



Durham-UNH Traffic Model 2017 Update



January 18, 2017



Overview of Meeting

- **Background/Introduction**
- **Land-Use Transportation Modeling**
- **The Durham-UNH Microsimulation Model**
 - Geography
 - Transportation Network (updates)
 - Land Use (updates)
 - 2017 Calibration
- **Recent Applications**
- **Future Applications**



Land-Use Transportation Modeling

- Computer simulation modeling for
 - how traffic is generated and
 - how vehicles travel through a road network
- Used to Assess how will traffic respond if a...
 - new road is built?
 - new traffic signal is installed?
 - new roundabout is constructed?
 - traffic pattern changes from two-way to one way, or vice versa
- How will a proposed development affect traffic in the local area?



Durham-UNH Model

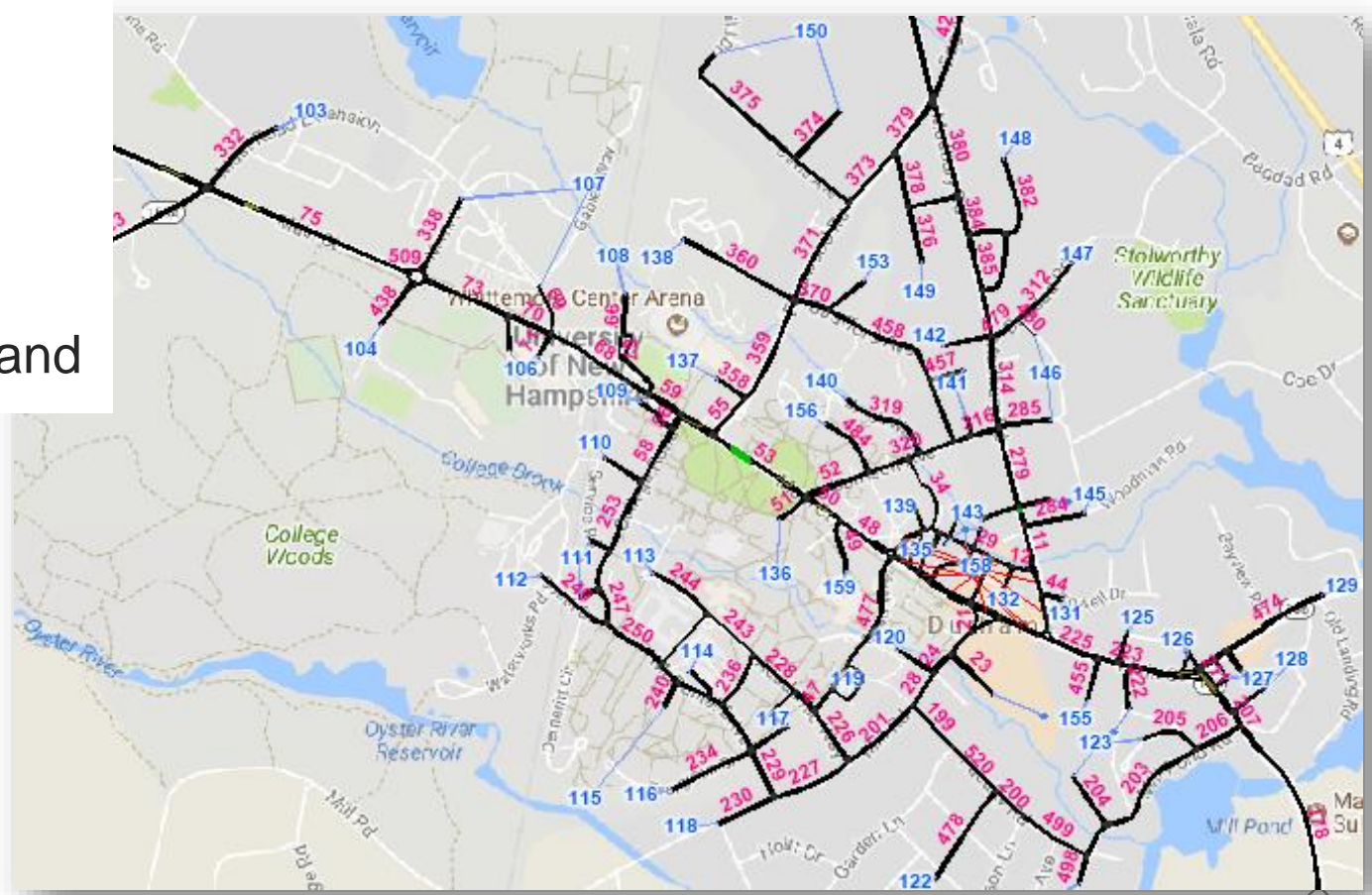
- Developed in 2009
 - AM peak hour
 - Relied on 2008 count data
- 2013 Update
 - AM peak hour
 - Updated land use and network
 - Recalibrated to 2013 count data
- 2017 Update
 - the AM model was updated
 - a PM peak hour model was created
 - Recent land use and network changes were incorporated
 - Calibrated to 2017 AM and PM peak hour counts



