Traffic Impact Assessment

Integration for Planning and Microsimulation

Implementation and Application

Daniel Morgan
Caliper Corporation
daniel@caliper.com

Caliper

www.caliper.com

Summary

- Planning and microsimulation models are important tools for writing a successful IJR
- Completed successful IJR using planning and microsimulation models integrated with TIA tools
- Implementation and Application from the TDM in order to
  - Best leverage the data we had
  - Best calculate the metrics we needed

Outline

- Project Background
- Model Scope
- Implementation and Application
- Project Results

Outline

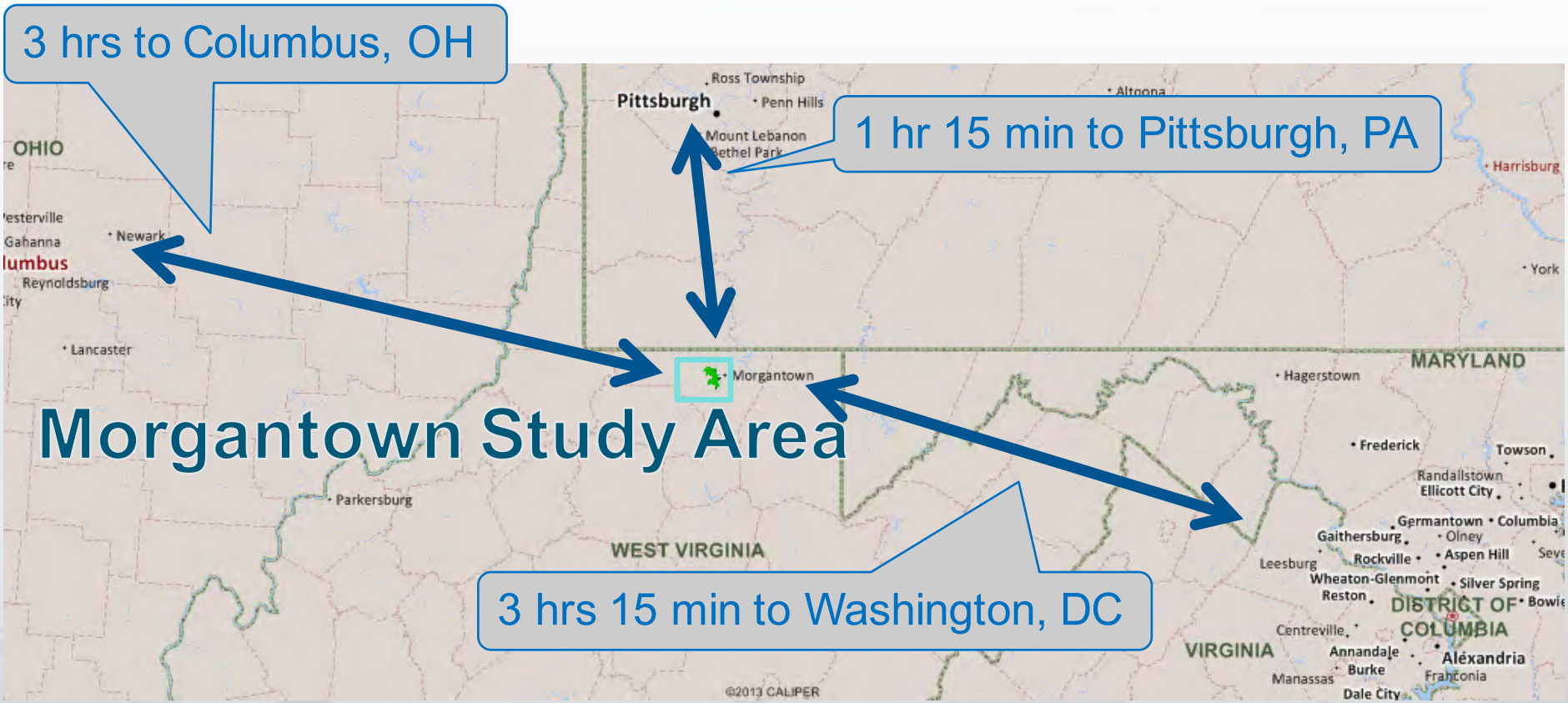
- Project Background
- Model Scope
- Implementation and Application
- Project Results

Project Background

- I-79/Morgantown Interchange Justification Report
- To develop a microsimulation model that:
  - Supports planning *and* operational analysis
  - Evaluates the construction of an interchange to provide direct access to new residential, medical, commercial developments and sports complex
  - Extends and complements existing models and modeling activities
- To evaluate future-year scenarios

Project Background

Project Background



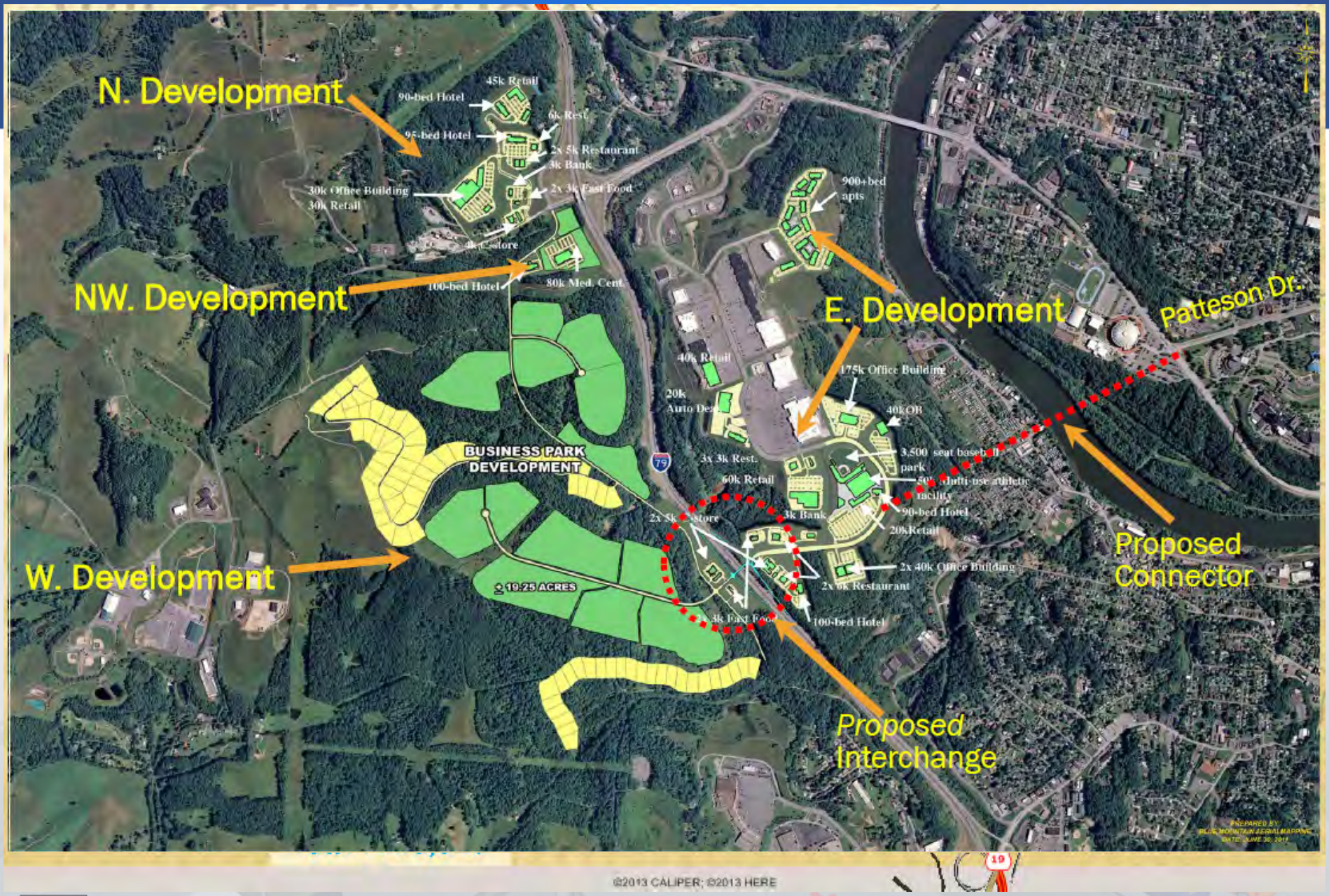
Project Background

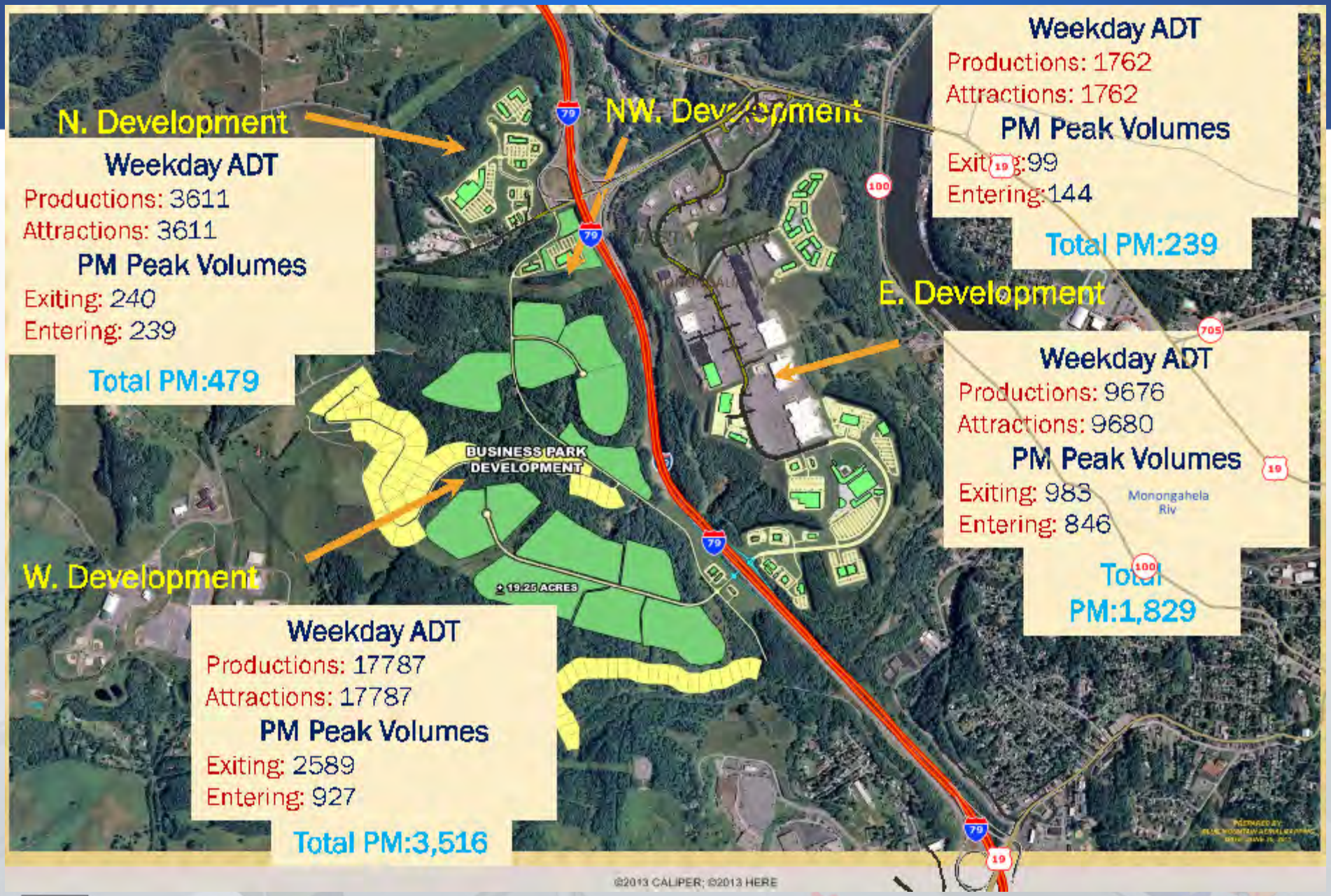
- **I-79/Morgantown Interchange Justification Report**
- To develop a microsimulation model that:
  - Supports planning *and* operational analysis
  - Evaluates the construction of an interchange to provide direct access to new residential and commercial developments
  - Extends and complements existing models and modeling activities
- To evaluate future-year scenarios

