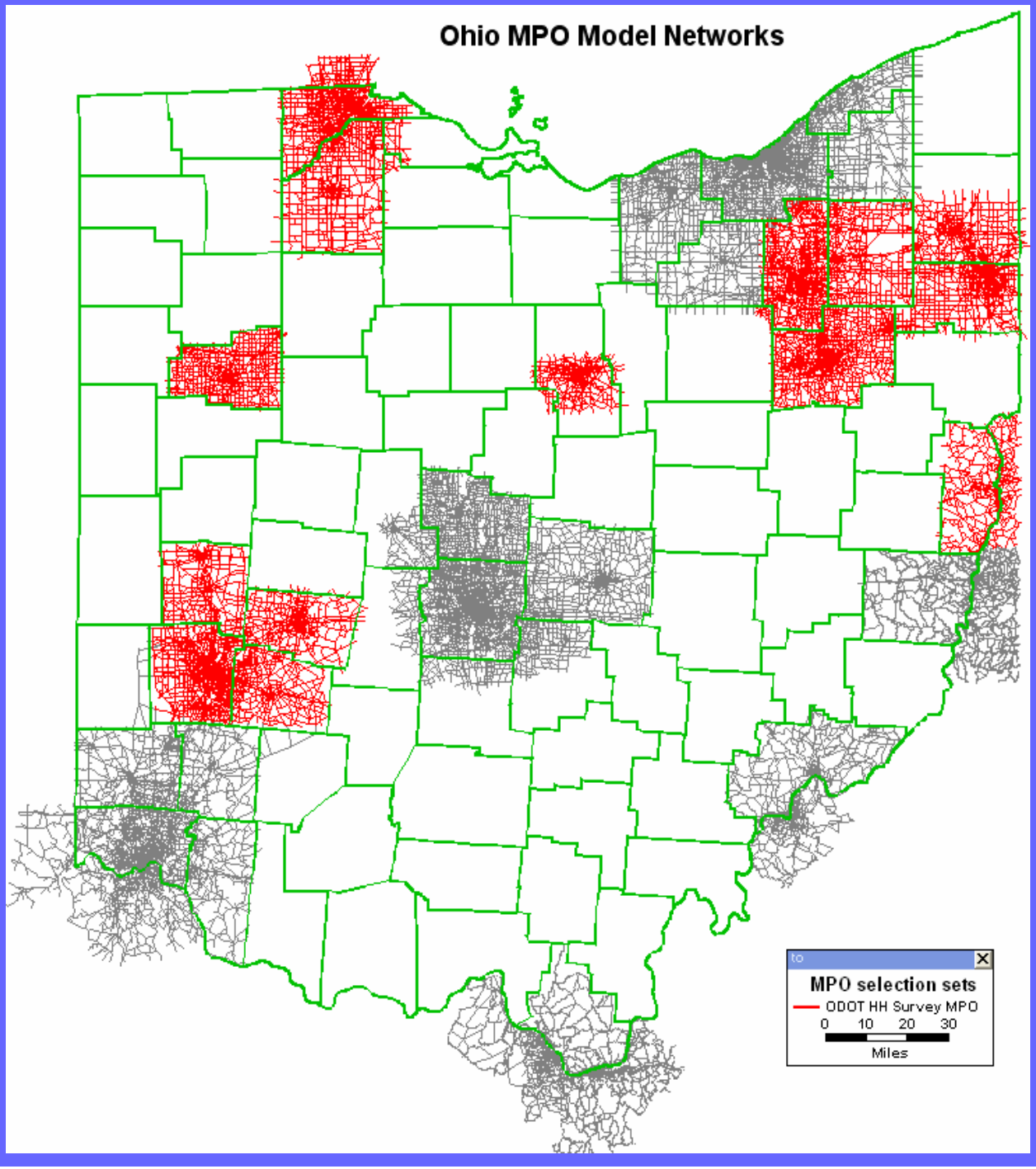
Introduction

- Organization of the Modeling & Forecasting Section
- Services and Products
- New Developments


Ohio MPO Model Networks
MPO selection sets
ODOT HH Survey MPO
0 10 20 30
Miles

The Modeling & Forecasting Team

Rebekah Anderson, 752-5735-Model support (MORPC, MVRPC, LCATS, OKI), Statewide model

Nino Brunello, 752-5742 - Model support(BHJ, ECOG, AMATS, SCATS, NOACA), Special studies, Air Quality.

Mark Byram, 466-7825 – Administration, Software development, Air Quality

Greg Giaimo, 752-5738 –Methodology development, Model support (CCSTS, LACRPC, RCRPC, TMACOG), Surveys, Statewide Model, Special studies, Model Development

Sam Granato, 644-6796 - Statewide Model, QRSII model support (ECRPC, HAITS, WWW, BOMTS).

Bryan Raderstorf, 752-5736 - Model Support for Design Traffic, Special Studies, Traffic Operations Modeling

Becky Salak, 644-8195- Certified traffic for projects, GIS/mapping support.