Durham-UNH Model

Represents Existing

- Roadway
- Intersection Conditions
- Land Use
- Parking
- Traffic Demand

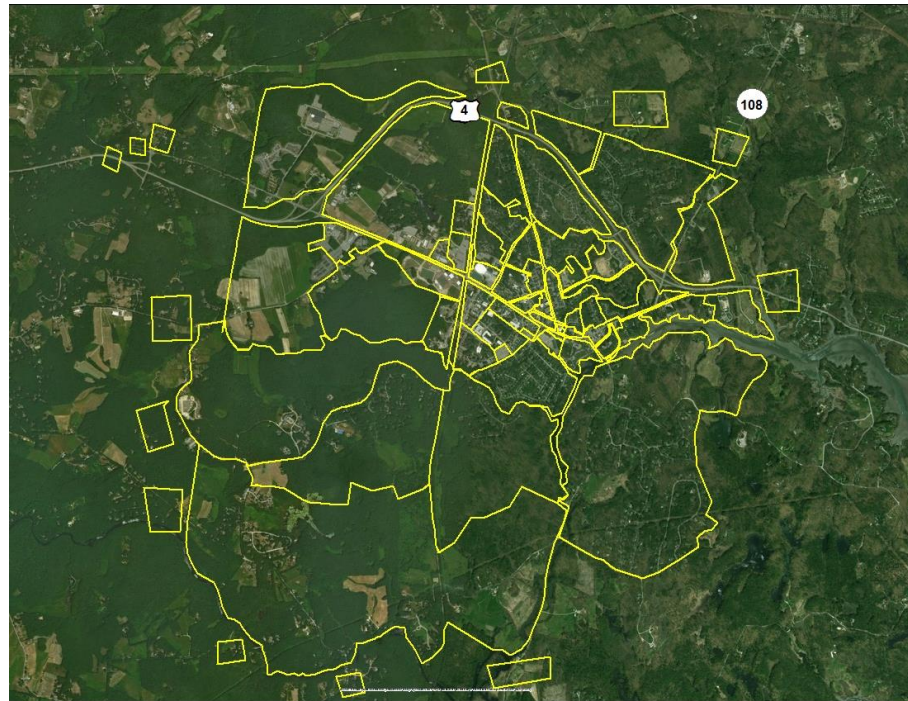


2017 Model Effort

- Focused on central core of UNH campus and downtown Durham



2013 Model Extent

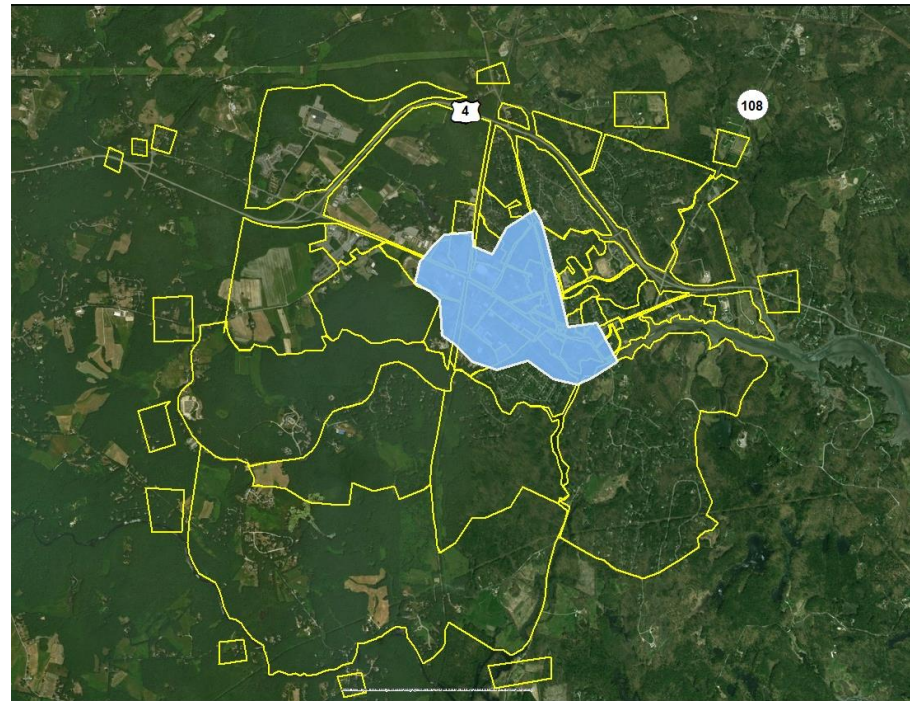


2017 Model Effort

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2017 Model Extent



The Durham-UNH Model: Background Information

- Model system implemented in TransModeler 5.0
- Reflects Durham and UNH roadway network
- Model-estimated traffic calibrated to traffic counts
- Model assigns traffic to network based on
 - roadway speeds
 - delays
 - travel times
 - alternate routes

