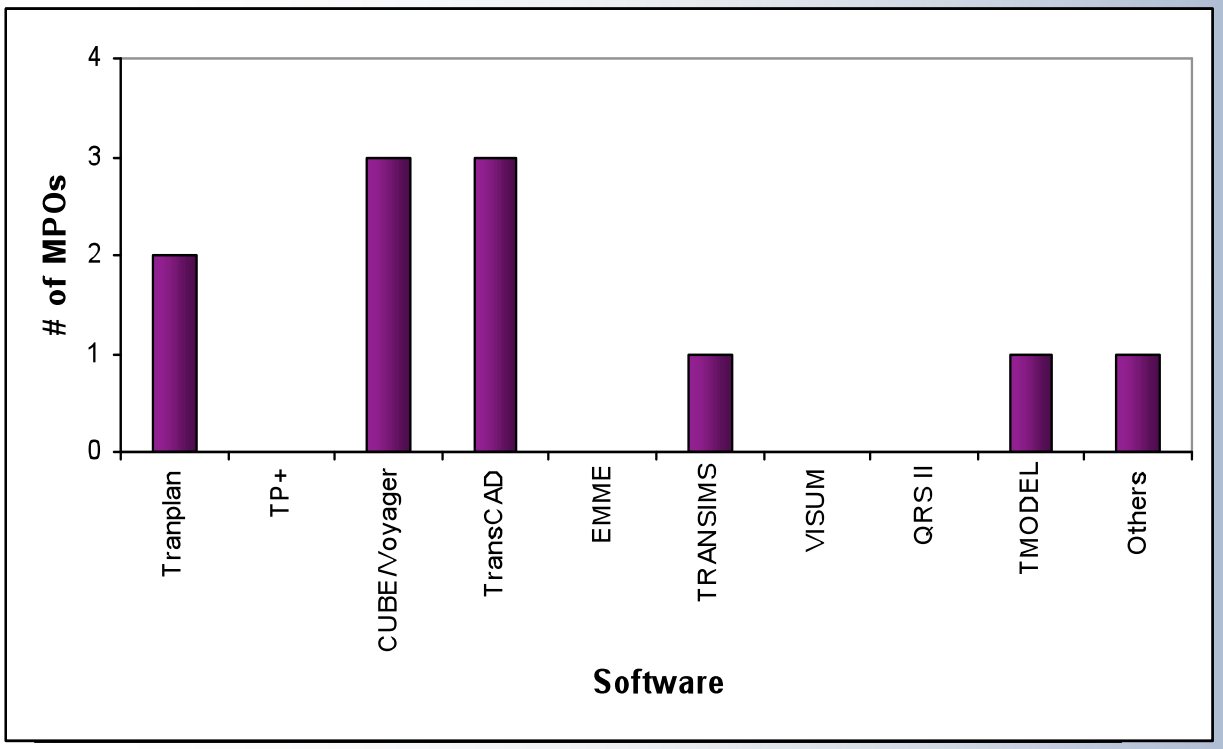
TDM Status in Illinois MPOs



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