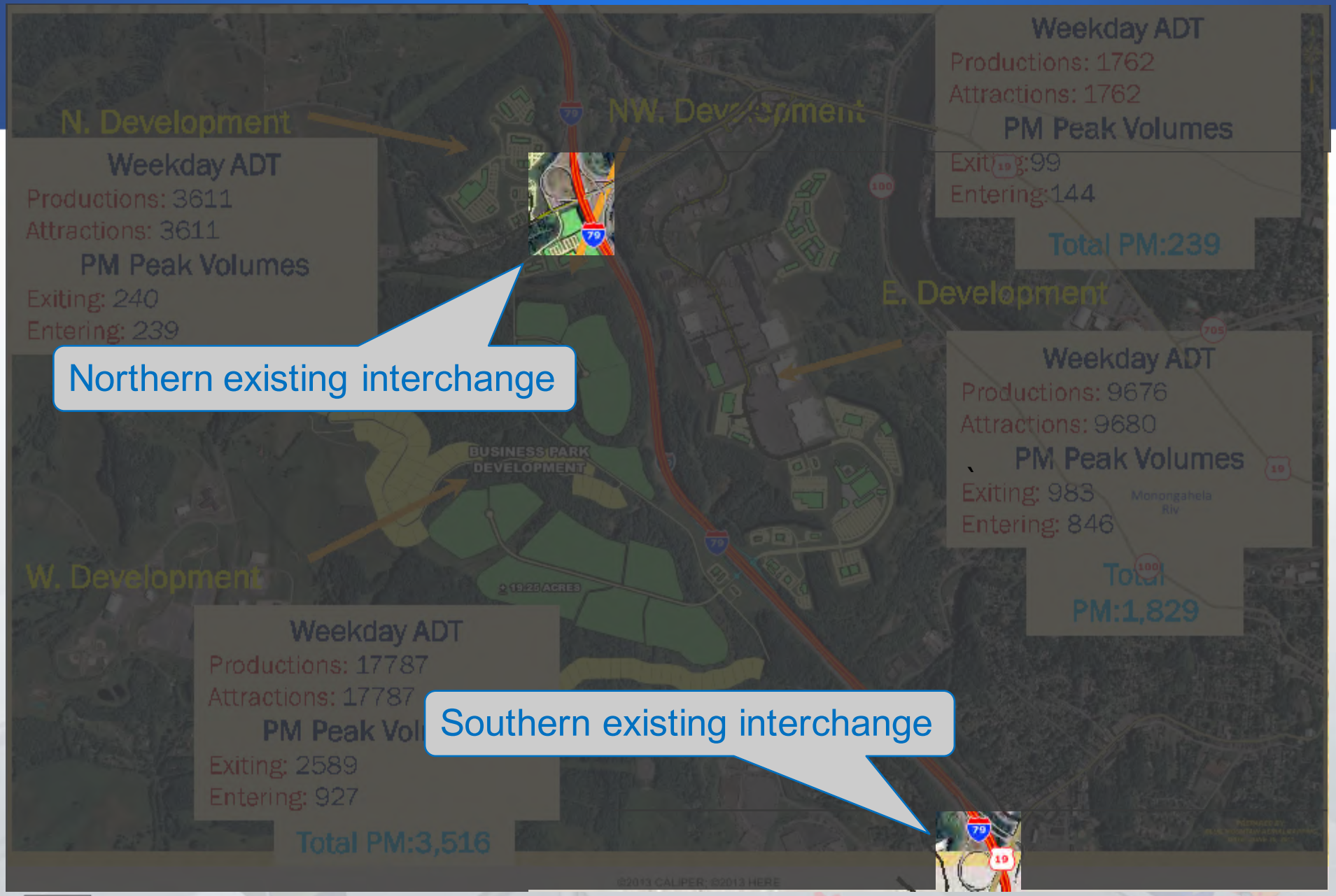
Project Background

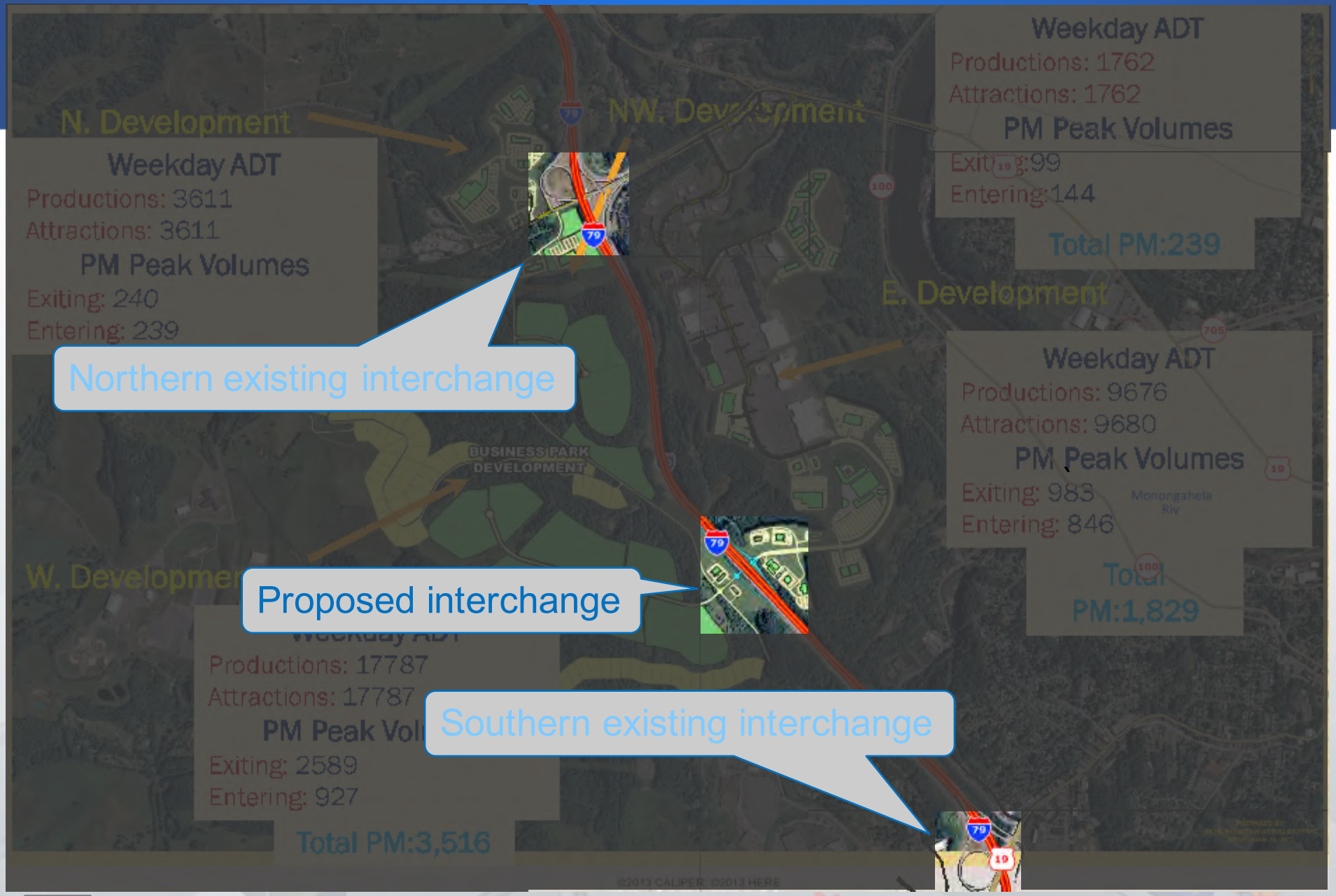
Project Background

- I-79/Morgantown Interchange Justification Report
- To develop a microsimulation model that:
  - Supports planning *and* operational analysis
  - Evaluates the construction of an interchange to provide direct access to new residential, medical, commercial developments and sports complex
  - Extends and complements existing models and modeling activities
- To evaluate future-year scenarios




N. Development
Weekday ADT
Productions: 3611
Attractions: 3611
PM Peak Volumes
Exiting: 240
Entering: 239
Total PM:479
NW. Development
Weekday ADT
Productions: 1762
Attractions: 1762
PM Peak Volumes
Exiting: 99
Entering: 144
Total PM:239
E. Development
Weekday ADT
Productions: 9676
Attractions: 9680
PM Peak Volumes
Exiting: 983
Entering: 846
Total PM:1,829
W. Development
Weekday ADT
Productions: 17787
Attractions: 17787
PM Peak Volumes
Exiting: 2589
Entering: 927
Total PM:3,516
BUSINESS PARK DEVELOPMENT
± 19.25 ACRES
Monongahela Riv
©2013 CALIPER; ©2013 HERE


N. Development
Weekday ADT
Productions: 3611
Attractions: 3611
PM Peak Volumes
Exiting: 240
Entering: 239
Northern existing interchange
NW. Development
Weekday ADT
Productions: 1762
Attractions: 1762
PM Peak Volumes
Exiting: 99
Entering: 144
Total PM:239
E. Development
Weekday ADT
Productions: 9676
Attractions: 9680
PM Peak Volumes
Exiting: 983
Entering: 846
Total PM:1,829
BUSINESS PARK DEVELOPMENT
W. Development
Weekday ADT
Productions: 17787
Attractions: 17787
PM Peak Vol
Exiting: 2589
Entering: 927
Total PM:3,516
Southern existing interchange