The screenshot displays the 'Intersection Control Editor' window for 'Inputs/Signals/Downtown_Signals_10-2-17.tms'. The interface includes a map of the intersection with roads labeled 214 (W), 212 (NE), and 220 (SE). The 'Settings' tab is active, showing a cycle time of 110 seconds and a coordinate beginning of 'Yellow'. The 'Phases' tab is also visible, showing a table of signal timing parameters for 8 phases.

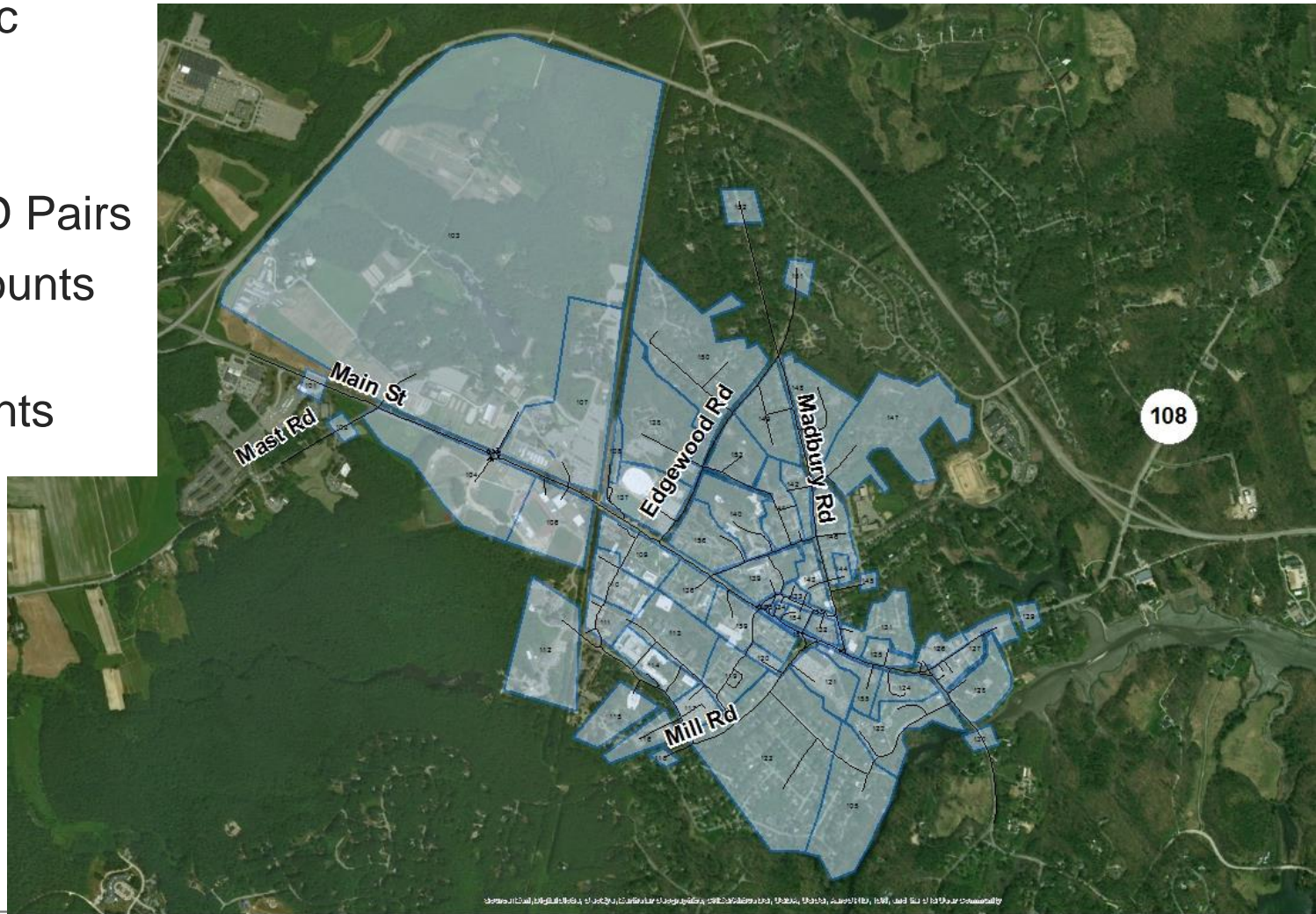
ID	1	2	3	4	5	6	8
Min Green	5	5	0	5	5	5	5
Max Green	6	51	19	13	31	26	13
Yellow	4	4	0	4	4	4	4
Red Clearance	2	2	3	2	2	2	2
Lost Time	6	6	3	6	6	6	6
Recall Mode	None	Min	None	None	None	Min	None
Detectors	1; 1	7; 7	Choose ...	4; 5; 4; 5	6; 6	2; 29; 2; 29	8; 8
Memory Mode	L	L	L	L	L	L	L
Extension	4	4	4	4	4	4	4
Simultaneous Gap ...	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Added Initial	0	0	0	0	0	0	0
Max Initial							
Time before Redu...							
Reduce by / Every							
Min Gap							
Ped Walk + FDW			15				
Ped Links			212, 215, ...				
Coordinated							
Split							
Max Inhibit							
Opt Min Green	6	6	6	6	6	6	6