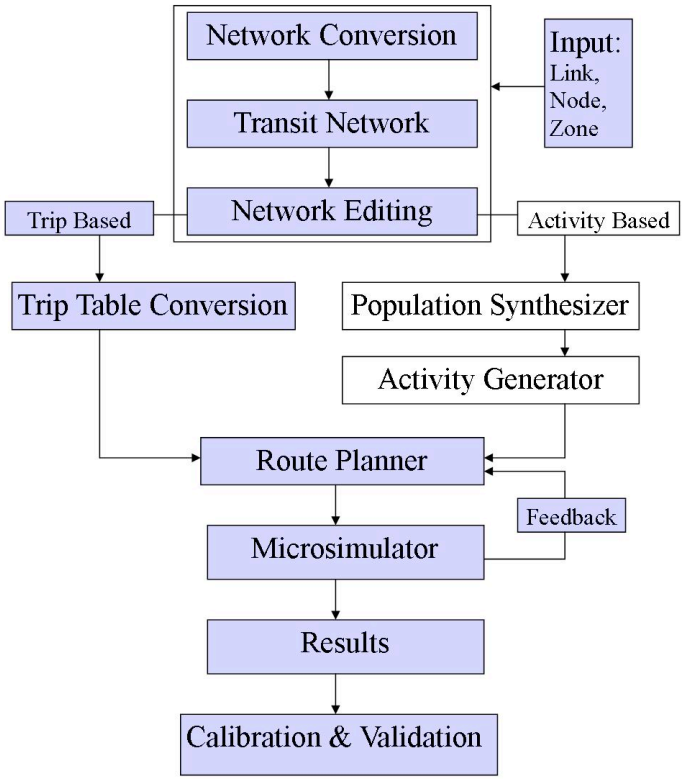
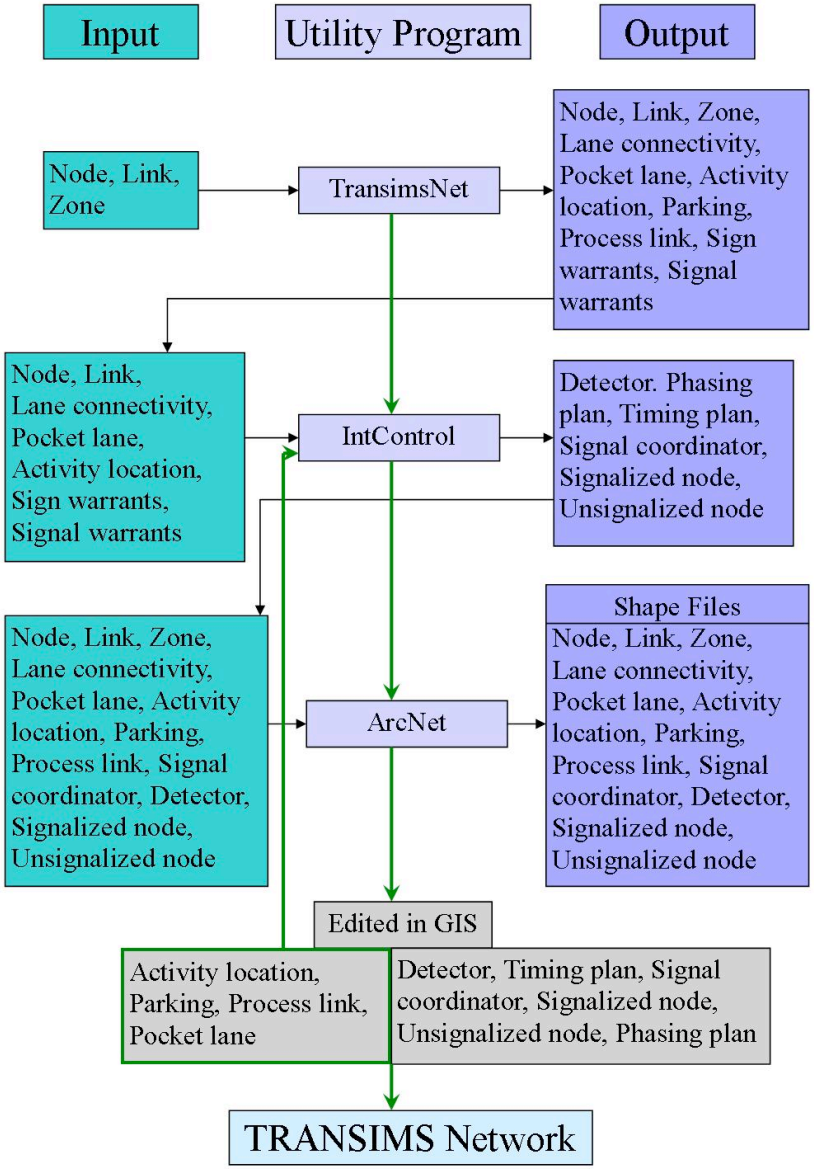
Functional Requirements for TRANSIMS Implementation