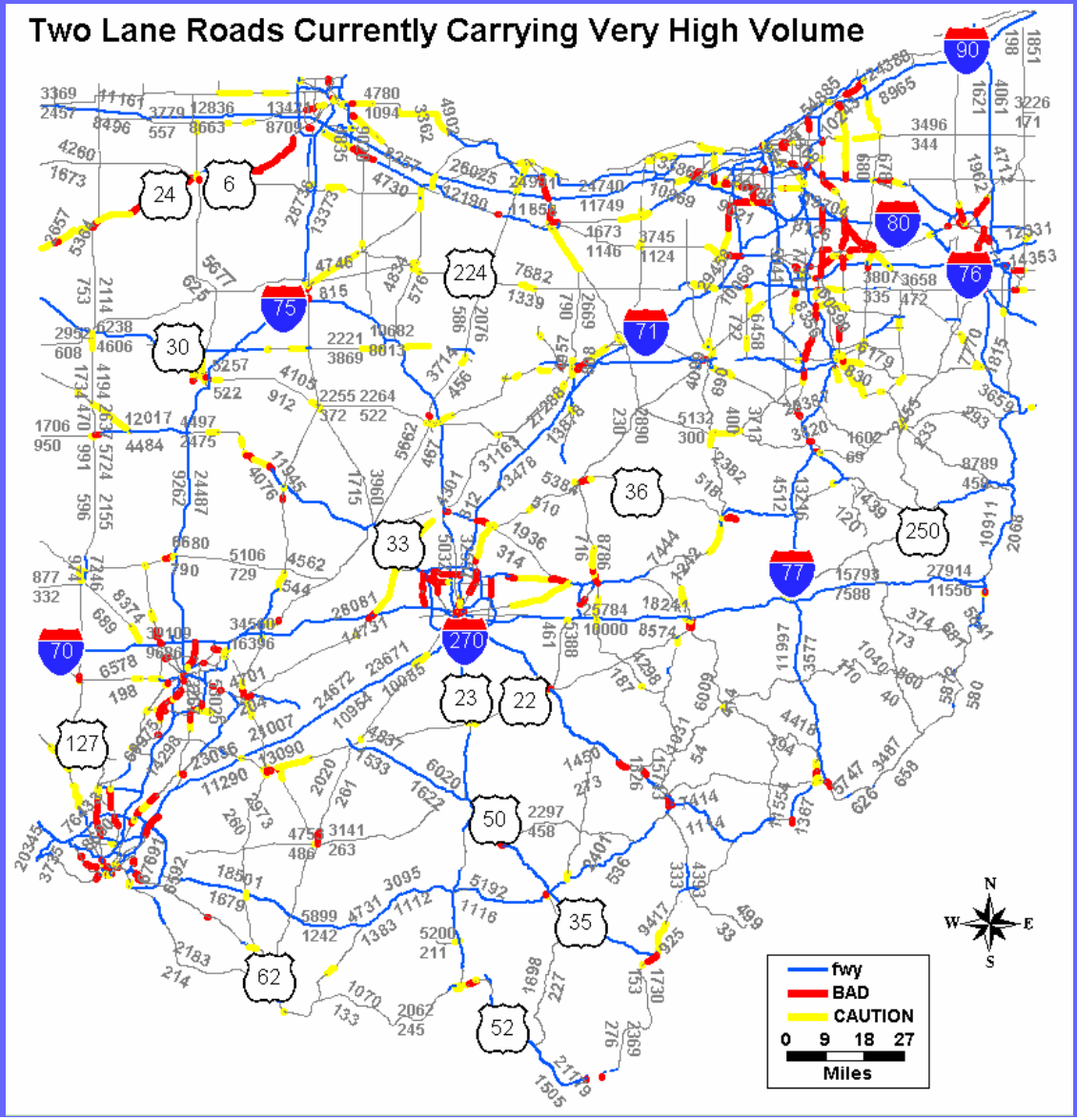
Services & Products

- Major investment studies
- Forecast traffic for pollution emissions. MPO long range plans and TIPs.
- Project ranking
- Interchange justification studies
- Study traffic impact of changes in land use and development.
- Study traffic impacts of new roadways or closing roadways (diversion)
- Road user benefit analysis

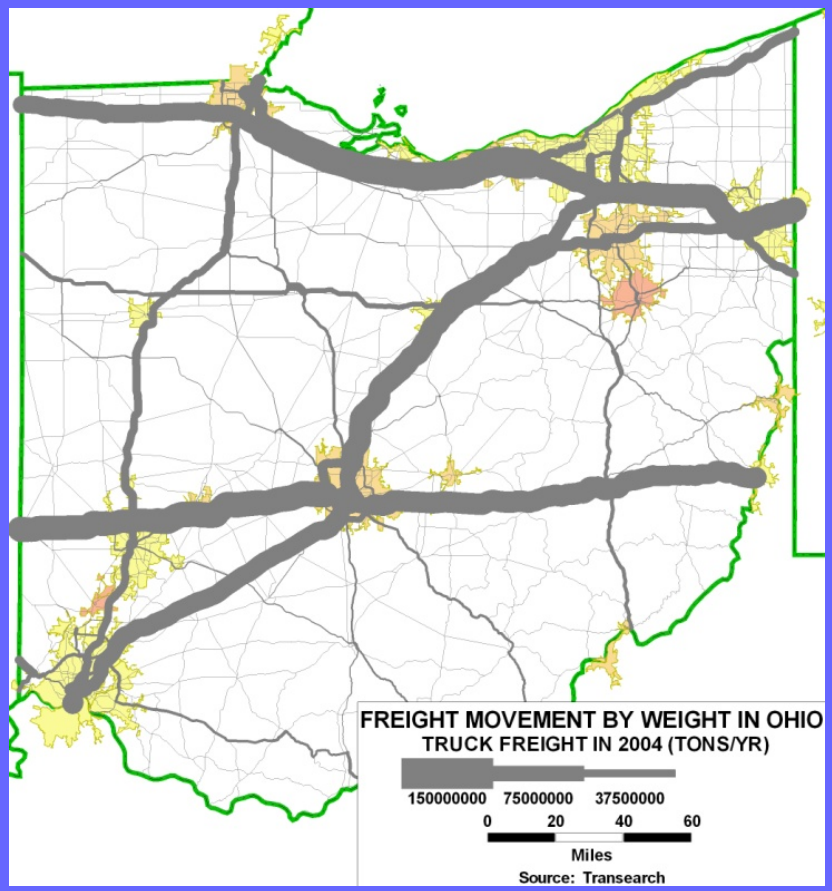
Services & Products

- Evaluate HOV lanes
- Congestion Management System
- Assist with MPO long range plan development
- Environmental Justice
- Evaluate bypasses
- Transit route planning
- Provide input for microsimulation models
- Provide "certified" opening and design year traffic for ODOT projects.