N. Development
Weekday ADT
Productions: 3611
Attractions: 3611
PM Peak Volumes
Exiting: 240
Entering: 239
Northern existing interchange
NW. Development
Weekday ADT
Productions: 1762
Attractions: 1762
PM Peak Volumes
Exiting: 99
Entering: 144
Total PM:239
E. Development
Weekday ADT
Productions: 9676
Attractions: 9680
PM Peak Volumes
Exiting: 983
Entering: 846
Total PM:1,829
BUSINESS PARK DEVELOPMENT
Proposed interchange
W. Development
Productions: 17787
Attractions: 17787
Exiting: 2589
Entering: 927
Total PM:3,516
Southern existing interchange

Traffic Simulation Scenarios

Scenarios	Identification
2012 Base Year	
No Build Network	
2015 Scenario (E+C)	
North Development (Phase 1 and 2)+Northwest Development East Development (University Town Centre and Apartment Complex)	
1a	No Build Network
1b	Capacity Improvements
1c	Proposed Interchange
2025 Scenario (E+C)	
North Development (Phase 1, 2 and 3)+Northwest Development+ East Development (100% Development)	
2a	No Build Network
2b	Capacity Improvements
2c	Proposed Interchange
2025 Scenario	
Full Development(100% East and West development)	
3	Proposed Interchange
2035 Scenario	
Full Development(100% East and West development)	
4	Proposed Interchange

Note: In the 2015 scenarios, Phase 1, 2 and 3 (as mentioned in Section 3.2) express phases of projects expected to be completed around 2015. The sensitivity analysis is expressed in the 2035 scenarios by gradually increasing the percentage of the expected development in the area (20%, 50% and 100%).

Traffic Simulation Scenarios

Scenarios	Identification
2012 Base Year	No Build Network
2015 Scenario (E+C) *North Development (Phase 1 and 2)+Northwest Development East Development (University Town Centre and Apartment Complex)*	
1a	No Build Network
1b	Capacity Improvements
1c	Proposed Interchange
2025 Scenario (E+C) *North Development (Phase 1, 2 and 3)+Northwest Development+ East Development (100% Development)*	
2a	No Build Network
2b	Capacity Improvements
2c	Proposed Interchange
2025 Scenario *Full Development(100% East and West development)*	
3	Proposed Interchange
2035 Scenario *Full Development(100% East and West development)*	
4	Proposed Interchange

Note: In the 2015 scenarios, Phase 1, 2 and 3 (as mentioned in Section 3.2) express phases of projects expected to be completed around 2015. The sensitivity analysis is expressed in the 2035 scenarios by gradually increasing the percentage of the expected development in the area (20%, 50% and 100%).

Four Demand Levels

Traffic Simulation Scenarios

Scenarios	Identification
2012 Base Year	No Build Network
2015 Scenario (E+C) *North Development (Phase 1 and 2)+Northwest Development East Development (University Town Centre and Apartment Complex)*	
1a	No Build Network
1b	Capacity Improvements
1c	Proposed Interchange
2025 Scenario (E+C) *North Development (Phase 1, 2 and 3)+Northwest Development+ East Development (100% Development)*	
2a	No Build Network
2b	Capacity Improvements
2c	Proposed Interchange
2025 Scenario *Full Development(100% East and West development)*	
3	Proposed Interchange
2035 Scenario *Full Development(100% East and West development)*	
4	Proposed Interchange

Note: In the 2015 scenarios, Phase 1, 2 and 3 (as mentioned in Section 3.2) express phases of projects expected to be completed around 2015. The sensitivity analysis is expressed in the 2035 scenarios by gradually increasing the percentage of the expected development in the area (20%, 50% and 100%).

No Build / E+C Network

Only Capacity Improvements

Proposed Interchange

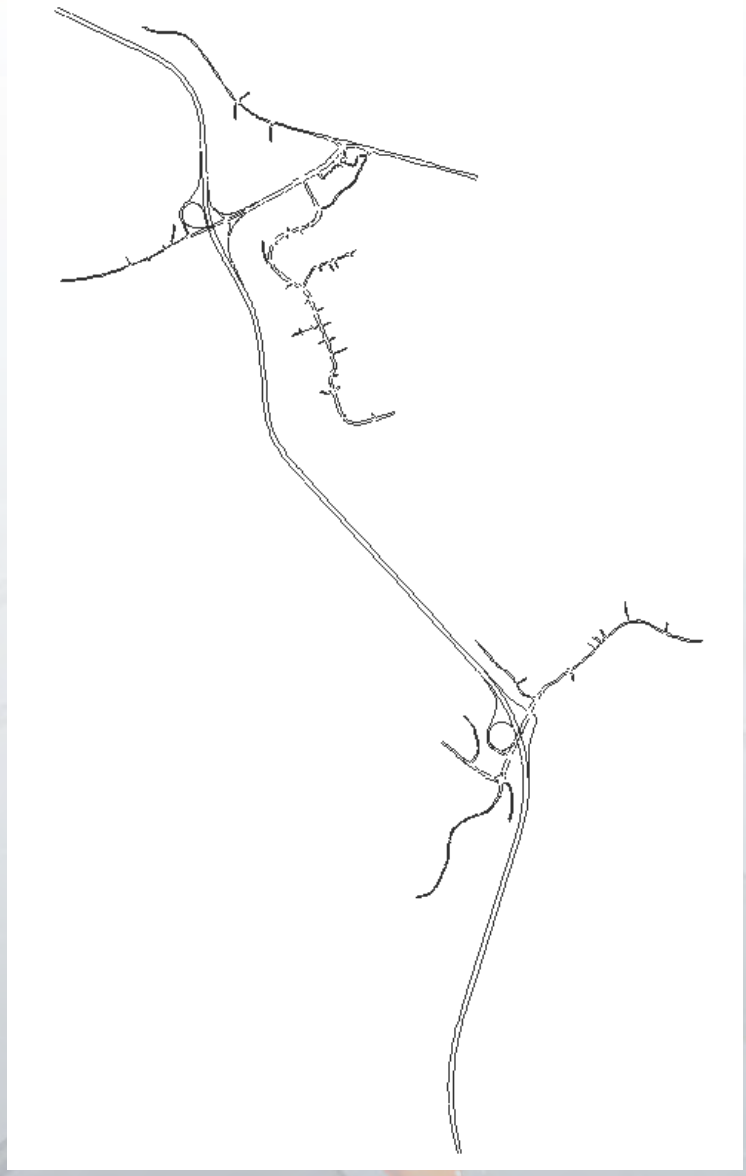
Outline

- Project Background
- Model Scope
- Implementation and Application
- Project Results

Outline

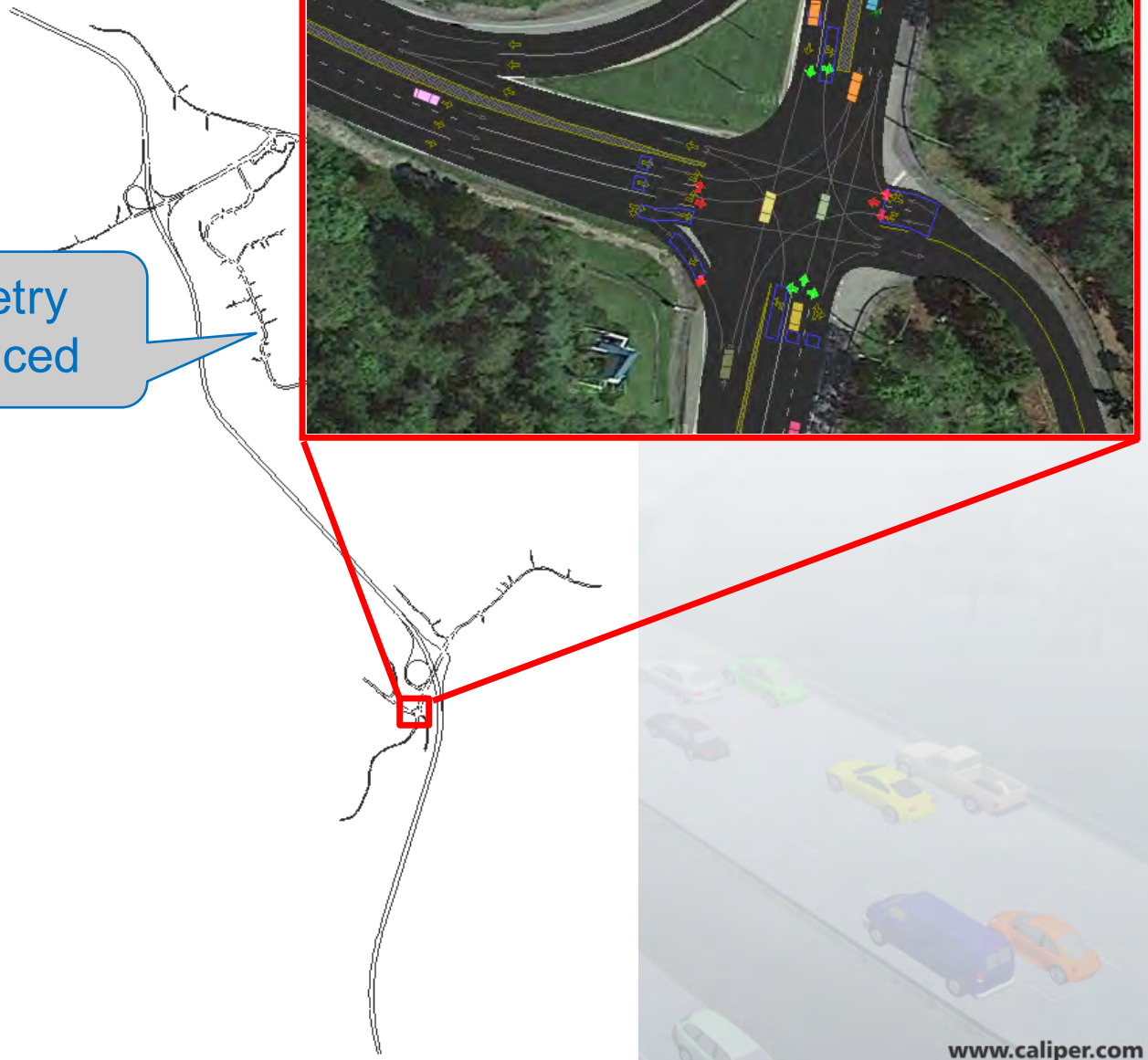
- Project Background
- Model Scope
  - Geography
  - Time Periods and Vehicle Population
- Implementation and Application
- Project Results