Functional Requirements for TRANSIMS Implementation

Input Data	Purpose	Source
Roadway (Node, Link)	Network Preparation & Editing	MPO (Transportation Planning/GIS Dept.)
Traffic Analysis Zone		MPO (Transportation Planning/GIS Dept.)
Trip Table	Route Planning	MPO (Transportation Planning Dept.)
Vehicle Type	Microsimulation	MPO (Transportation Planning Dept.)
Traffic and Transit Volumes	Calibration & Validation	MPO, Cities, Transit Authorities



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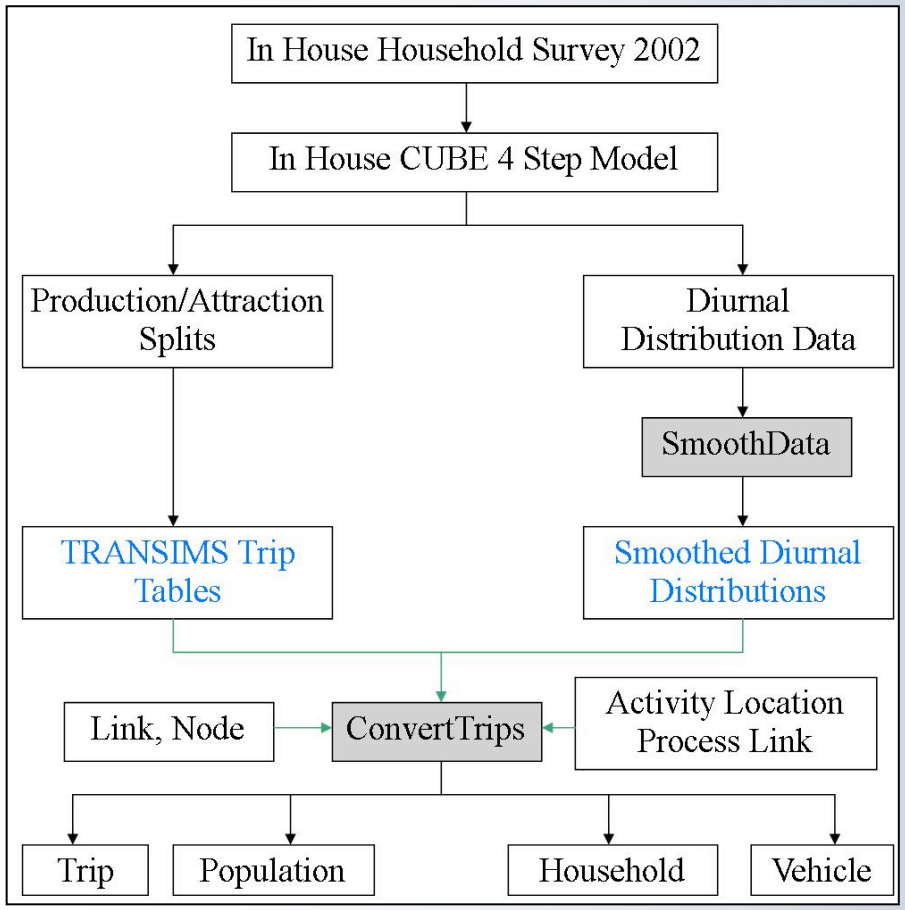
Trip Table Conversion