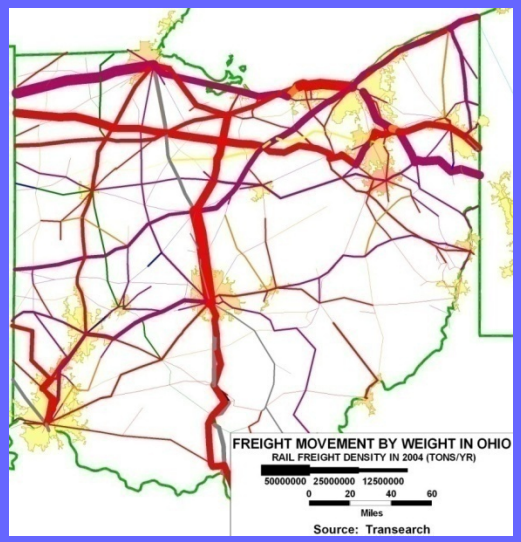
Forecast Volumes



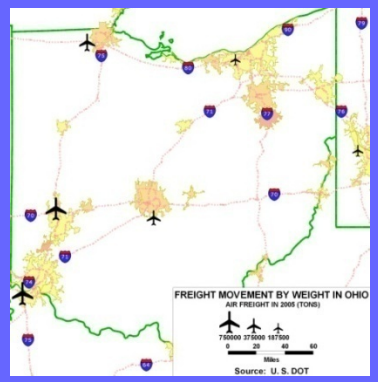
Freight Flows



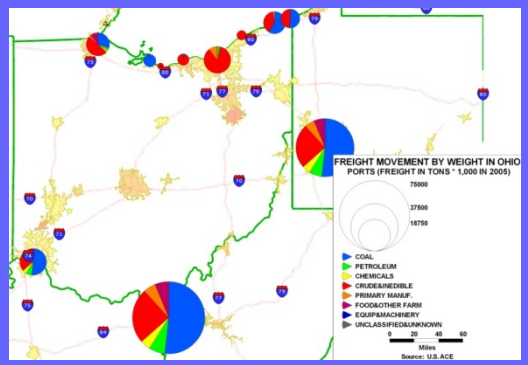
Truck



Rail



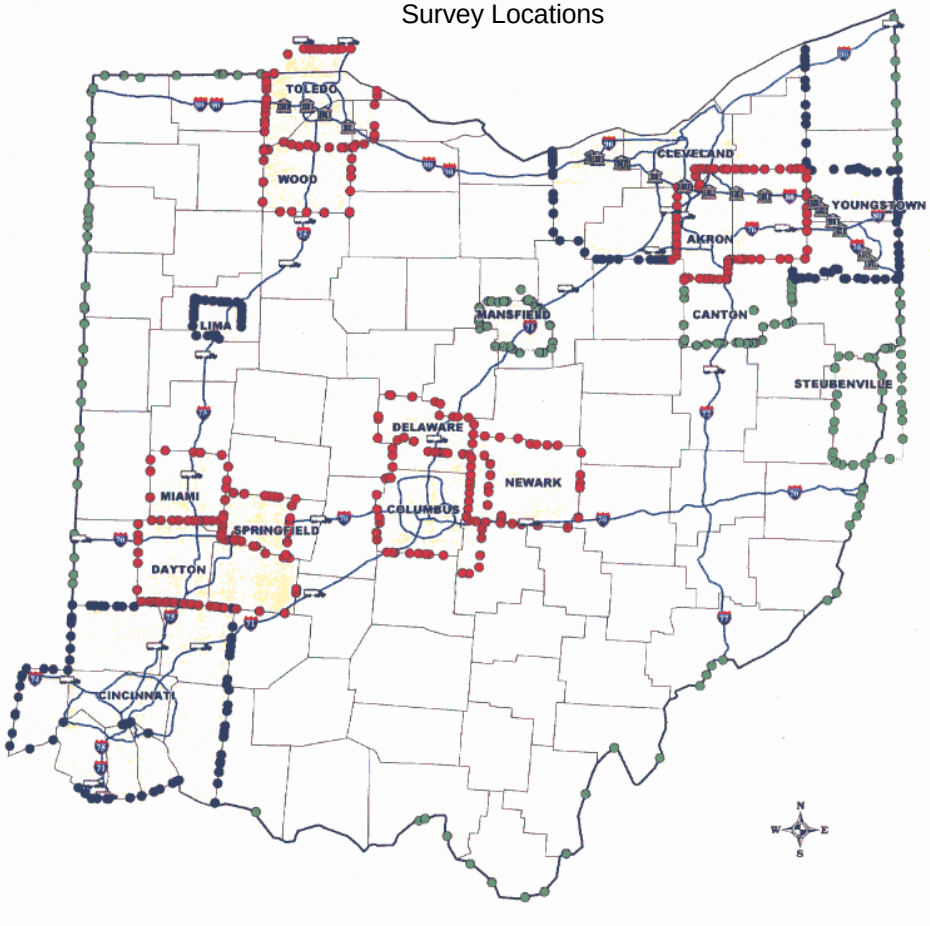
Air



Water

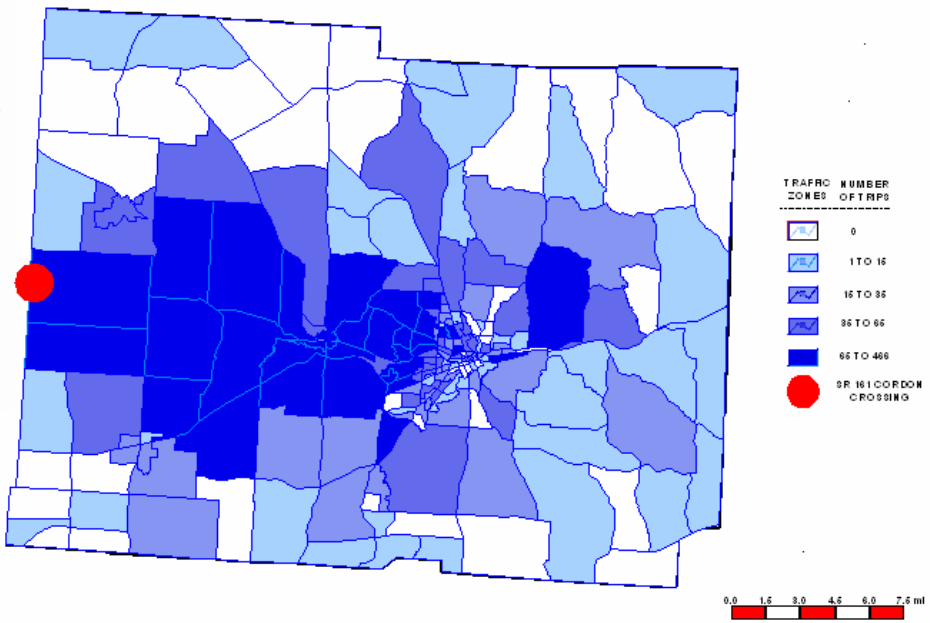
MPO Cordon Surveys

Survey Locations