Durham-UNH Model

Dynamic Traffic Assignment

- 59 TAZ
- 3,422 OD Pairs
- 48 TM counts
- 319 movements



The Durham-UNH Model: Background Information

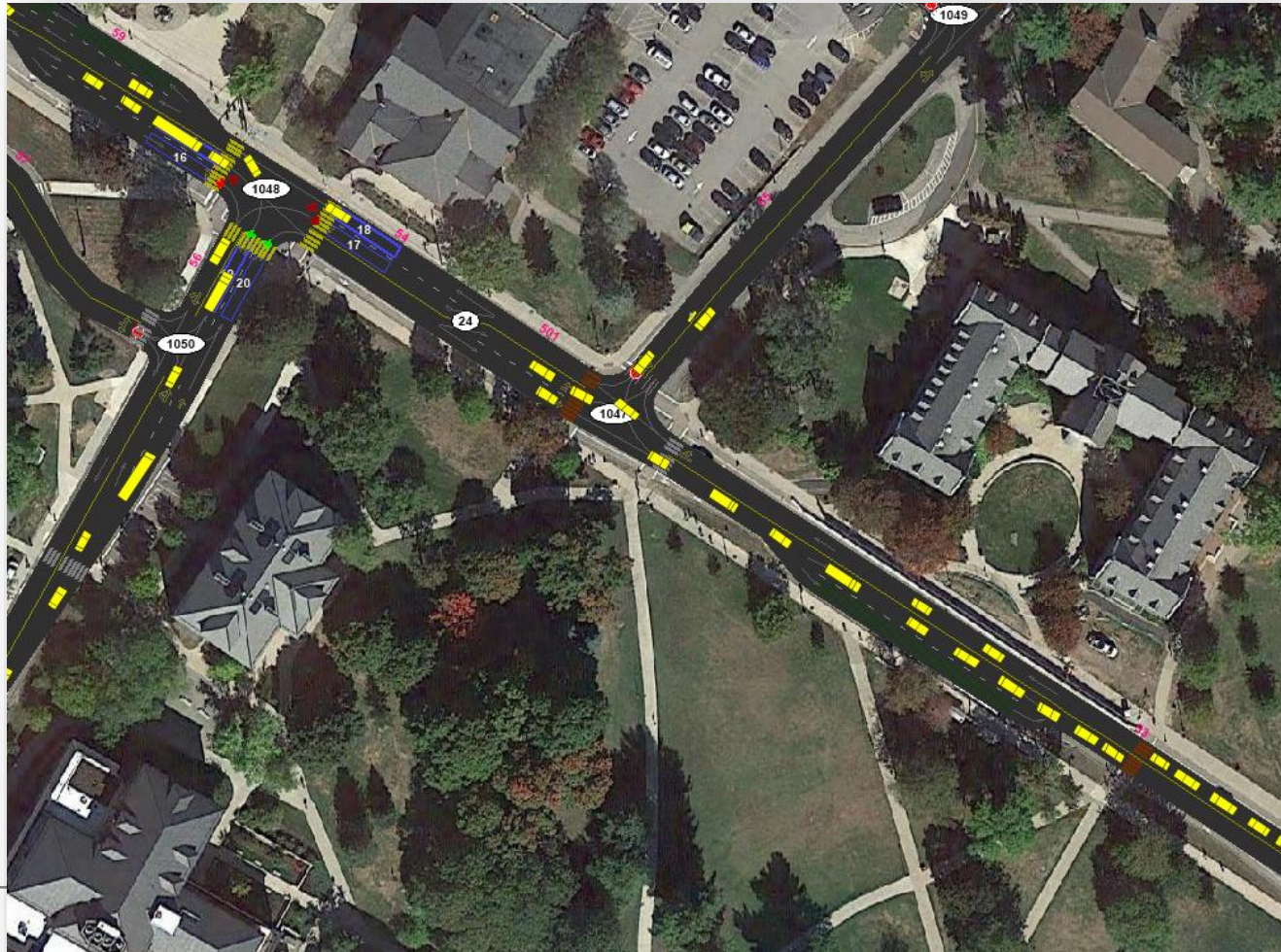
- Model traffic informed by land use
 - Parking (by type)
 - Residential (single family, multifamily)
 - Retail employment
 - Non-retail employment
- Land use based origin/destination zones (O/D)