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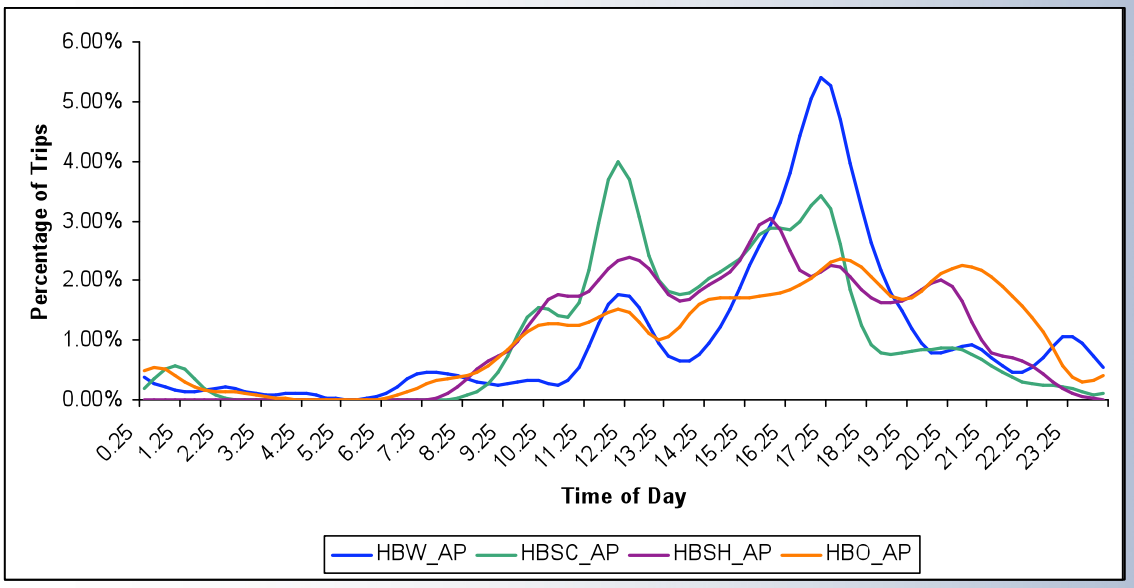
Diurnal Distribution



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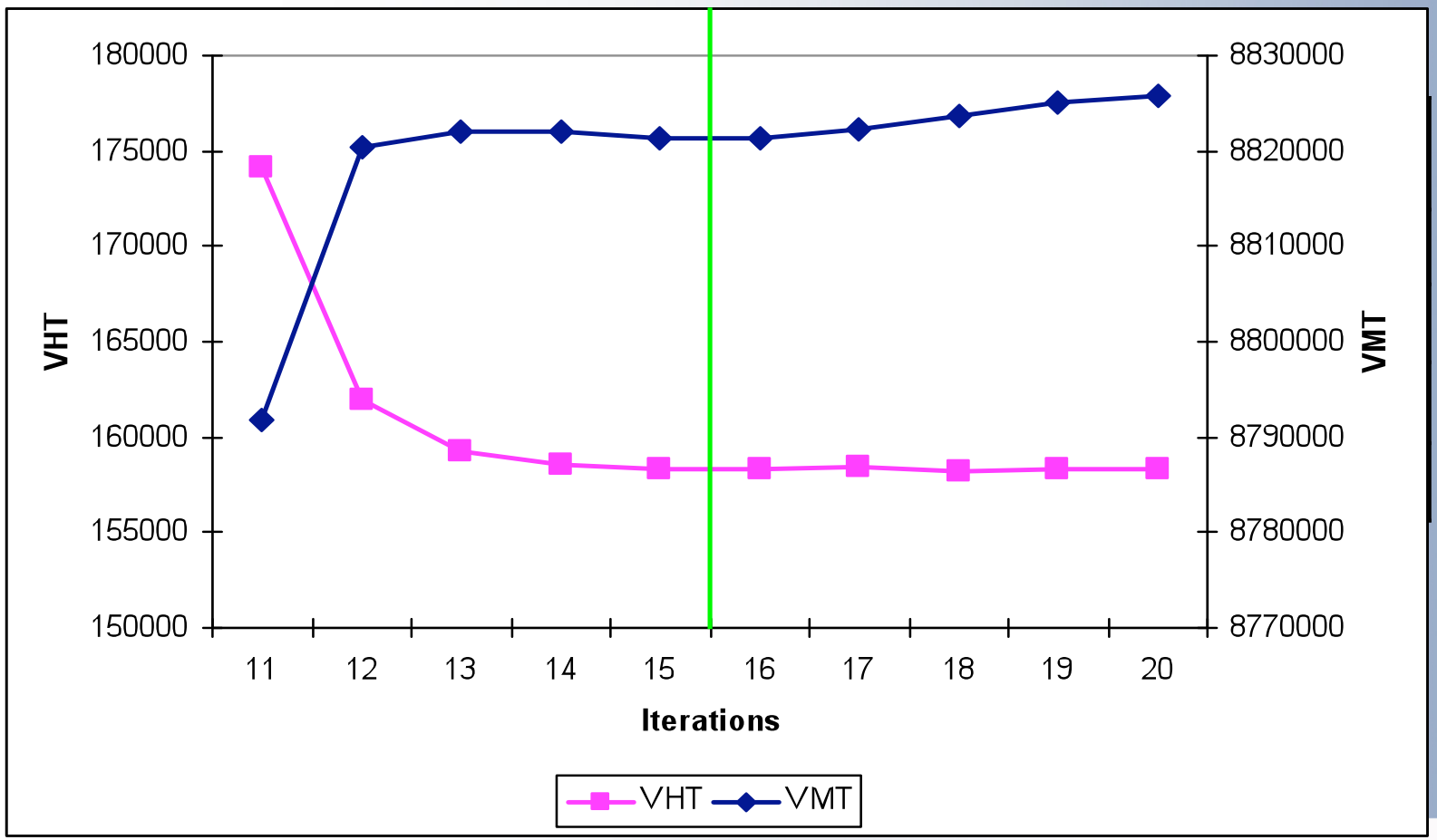
Router, Microsimulator, and Convergence Iterations