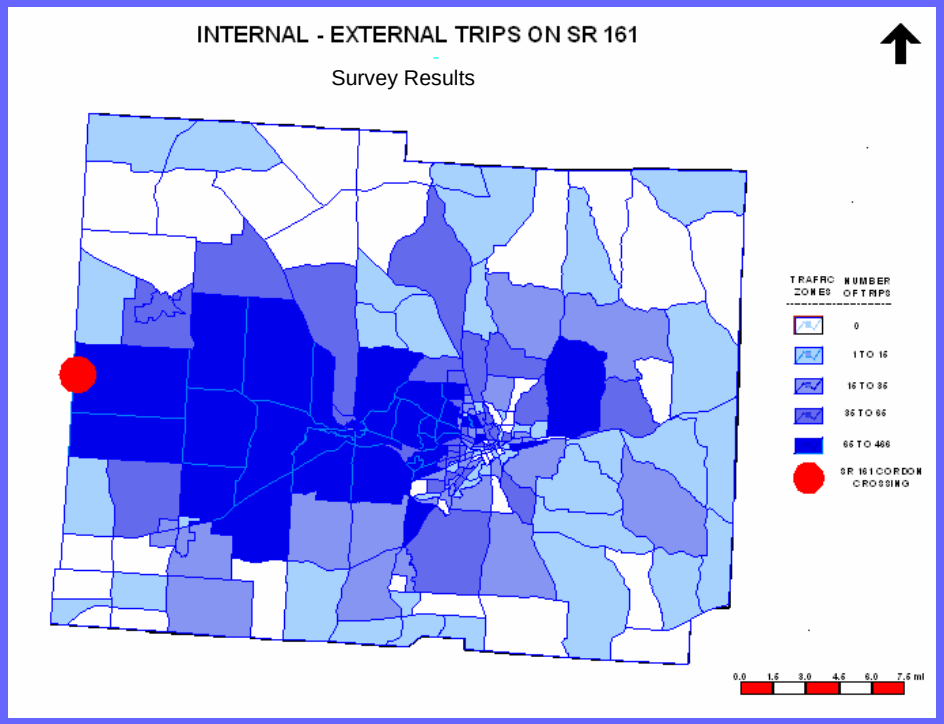
INTERNAL - EXTERNAL TRIPS ON SR 161

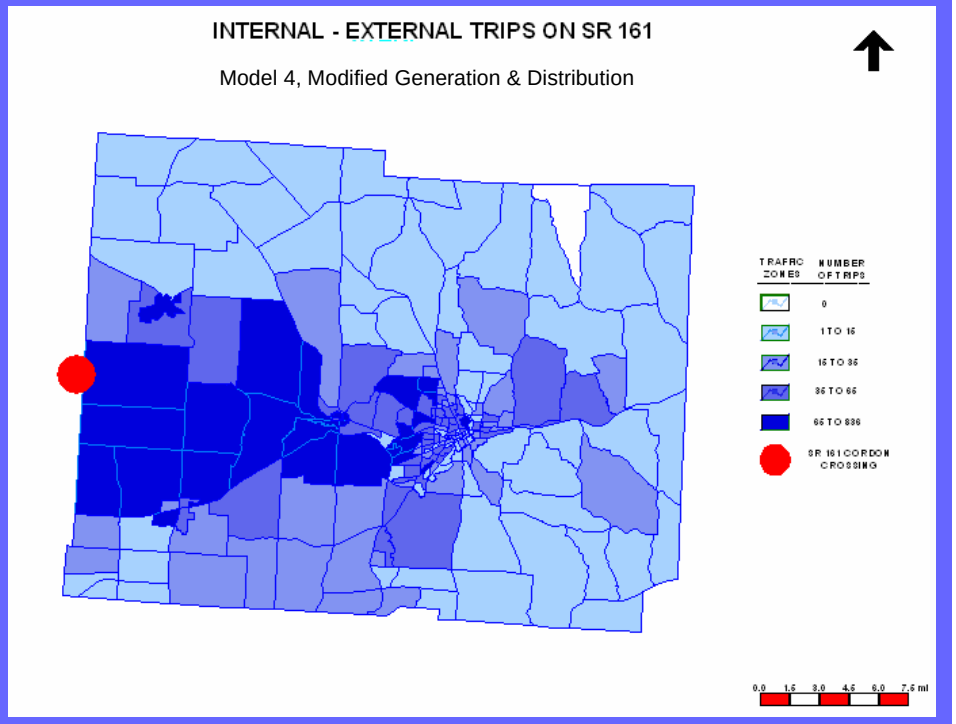
Survey Results



External Model Development

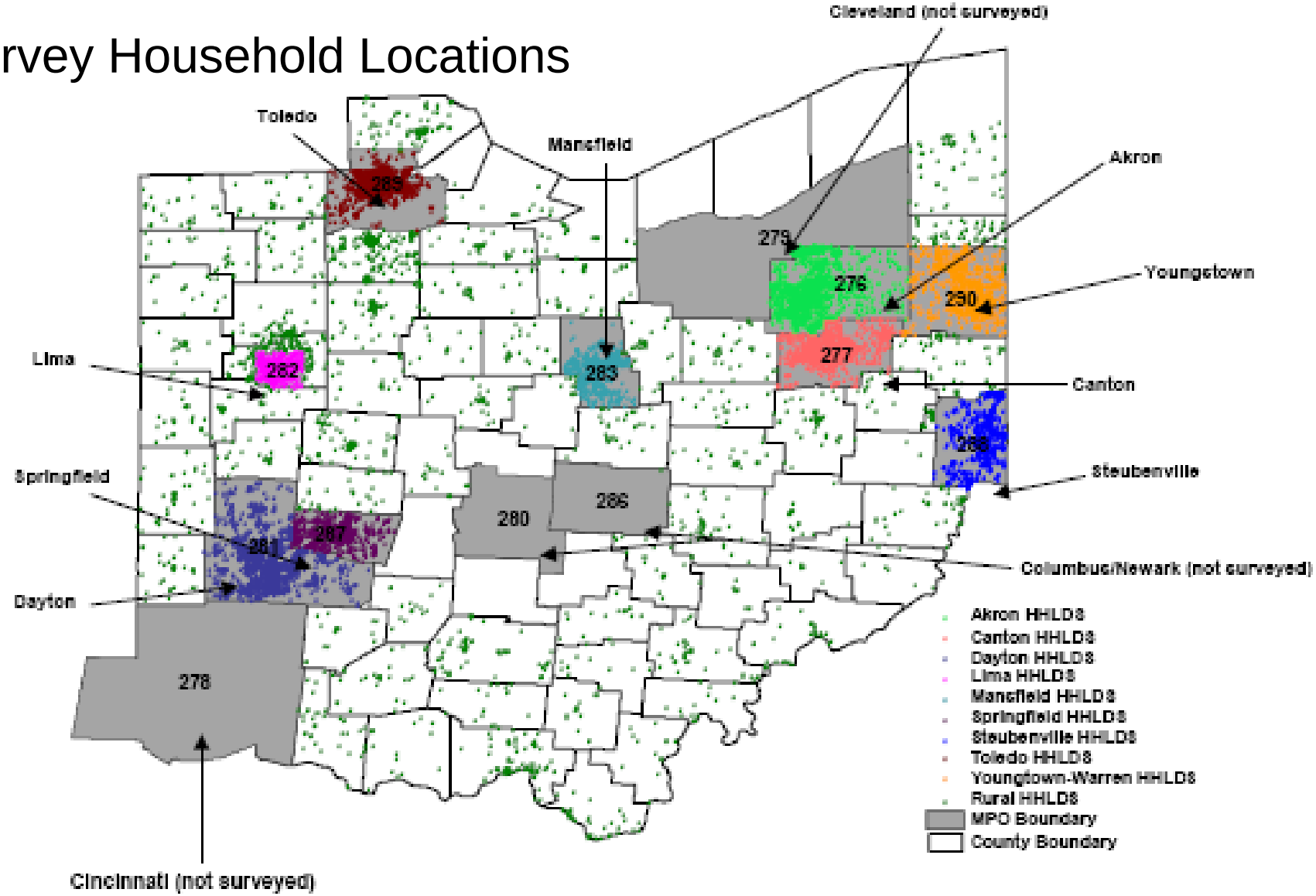
- Much time spent by ODOT on this aspect of models
- Built from roadside origin-destination surveys