2017 TAZ	# of Employees		Housing			Parking		
	Retail	Non-retail	SF	MF	Group	High TG	Med. TG	Low TG
103	0	0	10	0	0	616	11	0
104	0	0	0	0	0	0	20	0
105	0	0	41	0	0	0	0	0
106	0	3	0	0	0	44	64	9
107	0	19	0	0	984	1137	150	556
108	0	2	0	0	0	0	172	0
109	0	0	0	0	0	49	36	17
110	0	0	0	0	0	0	34	35
111	0	0	0	0	0	56	20	14
112	0	123	0	0	675	123	144	125



Road Network

- Roads & Streets
- Intersections
- Stop Control
- Signal Control
- Turn Restrictions
- Operating Speed
- Public Transit
- **On-street parking**
- **Pedestrians**



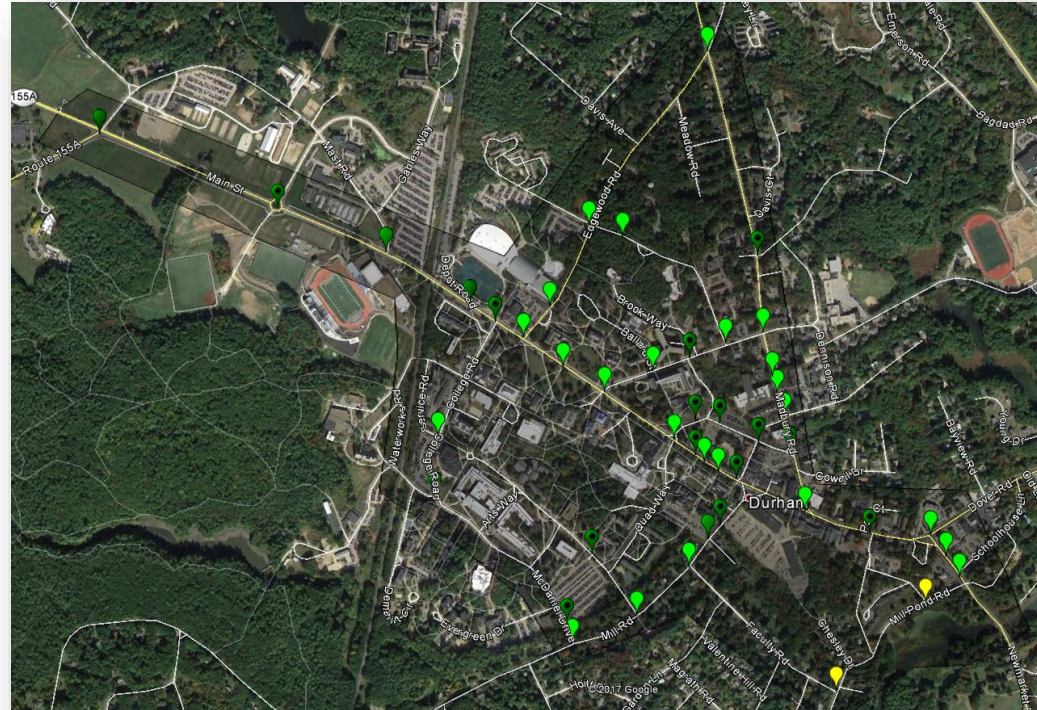
Network Update Highlights (2017)

- **Roadway Changes between 2013 and 2017**
 - All-way stop at Mill Road & McDaniel Drive
 - All-way stop at Faculty Road & Thompson Lane
 - New right-turn pocket along Garrison eastbound at Madbury Road
- **New Land Uses between 2013 and 2017**
 - 1 Madbury Road & 30 Main Street
 - Church Hill Project
 - Madbury Commons
 - Pauly's Pockets Project
 - Parking Changes