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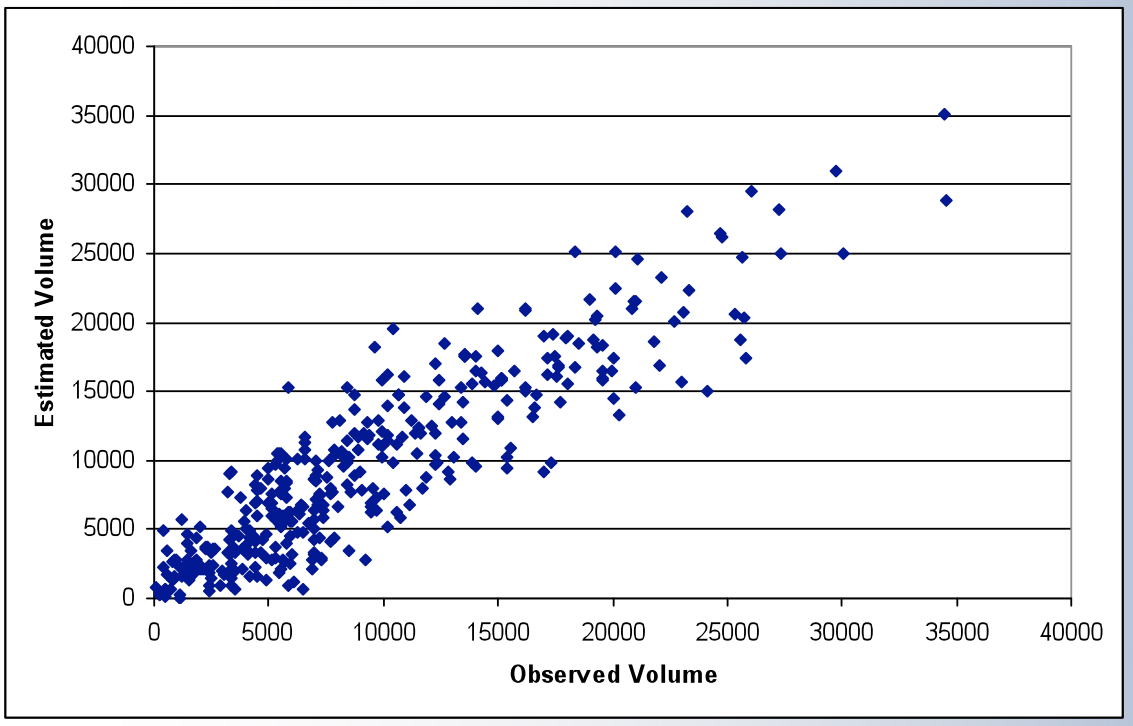
Model Calibration and Validation