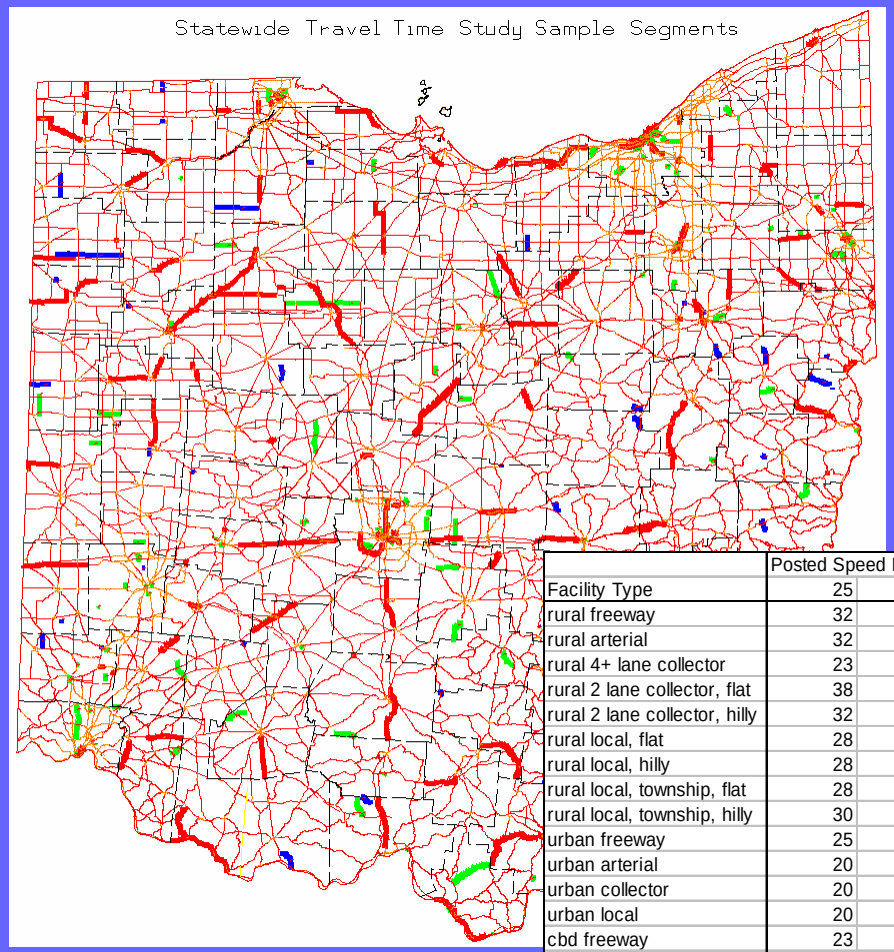


MPO Household Surveys

Survey Household Locations



Travel Time Studies

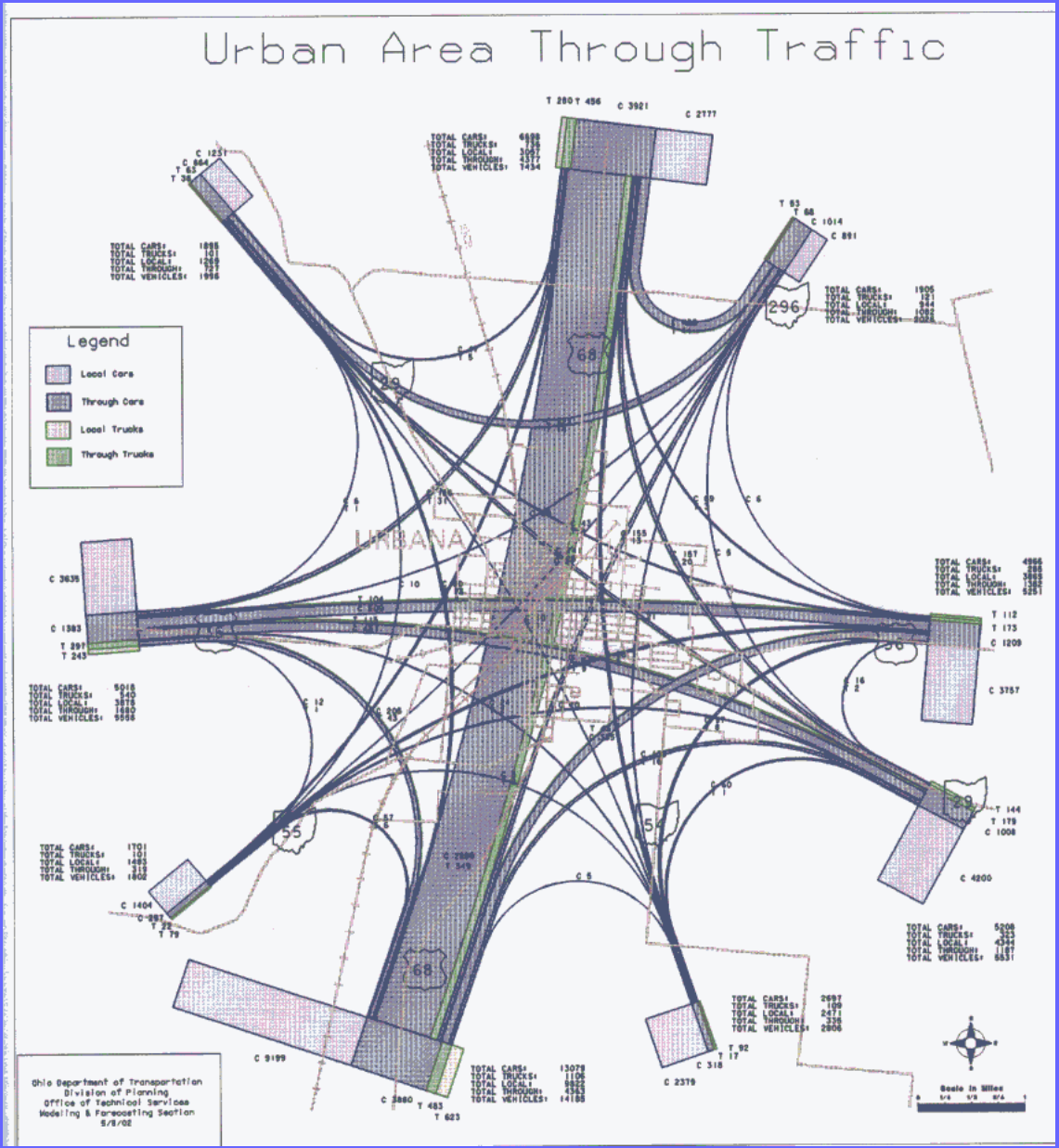


- Develop travel time relationships for models
- Site specific studies for projects

	Posted Speed Limit								
Facility Type	25	30	35	40	45	50	55	60	65
rural freeway	32	37	42	45	48	51	54	59	64
rural arterial	32	37	42	45	48	51	54	59	0
rural 4+ lane collector	23	28	33	38	43	48	53	59	0
rural 2 lane collector, flat	38	39	41	43	45	46	48	59	0
rural 2 lane collector, hilly	32	34	36	39	41	44	46	59	0
rural local, flat	28	32	35	38	41	44	47	59	0
rural local, hilly	28	32	35	36	36	37	37	59	0
rural local, township, flat	28	32	35	38	40	40	40	59	0
rural local, township, hilly	30	30	30	30	30	30	30	59	0
urban freeway	25	30	35	40	45	48	53	58	63
urban arterial	20	24	28	32	36	40	44	58	0
urban collector	20	24	28	32	36	40	44	58	0
urban local	20	24	25	30	35	40	44	58	0
cbd freeway	23	28	33	35	40	42	47	53	60
cbd arterial	19	22	26	29	33	38	43	53	0
cbd collector	19	21	22	24	25	30	35	53	0
cbd local	12	12	12	15	20	30	35	53	0
rural ramp	40	40	40	40	40	40	40	53	0
urban ramp	39	39	39	39	39	39	39	53	0