Geography

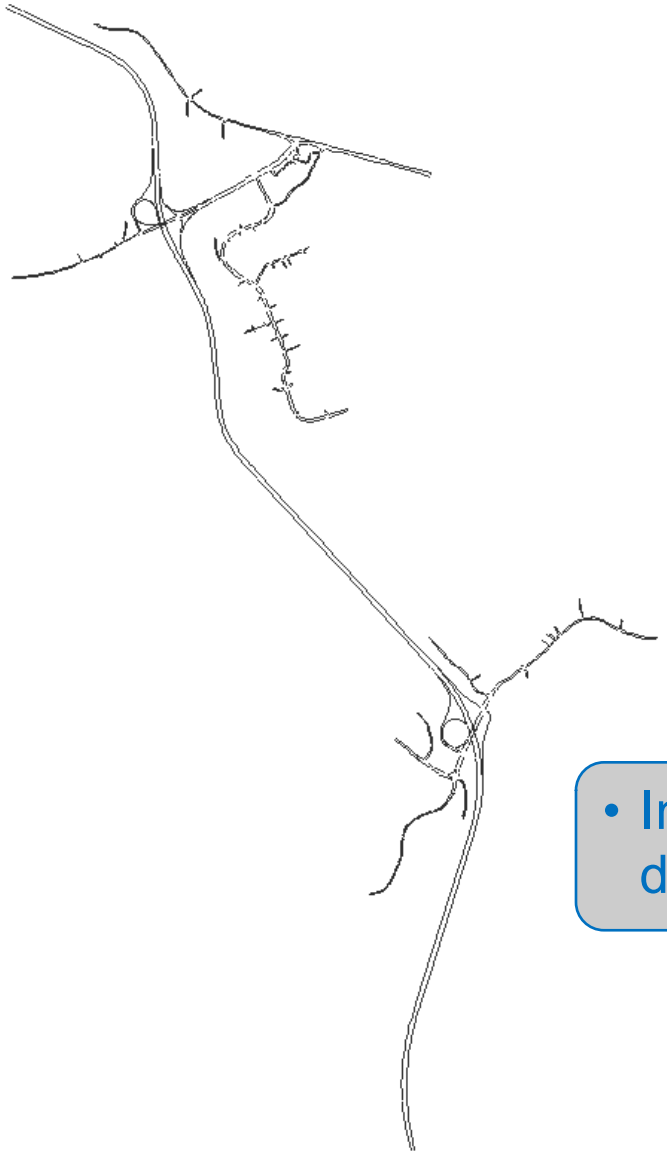


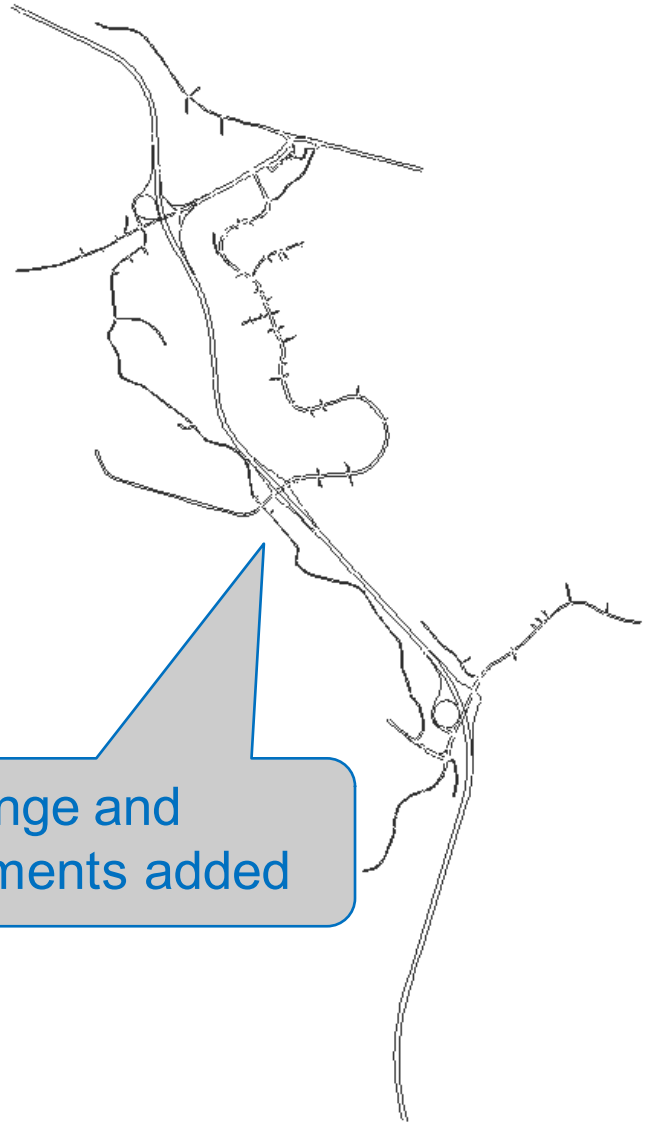
Geography

- Intersection geometry accurately reproduced



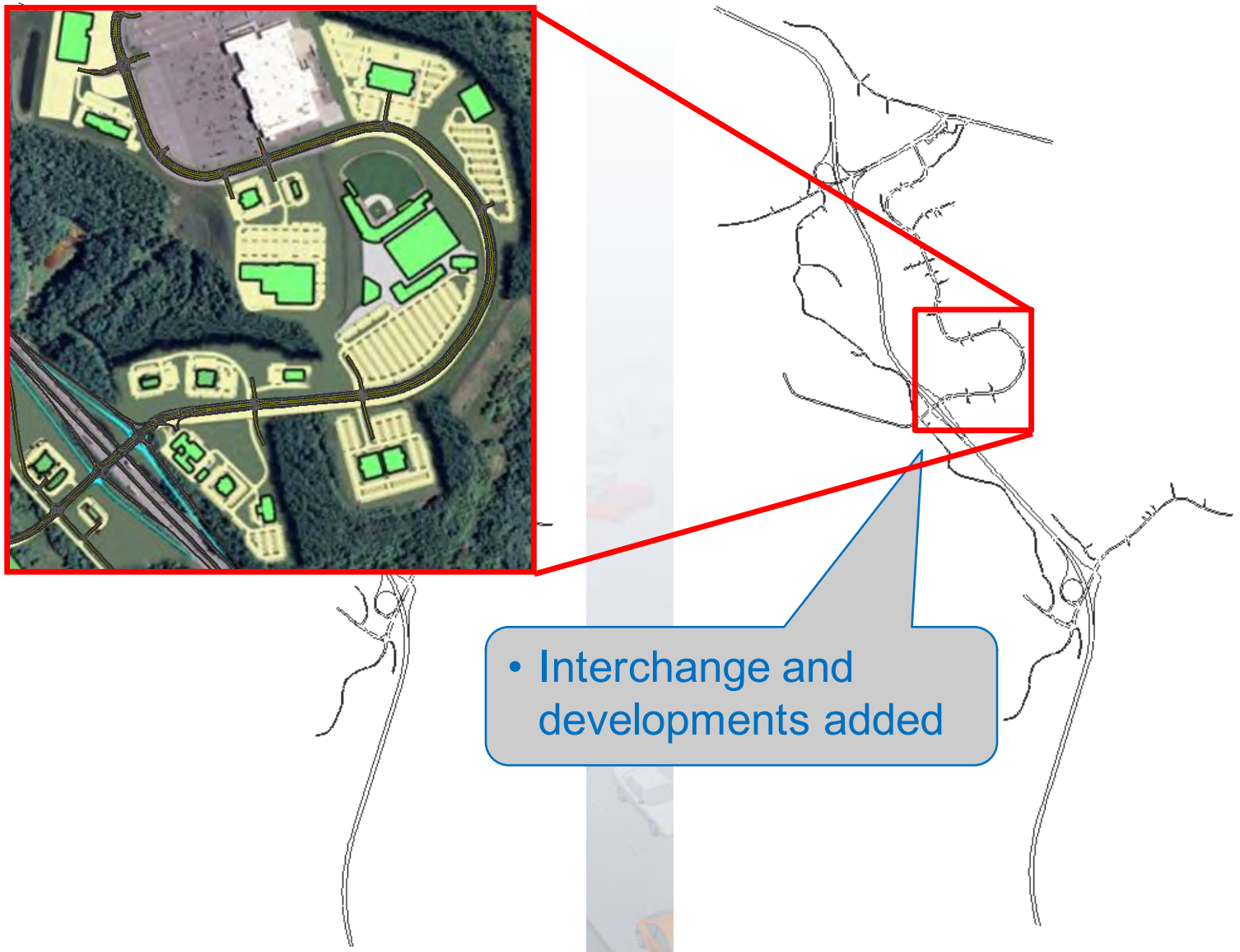
Geography





- Interchange and developments added

Geography



- Interchange and developments added

Outline

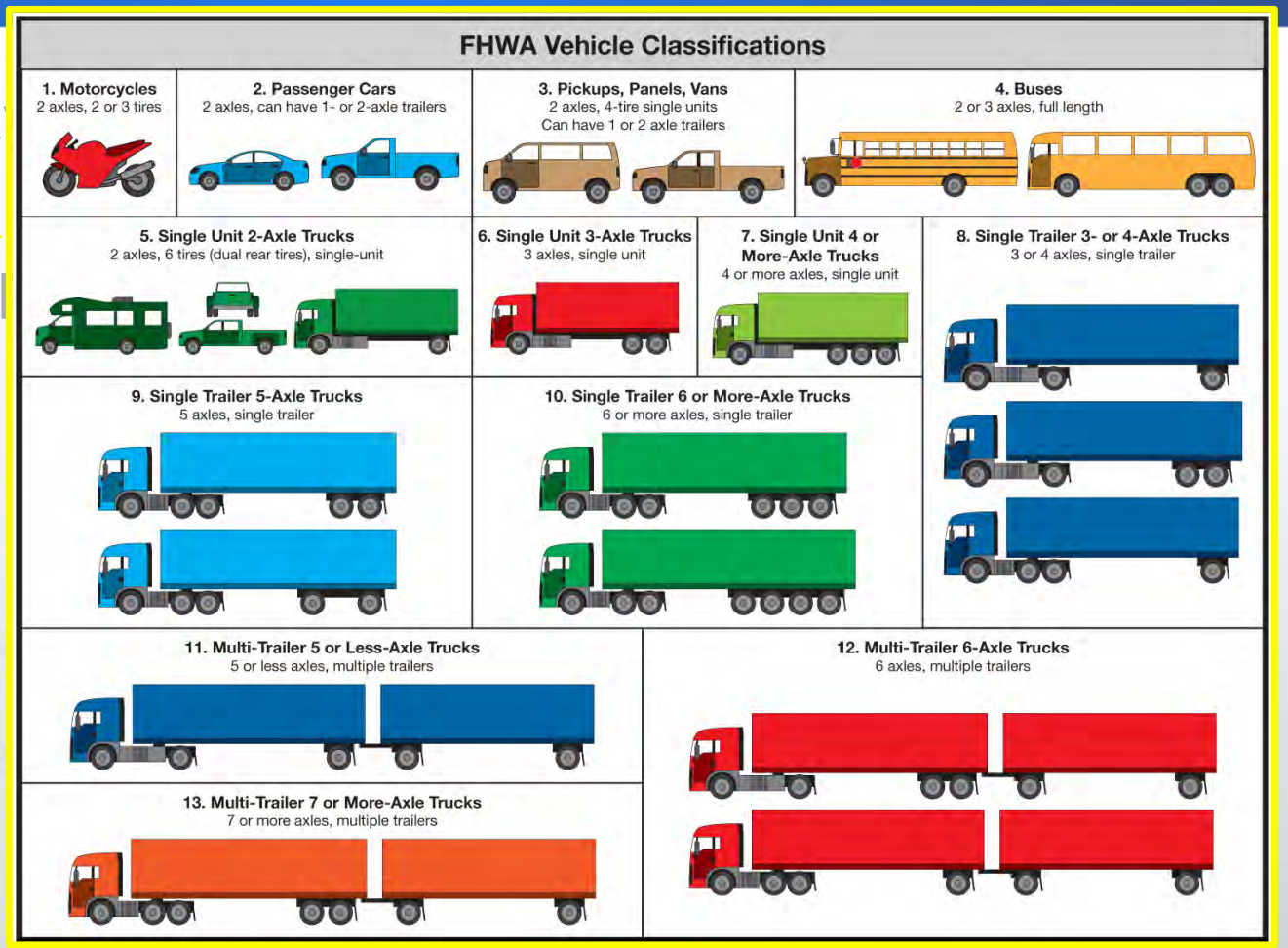
- Project Background
- Model Scope
  - Geography
  - Time Periods and Vehicle Population
- Implementation and Application
- Project Results