- **Testing the following model components:**
  - **Network**
  - **Socio-economic data**
  - **Trip Generation**
  - **Trip Distribution**
  - **Traffic Assignment**
    - **A network-wide validation comparison to field counts utilizing *Validate* utility program**
    - **Using Screenlines**
    - **Critical links comparison using major and minor arterials**

Model Calibration and Validation



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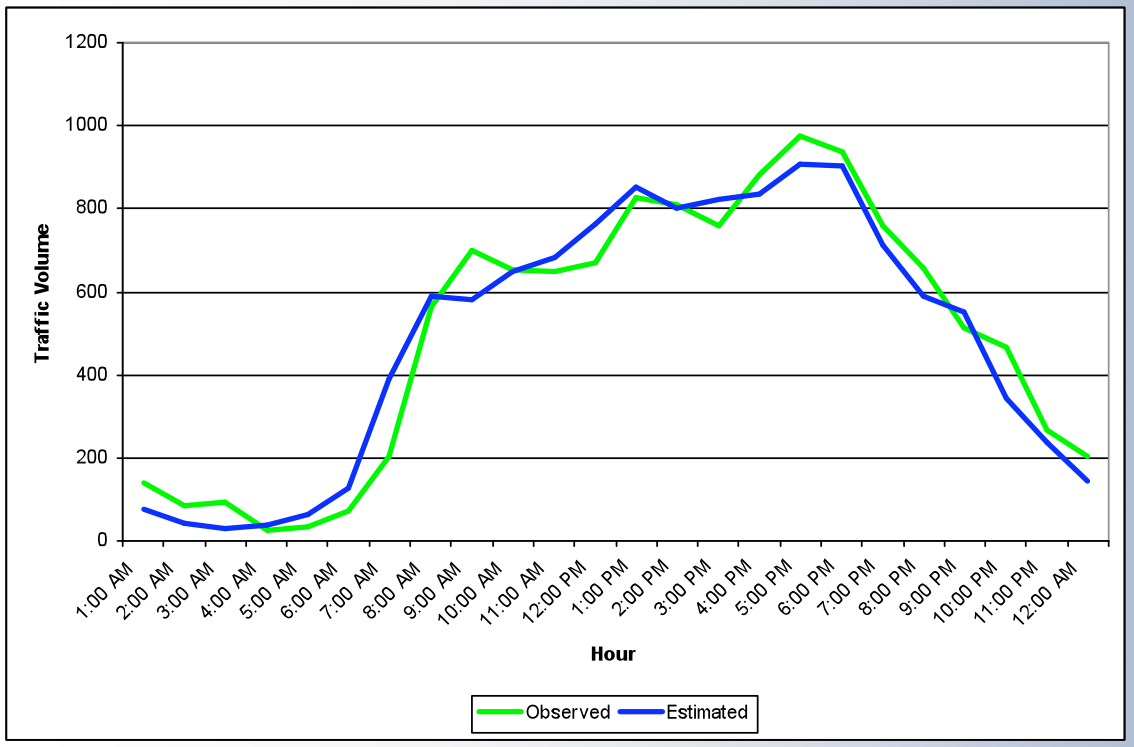
Model Calibration and Validation

Facility Type	FHWA Guideline[3] (+/-)	CUUATS 4-Step Model	CUUATS TRANSIMS Model
Freeway	7%	-3.10%	2.80%
Major Arterial	10%	1.60%	-1.20%
Minor Arterial	15%	-13.80%	8.40%
Collector	25%	-42.60%	4.30%

Model Calibration and Validation

Measure	FHWA Guideline	CUUATS 4-Step Model	CUUATS TRANSIMS Model
Correlation Coefficient	0.88	0.88	0.901
Percent Diff Reg. Wide	5%	12%	4.3%