Bypass Studies

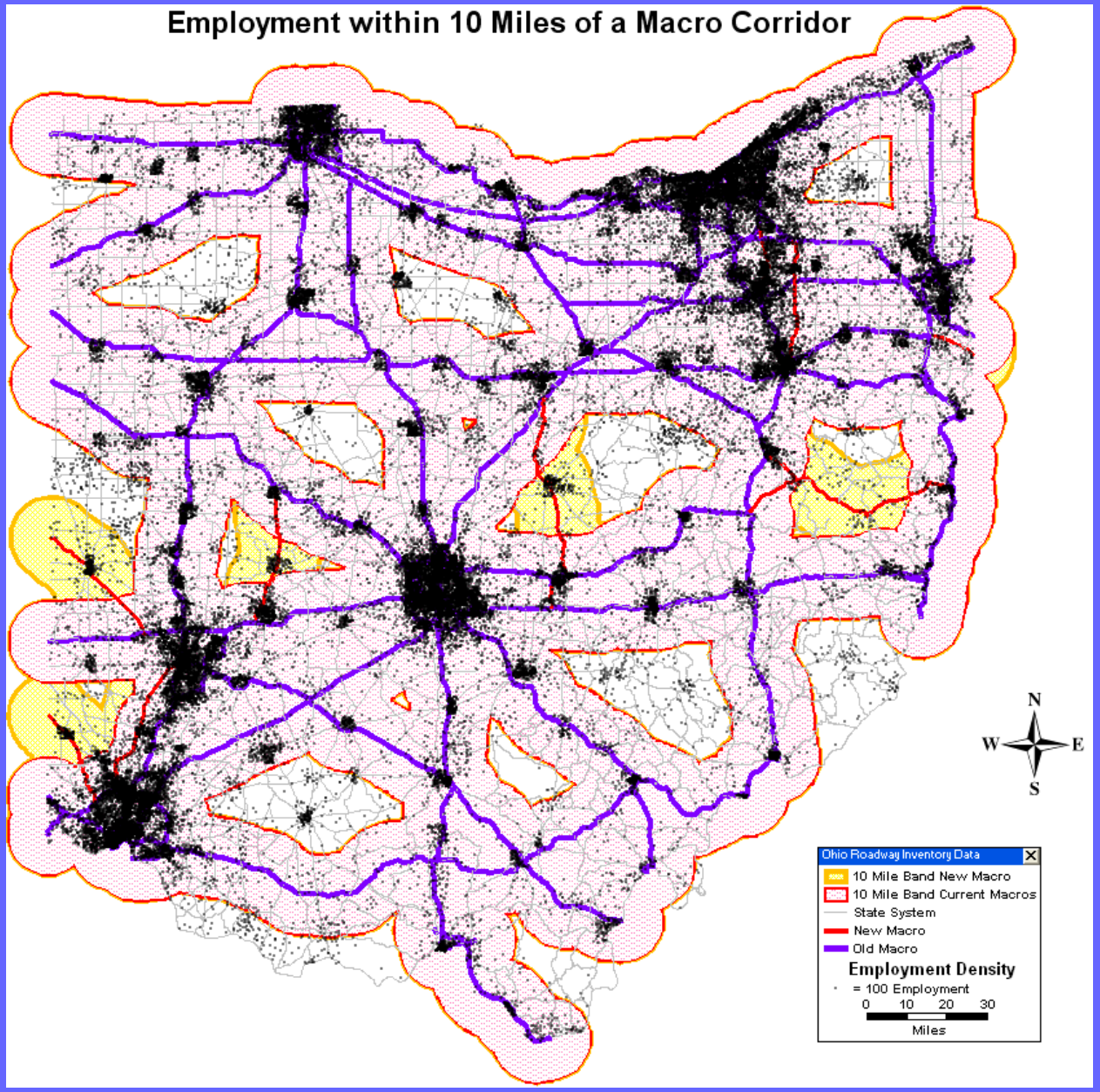
Urbana



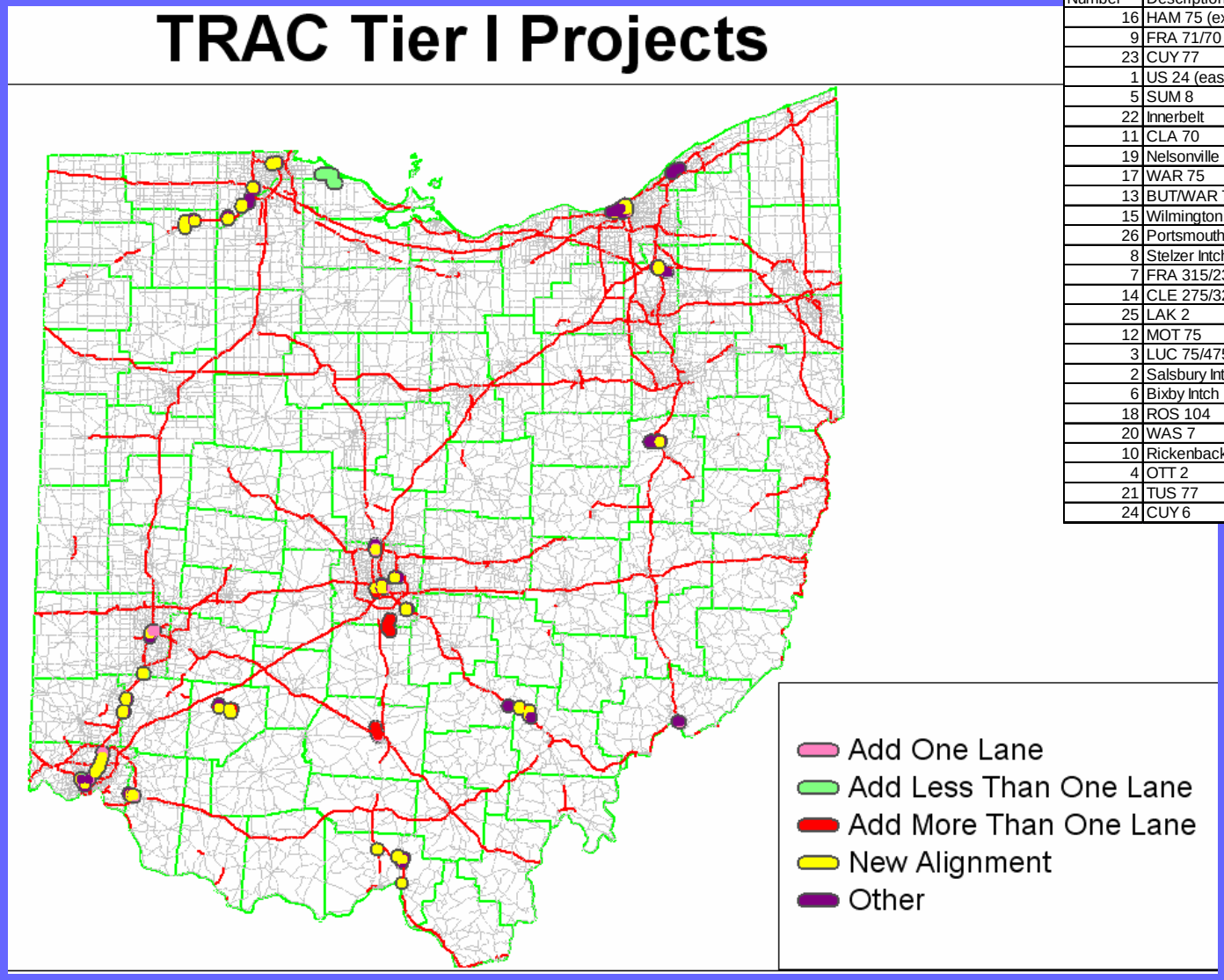
General Bypass Study Process

- Existing Conditions
- Origin/Destination Survey
- Traffic Counts
- Inventory of Traffic Impediments
- Travel Time/Delay Study
- Level of Service Analysis
- Accident Study