Time Periods & Vehicle Population

- Time of day includes one peak period: 4:00 - 5:00 PM
- Vehicle Population
  - Auto
  - Truck

Time Periods & Vehicle Population

- Time of da
  PM
- Vehicle Po
  - Auto
  - Truck



Outline

- Project Background
- Model Scope
- Implementation and Application
- Project Results

Outline

- Project Background
- Model Scope
- Implementation and Application
  - Regional, planning analysis
  - Local, microsimulation analysis
- Project Results

Implementation and Application

- Travel demand modeling of regional network to test system deficiencies under new developments
  - Model: MMC (Morgantown) travel demand model
  - MOE: V/C ratios
- Simulation modeling of traffic conditions under new development and proposed interchange for current and future years
  - Model: Calibrated microsimulation of proposed and adjacent interchanges
  - MOEs: HCM Levels of service for freeway segments, intersections, and urban streets

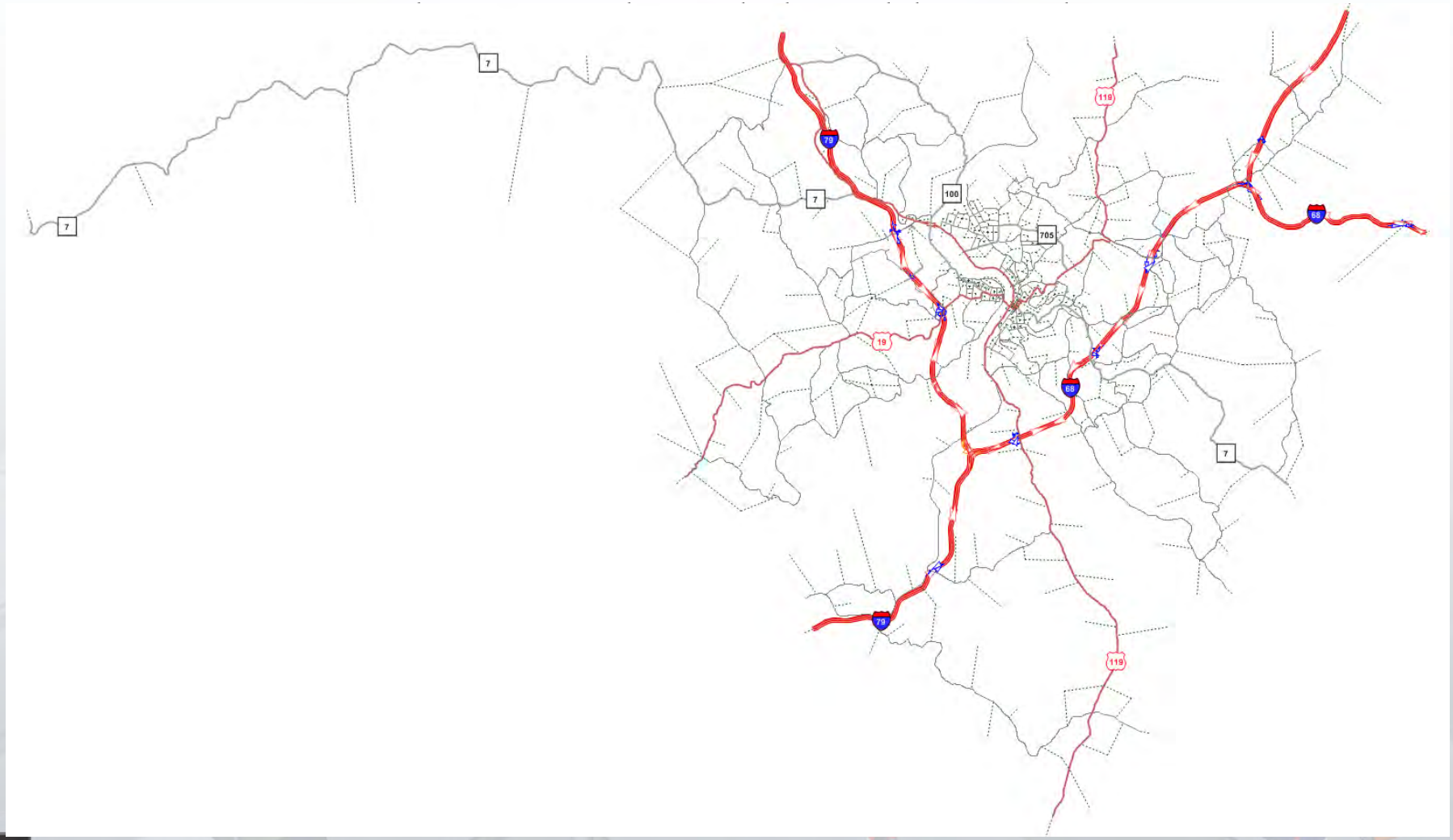
Outline

- Project Background
- Model Scope
- Implementation and Application
  - Regional, planning analysis
  - Local, microsimulation analysis
- Project Results

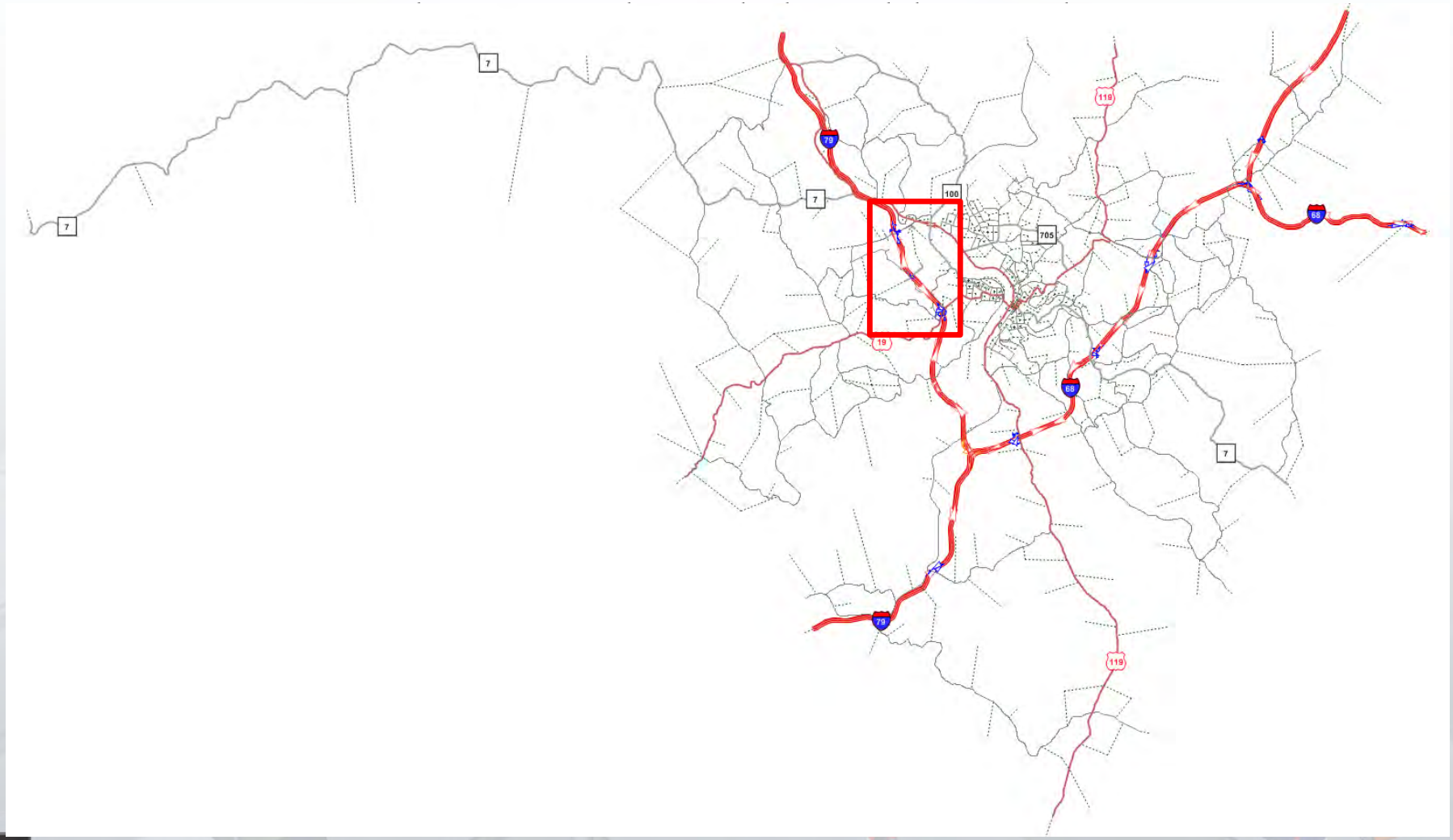
Planning Analysis

1. Update MMC Travel Demand Model (calibrated to a 2010 base year) to reflect build scenarios
2. Develop OD matrices for analysis years 2015 and 2035 using straight-line projection of socioeconomic and demographic variables based on MMC horizon year 2040
3. Adjust matrix row and column trip totals based on the proposed land uses
4. Perform traffic assignments
5. Analyze V/C impacts