Model Calibration and Validation



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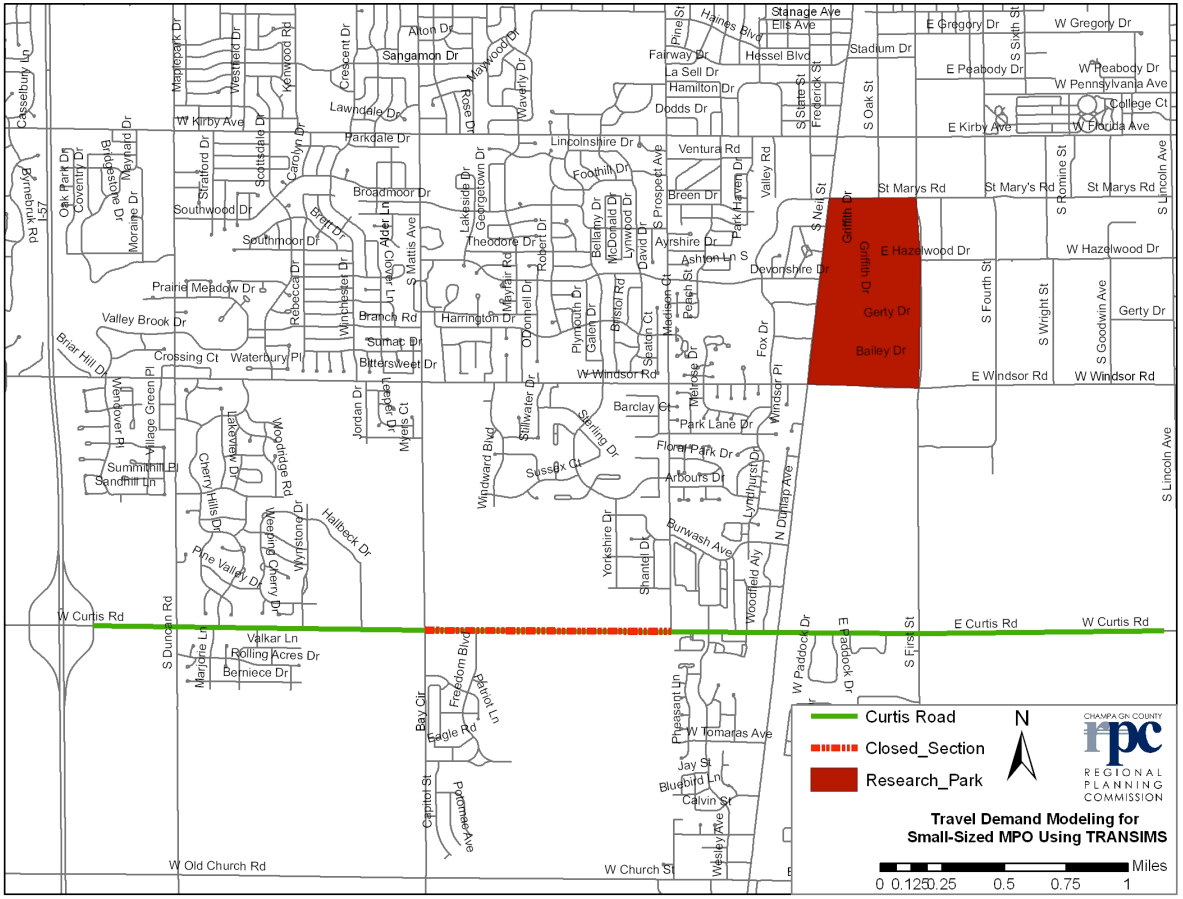
Model Sensitivity Analysis