Corridor Prioritization



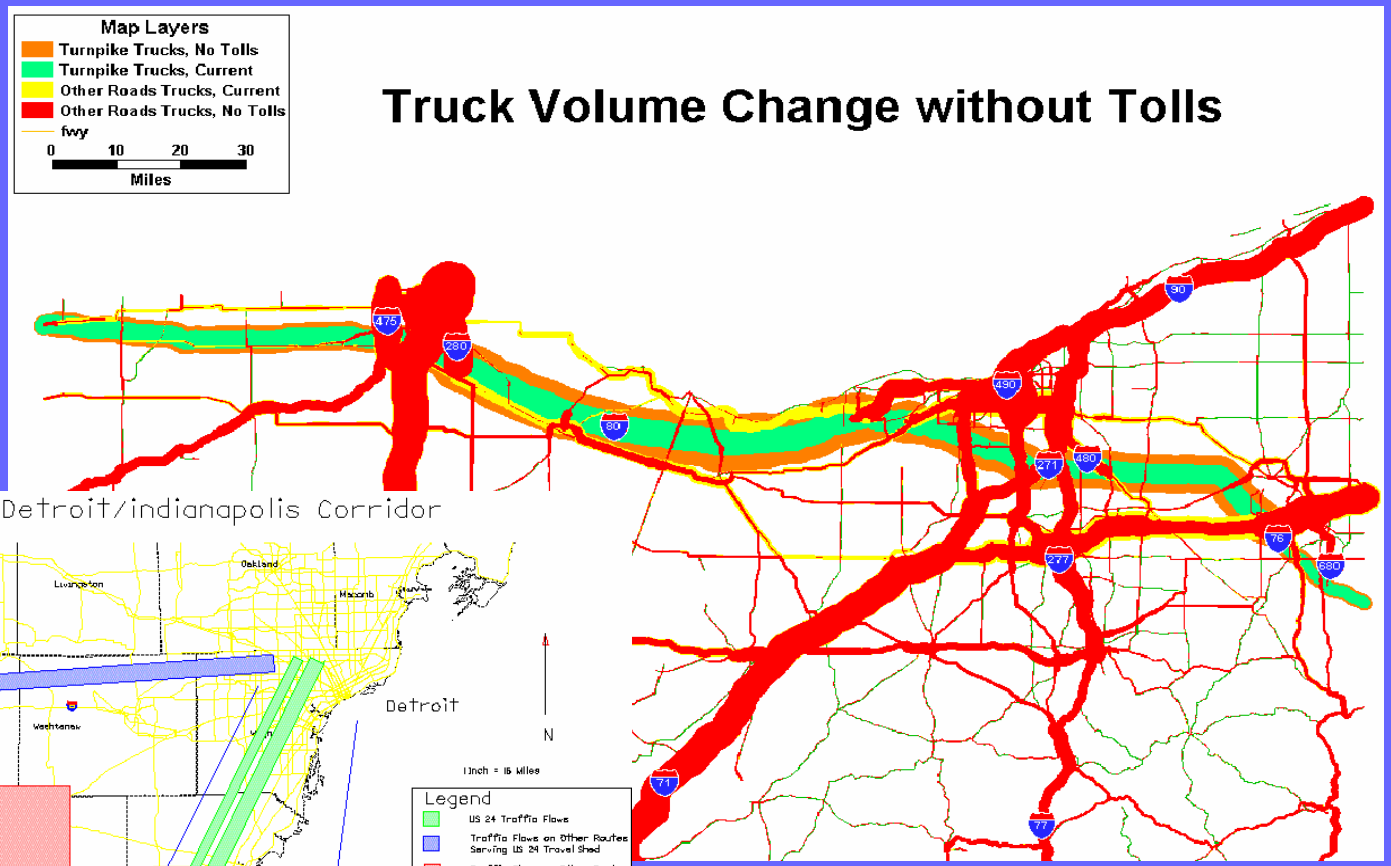
Project Prioritization

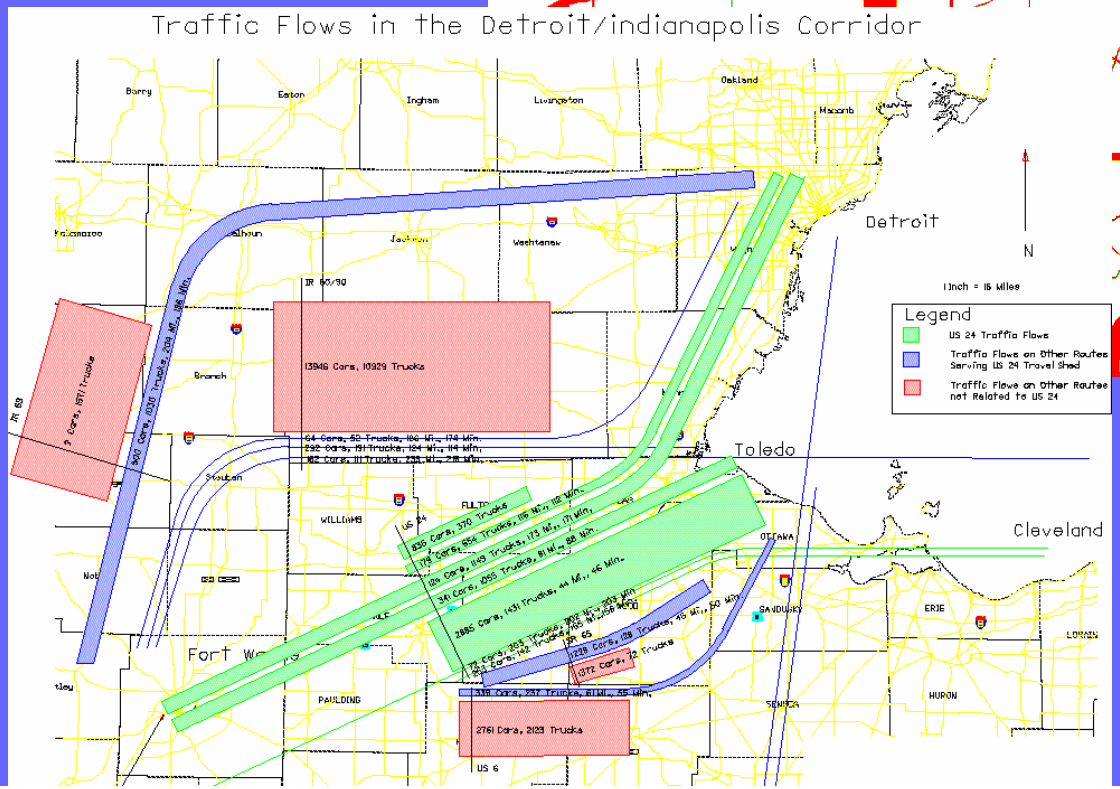


Project Number	Project Description	Project Benefits
16	HAM 75 (excl. BSB)	$1,100,331,431
9	FRA 71/70	$956,466,312
23	CUY 77	$912,827,463
1	US 24 (east 1/3 only	$676,360,955
5	SUM 8	$586,975,542
22	Innerbelt	$457,529,189
11	CLA 70	$422,564,201
19	Nelsonville Byp	$369,285,259
17	WAR 75	$305,840,158
13	BUT/WAR 75	$286,008,080
15	Wilmington Byp	$251,283,357
26	Portsmouth Byp	$243,949,486
8	Stelzer Intch	$235,830,465
7	FRA 315/23	$198,432,505
14	CLE 275/32	$188,533,864
25	LAK 2	$178,127,333
12	MOT 75	$163,870,500
3	LUC 75/475	$129,729,725
2	Salsbury Intch	$77,331,836
6	Bixby Intch	$45,957,909
18	ROS 104	$25,203,480
20	WAS 7	$17,609,446
10	Rickenbacker	$16,967,915
4	OTT 2	$15,266,360
21	TUS 77	$4,222,174
24	CUY 6	-$327,705,331