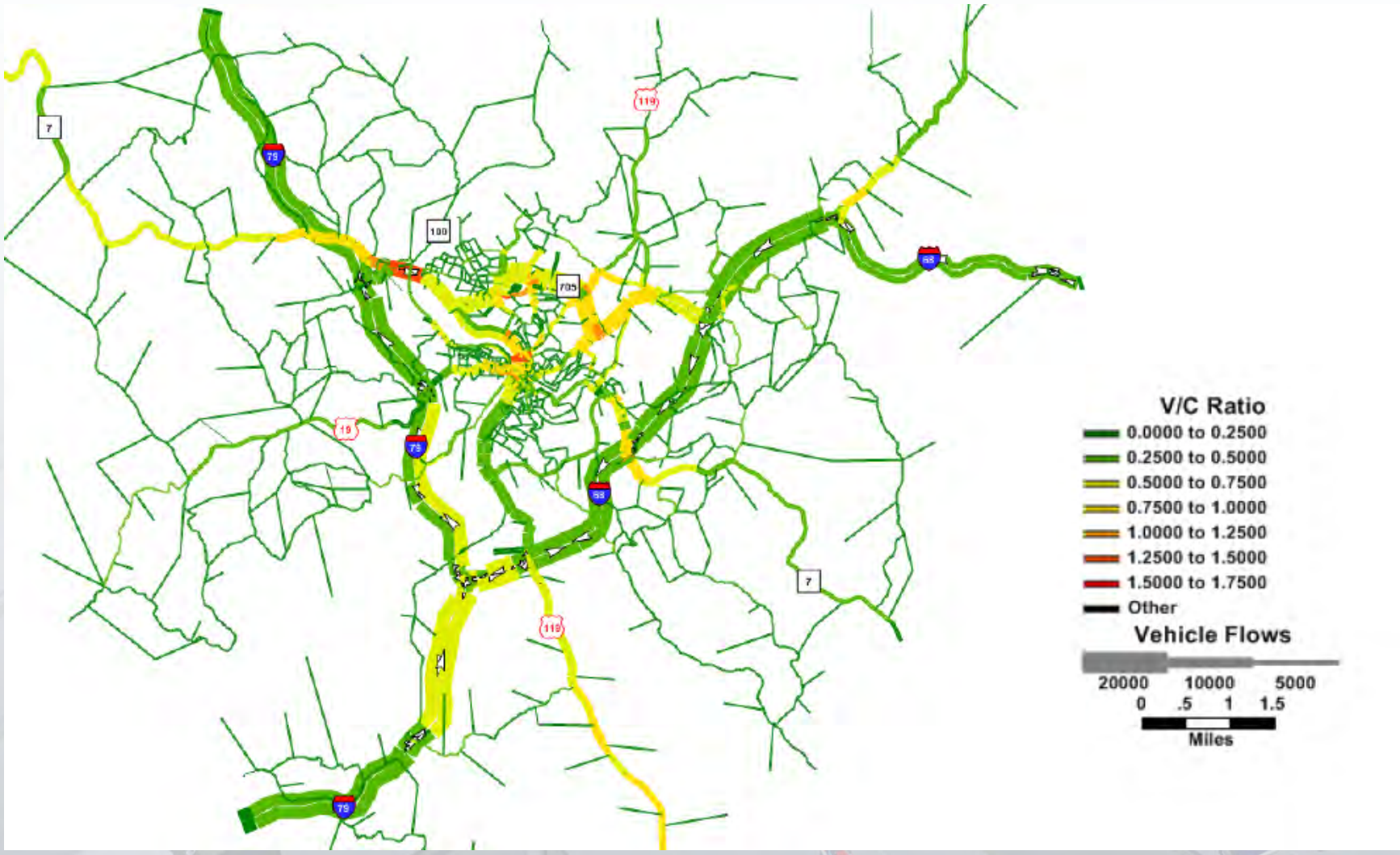
Planning Analysis



Planning Analysis



Planning Analysis MOEs



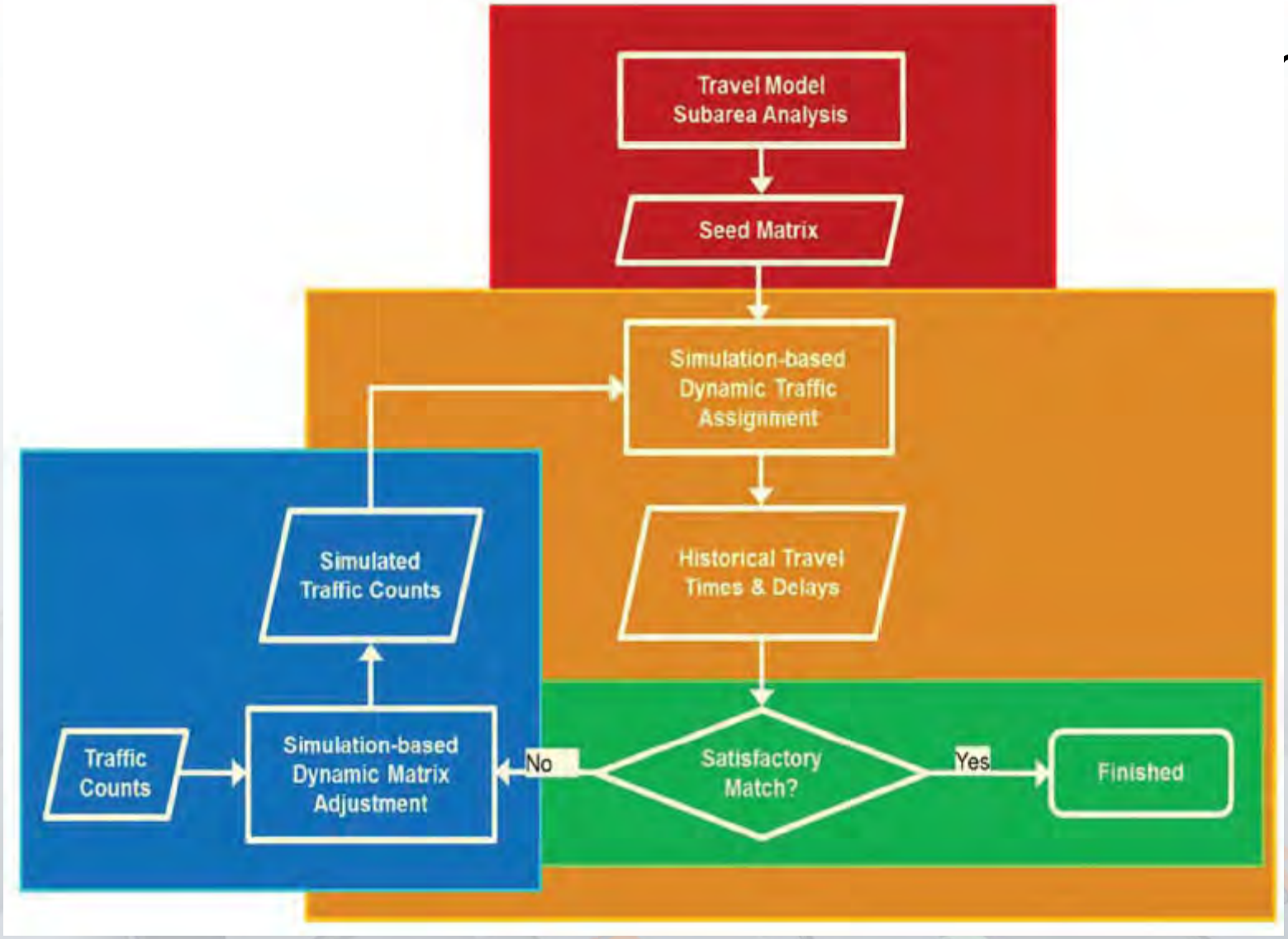
Microsimulation Analysis

- In order to test the effects of changes in demand or geometry on facility performance, we need to create a calibrated base model
- This calibrated base model is created by starting from a 24-hour TDM and then refining the OD matrix based on 15-minute turning movement counts
- To achieve this, we disaggregate demand in space and time

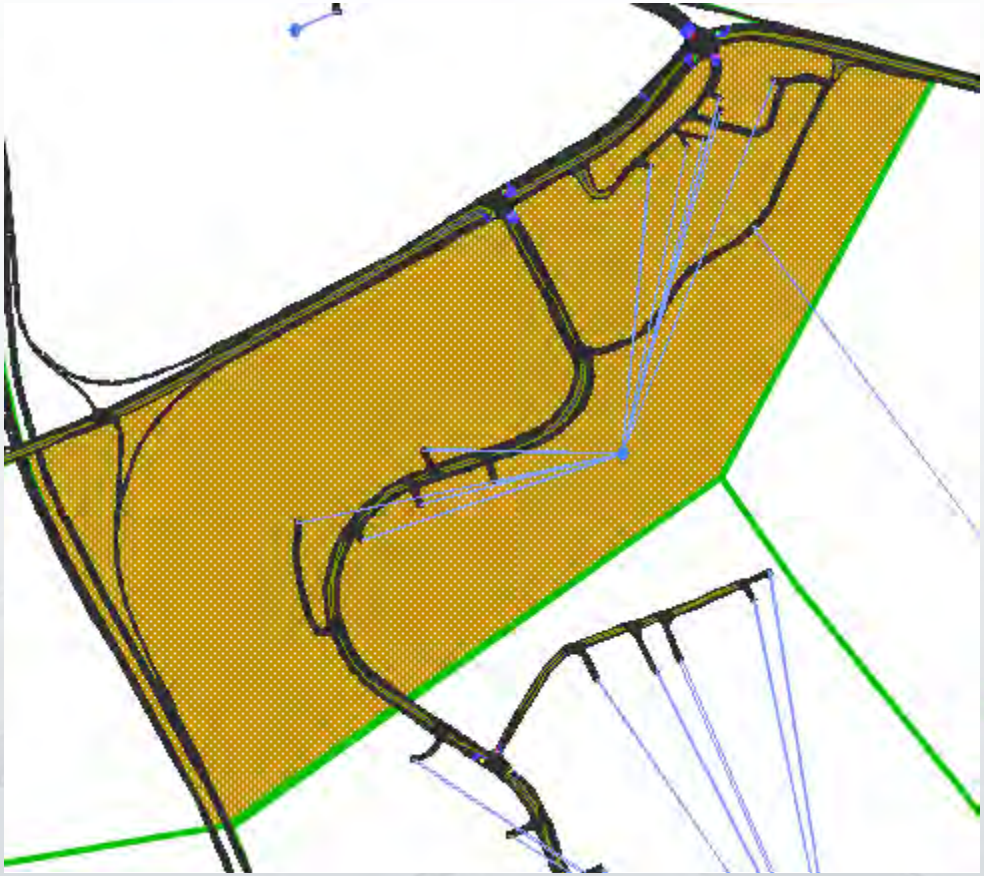
Outline

- Project Background
- Model Scope
- Implementation and Application
  - Regional, planning analysis
  - Local, microsimulation analysis
- Project Results