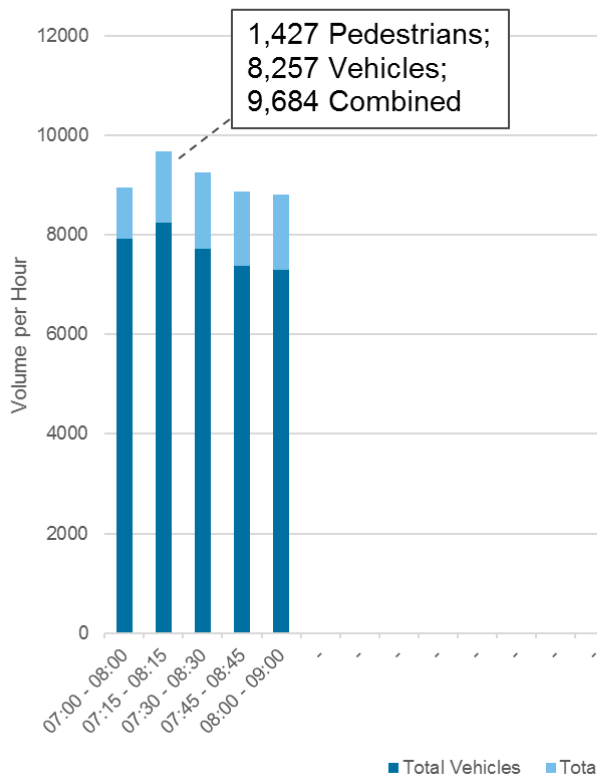
Calibration Traffic Count Data

- **Comprehensive counts**
 - Data collected at 48 intersections
 - Collected during March and April 2017
 - Nine hours of data between 7AM and 6PM
 - Ensures accurate peak hour selection
 - AM peak hour = 7:15 – 8:15 AM
 - PM peak hour = 4:30 – 5:30 PM

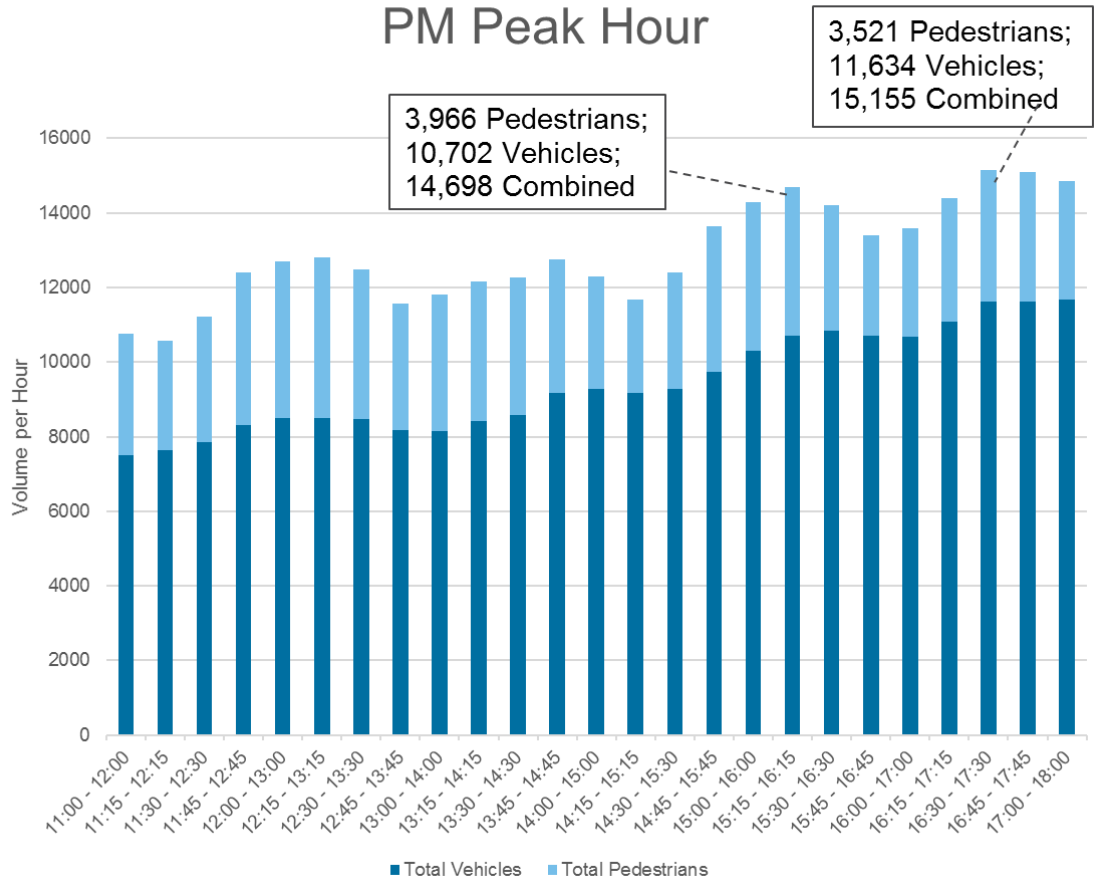


The Durham-UNH Model: Peak Hour Determination

Downtown Durham
AM Peak



Downtown Durham
PM Peak Hour



Model Calibration

- Ensures the model matches the observed traffic patterns
- Is necessary for model validity
- Uses national regional and simulation modeling standards

$$GEH = \sqrt{\frac{(ModelVolume - CountVolume)^2}{0.5 * (ModelVolume + CountVolume)}}$$

Example GEH
Calculations:

Count Volume	1000	100	10
Model Volume	500	50	5
Resulting GEH Statistic	18	6	2



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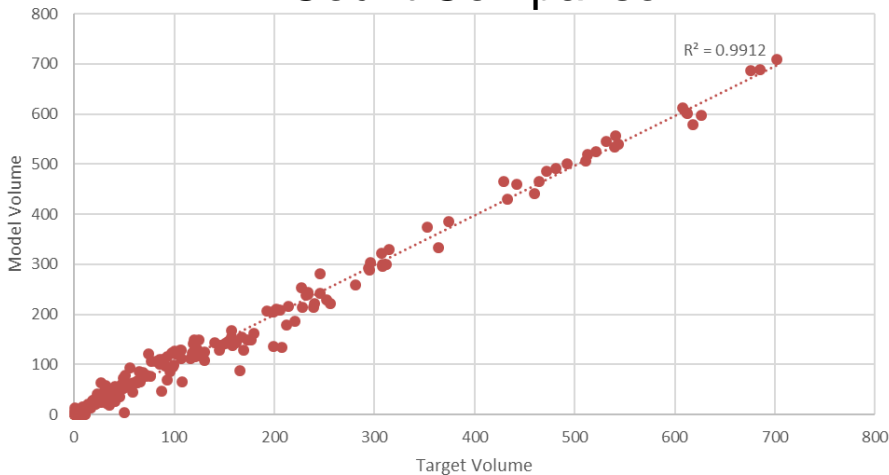
	Target	AM Model	PM Model
Root Mean Squared Error	<40%	14.3%	14.0%
Coefficient of Correlation (r)	>= 0.88	0.996	0.996
Percent Error (Region)	+/- 5%	0.2%	-0.2%
GEH <=5, by movement	>85%	98.7%	96.2%
5<GEH<=10, by movements	<=15%	1.3%	3.8%
GEH >10, by movement	0%	0.0%	0.0%



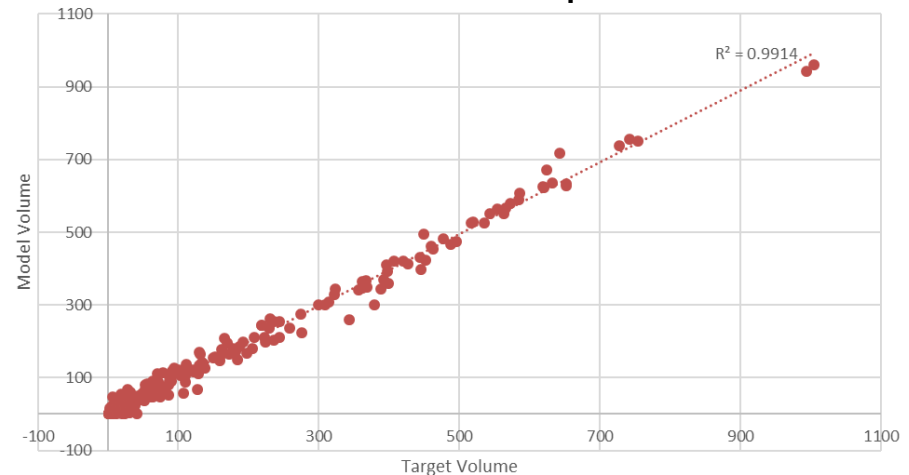
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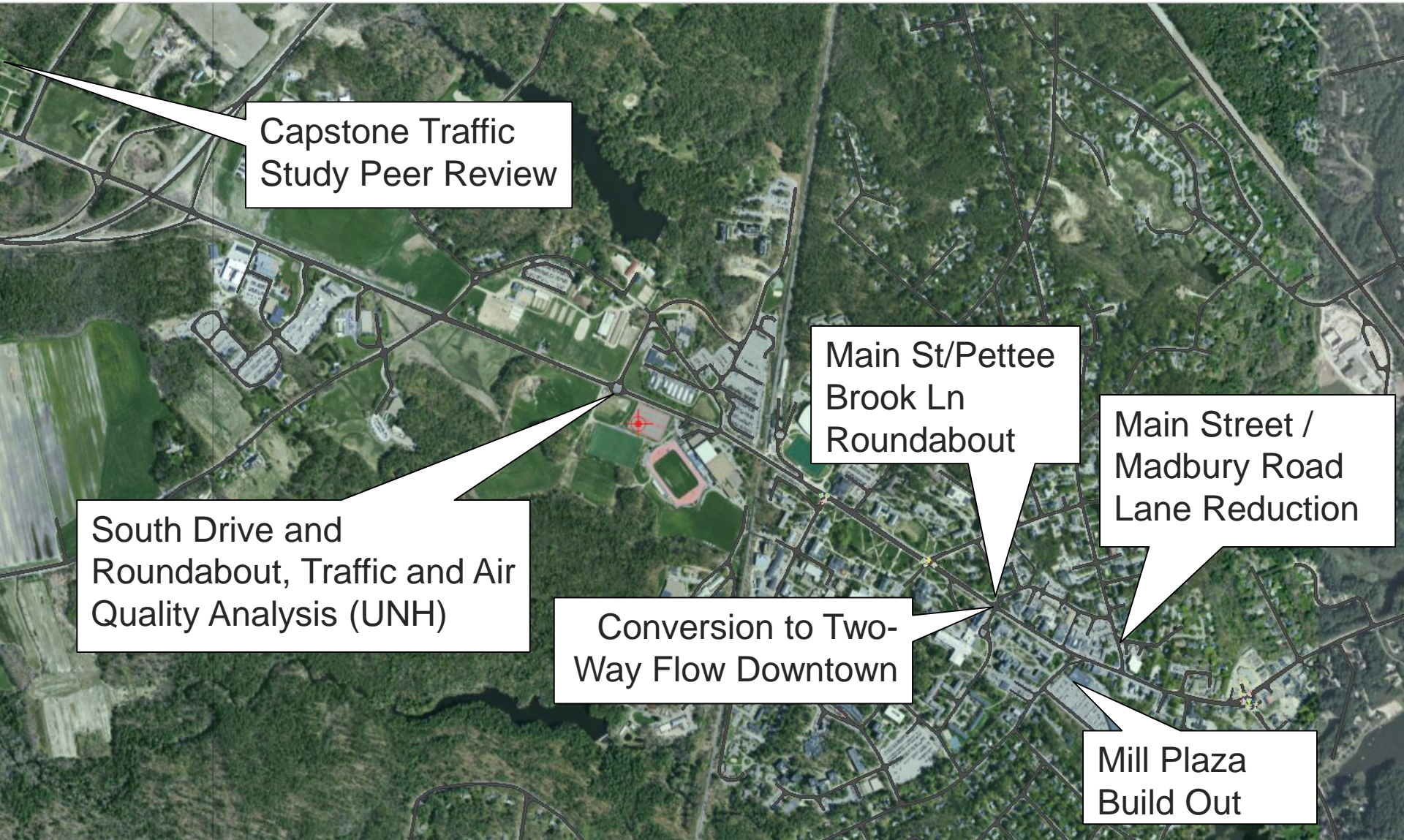
AM Count Comparison