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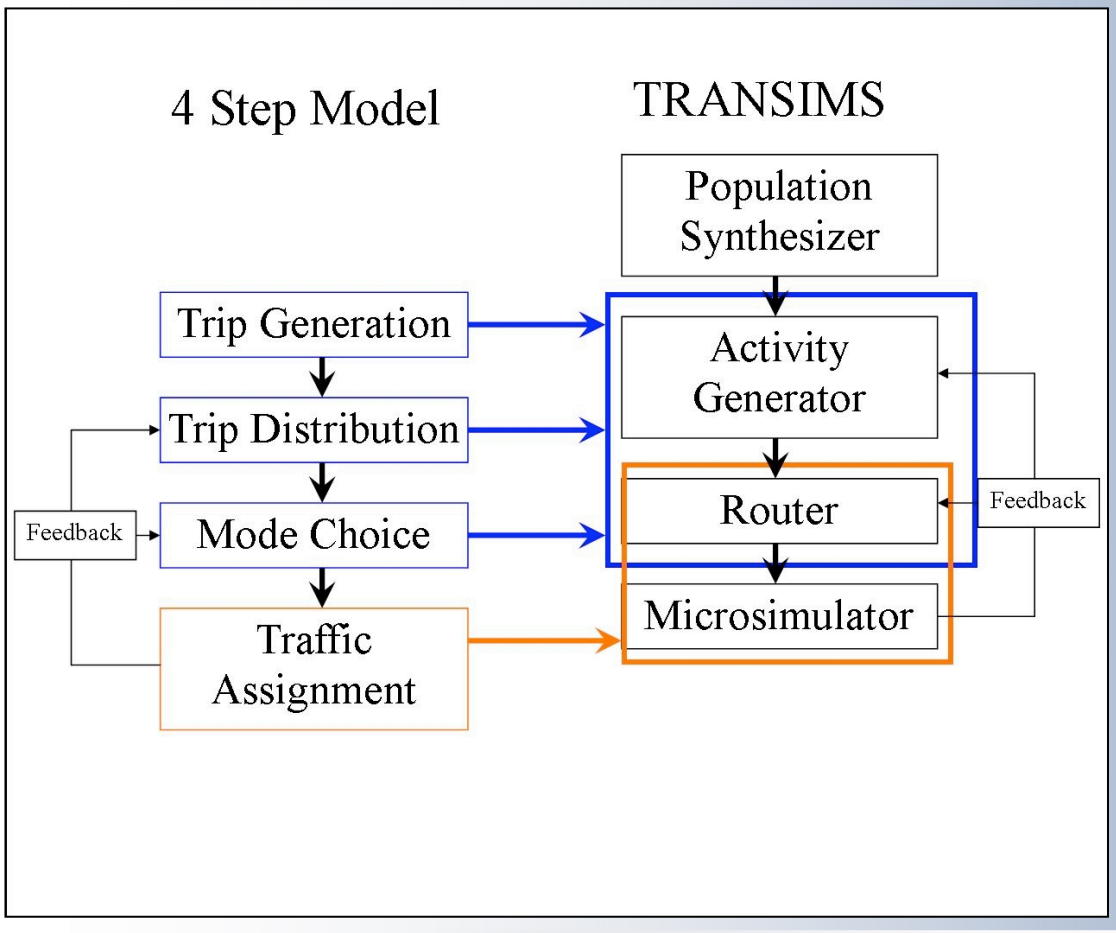
Model Sensitivity Analysis

Roadway	24-Hour Volume	
	Observed (Year)	Estimated (TRANSIMS Output)
I-57 South of Curtis Road	28,980 (2005)	29,586
I-57 North of Curtis Road	28,980 (2005)	29,749
Curtis Road to I-57 SB	650 (2009)	692
I-57 NB to Curtis Road	750 (2009)	2,011
I-57 SB to Curtis Road	1,370 (2009)	1,105
Curtis Road to I-57 NB	1,375 (2009)	1,760
Curtis Road E of I-57 Ramps	No data	2,916
Curtis Road W of I-57 Ramps	No data	1,613

4-Step TDM and TRANSIMS



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4-Step TDM and TRANSIMS

- The cost of four-step travel model software packages is the biggest initial cost for a small sized MPO.

- Skill development for software operation (training) and maintenance costs are also significant, e.g. typical yearly maintenance fee is around $5,000.

- TRANSIMS is available free of cost, but it requires strong GIS capabilities.

- TRANSIMS training and maintenance are also available free of cost.

Opportunities for Future Work

- **Developing travel models for small sized MPOs in Illinois which do not have a travel demand model in place by considering both Track 1 implementation and integrating other Population Synthesizer and Activity Generator models blended with the Router and Microsimulator modules.**
- **Utilizing the TRANSIMS travel model for emergency evacuation planning for small urbanized areas.**
- **Addition of transit component with the current TRANSIMS based model for Champaign-Urbana Urbanized Area.**

Thank You!

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Questions?

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