Microsimulation Analysis

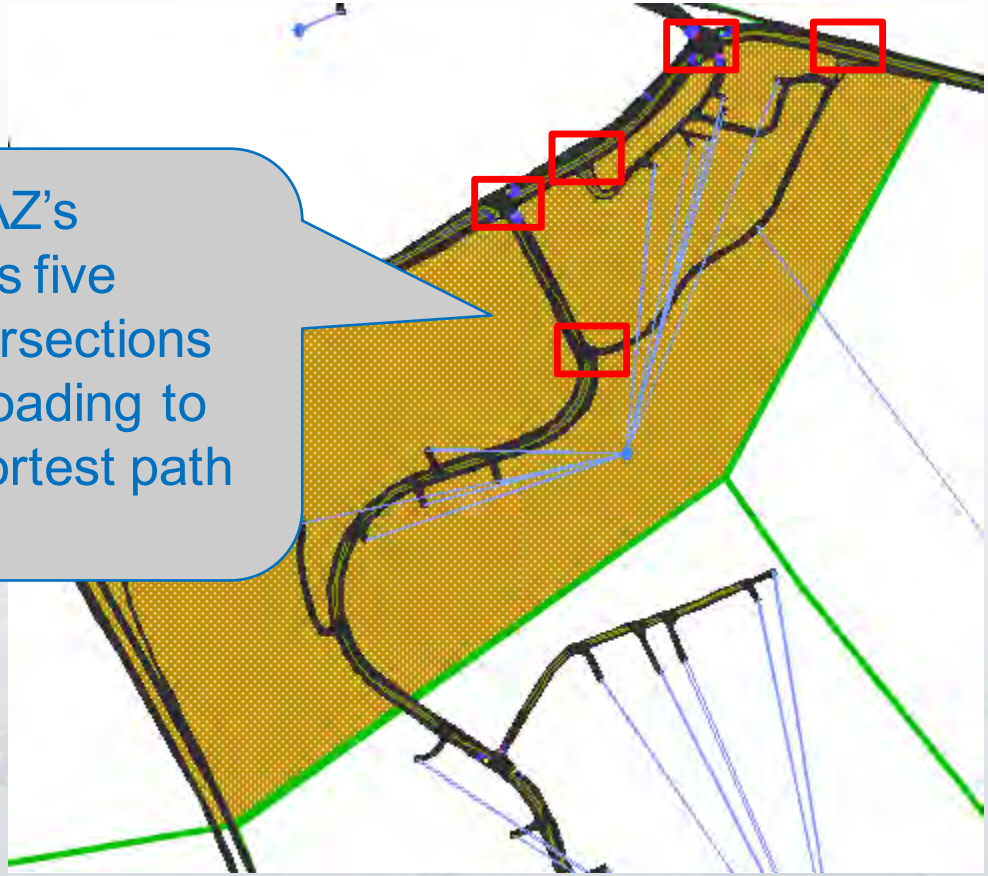


Spatial Disaggregation



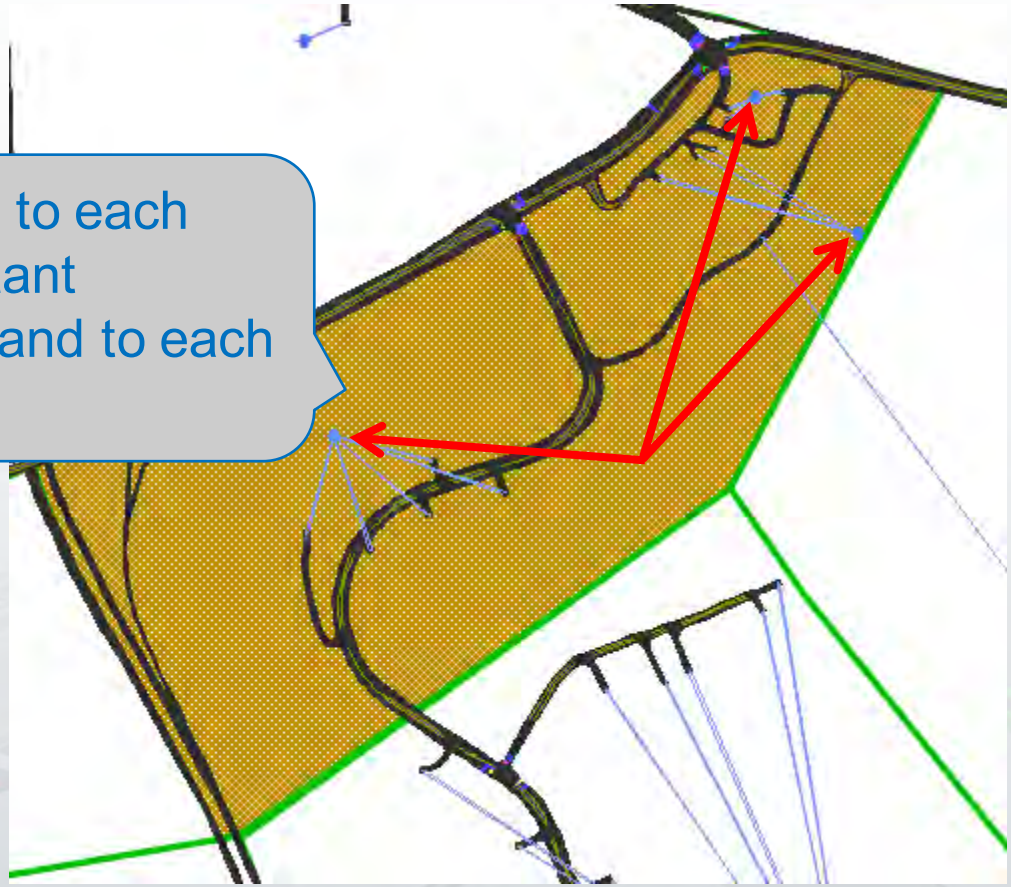
Spatial Disaggregation

- This single TAZ's loading affects five important intersections
- Leaving this loading to chance or shortest path is ineffectual

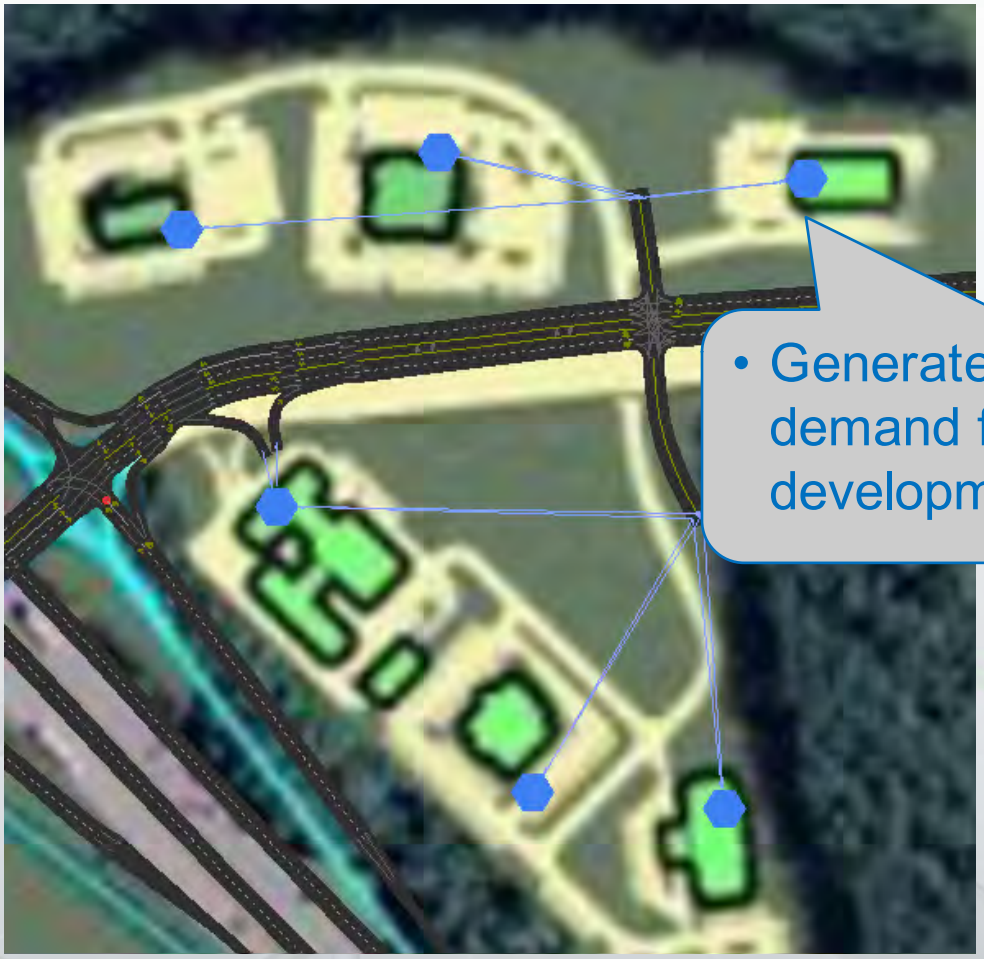


Spatial Disaggregation

- Disaggregate to each side of important intersections and to each development



Spatial Disaggregation



- Generate future year demand from each development

Temporal Disaggregation

- The travel demand model has 24-hour fidelity
- The simulation study period is 1 hour
- The turning movement counts have 15-minute fidelity
- 99.3% of trips are shorter than 15 minutes

Temporal Disaggregation

- **The travel demand model has 24-hour fidelity**
- The simulation study peri is 1 hour
- The turning moveme fidelity
- 99.3% of trips are sh

- Though the 24-hour model does not capture any diurnal ebbs, it will provide the subarea with the important O's and D's

Temporal Disaggregation

- The travel demand model has 24-hour fidelity
- **The simulation study period is 1 hour**
- The turning movemen[illegible]ounts have 15-minute fidelity
- 99.3% of trips a[illegible]

- But, we extend our ODME time period to include the prior and following half-hour
- Ensure trips are going to where they should for the 1st and last time periods

Temporal Disaggregation

- The travel demand model has 24-hour fidelity
- The simulation study period is 1 hour
- **The turning movement counts have 15-minute fidelity**
- 99.3% of trips are shorter than 15 minutes