PM Count Comparison



History of Model Applications



Capstone Traffic Study Peer Review

Main St/Pettee Brook Ln Roundabout

Main Street / Madbury Road Lane Reduction

South Drive and Roundabout, Traffic and Air Quality Analysis (UNH)

Conversion to Two-Way Flow Downtown

Mill Plaza Build Out

State-of-the-practice Tool

- Workshop on Simulation Modeling and Analysis of the Effect of Operational Strategies on Greenhouse Gas Emissions
- Workshop on Integrating MOVES with Transportation Microsimulation Models
- ACEC-NH Engineering Excellence Award
- 90th Annual Meeting of the Transportation Research Board of the National Academies

South Drive and Roundabout Traffic and Air Quality Analysis

CO2 (grams)

Scenario	CO2 (grams)
Baseline	~1000
Roundabout	~800
Roundabout + Land Use	~600

Integrated Traffic and Land Use Model For Planning and Design Durham, New Hampshire

Land Use Model Area Boundaries

Virtual 3-D Animation

Complete Streets Conversion

The Integrated Traffic-Land Use Model is an innovative tool for evaluating future land use changes and transportation improvements. The model was developed by the University of New Hampshire, the Town of Durham, and Resource Systems Group as a decision support tool for transportation planning and design.

The model is based on land uses geolocated into 64 Transportation Analysis Zones. The land uses (specified by type and size) generate traffic on the local roadway network. The model estimates network-wide response to new traffic and capacity changes, providing a dynamic, whole town view of traffic impacts.

The model contains every public street and intersection within the town, and precisely represents traffic engineering parameters such as signal timing, turn lane dimensions, intersection geometries, posted speeds, and lane widths. Traffic data was collected at 64 intersections for model calibration exceeding FHWA's national calibration standards. The model incorporates 3-D renderings of existing and proposed buildings, enhancing its value as a visualization tool in public meetings and hearings.

In 2011 the modeling system was used to evaluate the traffic impacts of three development proposals and to assess alternative downtown circulation designs. The model was also used to evaluate the traffic response to a new roundabout and proposed connector road at the intersection of Main Street with South Drive. The model has been a test bed for an exciting new linkage with the EPA's MOVES mobile emissions model. This work has received national attention with several presentations to the Transportation Research Board.

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R.S.G. IN C.
RESOURCE SYSTEMS GROUP, INC.

Discussion

- Questions about the model development or design?
- Future model applications?





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