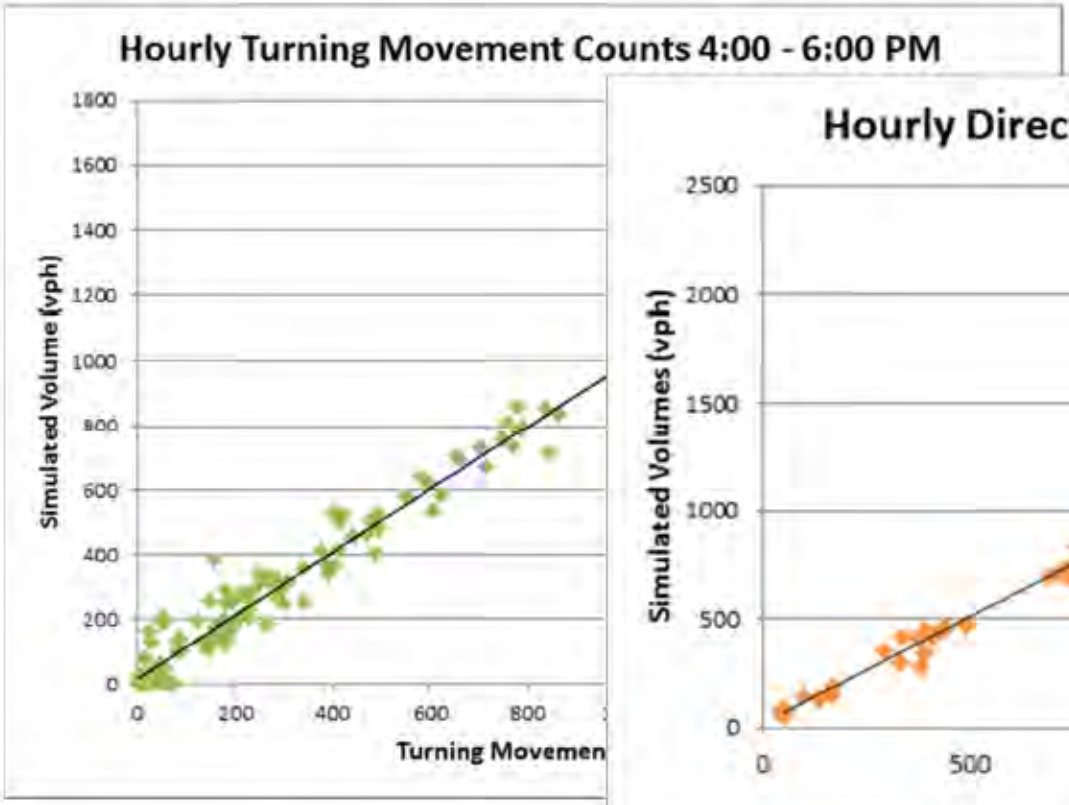
- As a 1st pass, we impose a curve on the subarea demand to give some temporal shape

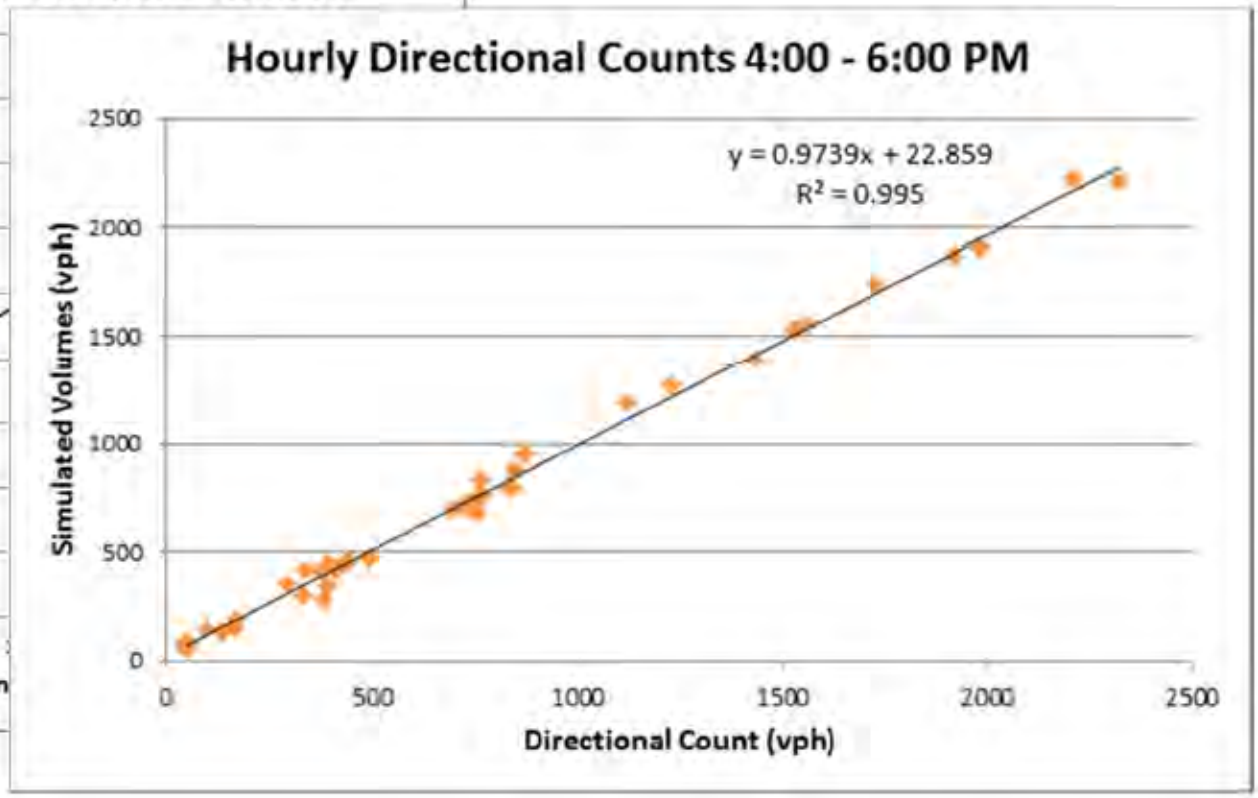
Temporal Disaggregation

- The travel demand model has 24-hour fidelity
- The simulation study period is 1 hour
- The turning movement counts have 15-minute fidelity
- **99.3% of trips are shorter than 15 minutes**

  - Despite the 15-minute count fidelity, we went to a 5-minute demand fidelity because the trips are so short

Calibration





Outline

- Project Background
- Model Scope
- Implementation and Application
- Project Results

Project Results

- **IJR was approved with FONSI**

Project Results

- IJI

Traffic Simulation Intersections Level of Service (LOS)

Scenarios / Location	2012	2015			2025				2035
	No Build	1a	1b	1c	2a	2b	2c	3	4
Chaplin Hill Road & Mononghela Blvd (Sheetz I/S)	E	F	F	F	F	F	F	F	F
I-79 Exit 155 SB Ramp & Chaplin Hill Road (CR 19/24)	B	E	D	D	F	F	E	E	F
I-79 Exit 155 NB Ramp & Chaplin Hill Road (CR 19/24)	B	F	C	B	F	E	D	D	F
Chaplin Hill Road (CR 19/24) and University Town Centre Drive	D	D	D	D	F	F	D	E	F
I-79 Exit 152 SB Ramp & US 19	C	B	C	C	E	E	C	E	D
I-79 Exit 152 NB Ramp & US 19	B	B	B	B	D	D	C	C	E
New I-79 I/C NB Ramp & New Mountaineer Park Connector	N/A	N/A	N/A	B	N/A	N/A	B	B	C
New I-79 I/C SB Ramp & New Mountaineer Park Connector	N/A	N/A	N/A	A	N/A	N/A	B	C	D
Relocated Martin Hollow road (CR 46/3) & Mountaineer Park Connector	N/A	N/A	N/A	N/A	N/A	N/A	N/A	E	F

Project

- IJR was

Traffic Simulation-Freeway Level of Service (LOS)

Scenarios / Location	2012 Base Year	2015 Scenario (E+C)			2025 Scenario (E+C)			2025 Scenario (100% Build)	2035 Scenario (100% Build)
	No Build	1a *No build*	1b *Capacity improvements*	1c *I/C*	2a *No build*	2b *Capacity improvements*	2c *I/C*	3 *I/C*	4 *I/C*
I-79 NB *basic section* between Exit 152 & 155	B	B	B	N/A	F	F	N/A	N/A	N/A
I-79 NB *merging section* between Exit 152& 155	B	D	B	N/A	E	E	N/A	N/A	N/A
I-79 NB *diverging section* between Exit 152 & 155	B	B	B	N/A	E	E	N/A	N/A	N/A
I-79 SB *basic section* between Exit 155 & 152	B	C	C	N/A	E	E	N/A	N/A	N/A
I-79 SB *merging section* between Exit 155 & 152	B	B	B	N/A	D	D	N/A	N/A	N/A
I-79 SB *diverging section* between Exit 155 & 152	B	B	B	C	E	B	N/A	N/A	N/A
I-79 NB *basic section* between new I/C & Exit 155	N/A	N/A	N/A	B	N/A	N/A	C	C	E
I-79 NB *merging section* between new I/C & Exit 155	N/A	N/A	N/A	B	N/A	N/A	C	C	C
I-79 NB *diverging section* between new I/C & Exit 155	N/A	N/A	N/A	B	N/A	N/A	C	C	D
I-79 NB *basic section* between Exit 152& I/C	N/A	N/A	N/A	A	N/A	N/A	C	C	F
I-79 NB *merging section* between Exit 152 & I/C	N/A	N/A	N/A	B	N/A	N/A	C	C	E
I-79 NB *diverging section* between Exit 152 & I/C	N/A	N/A	N/A	B	N/A	N/A	C	C	E
I-79 SB *basic section* between Exit 155 & I/C	N/A	N/A	N/A	C	N/A	N/A	C	C	D
I-79 SB *merging section* between Exit 155 & I/C	N/A	N/A	N/A	B	N/A	N/A	B	C	D
I-79 SB *diverging section* between Exit 155& I/C	N/A	N/A	N/A	B	N/A	N/A	C	C	E
I-79 SB *basic section* between I/C & Exit 152	N/A	N/A	N/A	C	N/A	N/A	C	E	E
I-79 SB *merging section* between I/C & Exit 152	N/A	N/A	N/A	C	N/A	N/A	D	E	E
I-79 SB *diverging section* between I/C & Exit 152	N/A	N/A	N/A	C	N/A	N/A	D	E	E

Project Results

- Urban Streets Level of Service (LOS)

Scenarios / Location	2012	2015 (E+C)			2025 (E+C)			2025 (100% Build)	2035 (100% Build)
	No Build	1a	1b	1c	2a	2b	2c	3	4
Chaplin Hill Road EB (CR 19/24)	C	E	D	C	F	F	F	F	F
Chaplin Hill Road WB (CR 19/24)	D	E	D	D	E	E	D	F	F
US 19 EB	C	C	B	B	E	E	C	C	D
US 19 WB	C	C	B	C	E	D	C	C	D
Mountaineer Park Connector EB	N/A	N/A	N/A	B	N/A	N/A	C	C	D
Mountaineer Park Connector WB	N/A	N/A	N/A	B	N/A	N/A	C	D	D

Analysis Extended in Phase 2