Corridor Studies

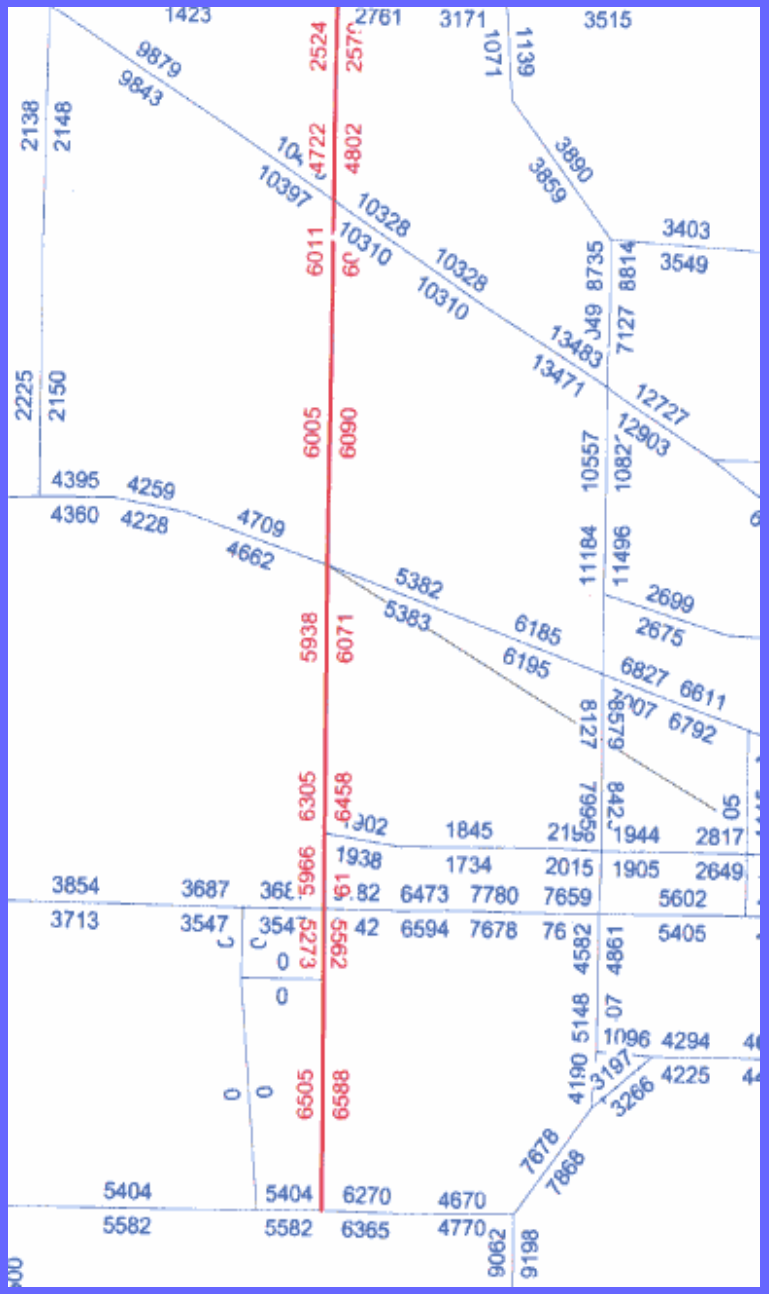
In rural areas





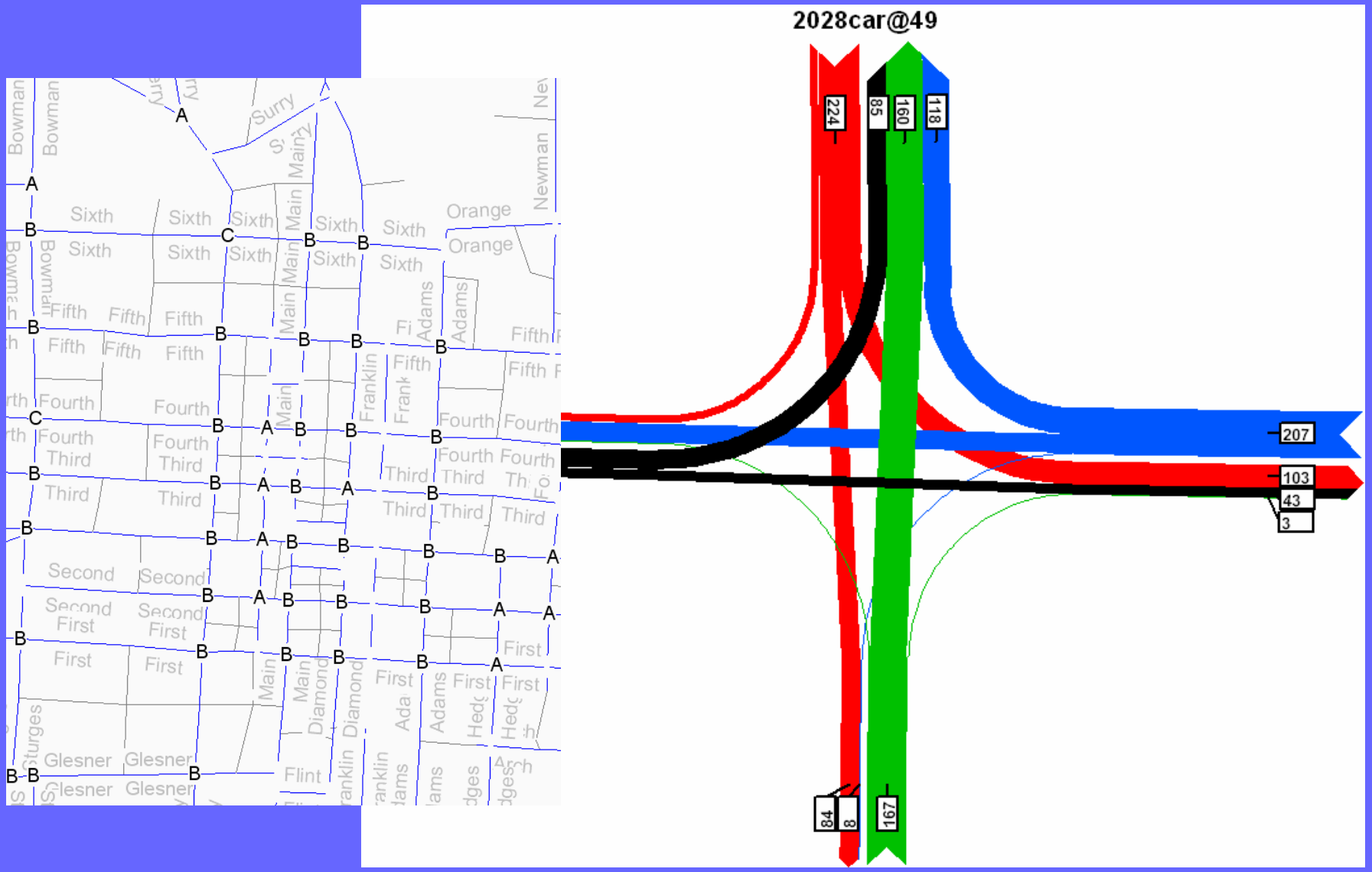
Corridor Studies

In MPO

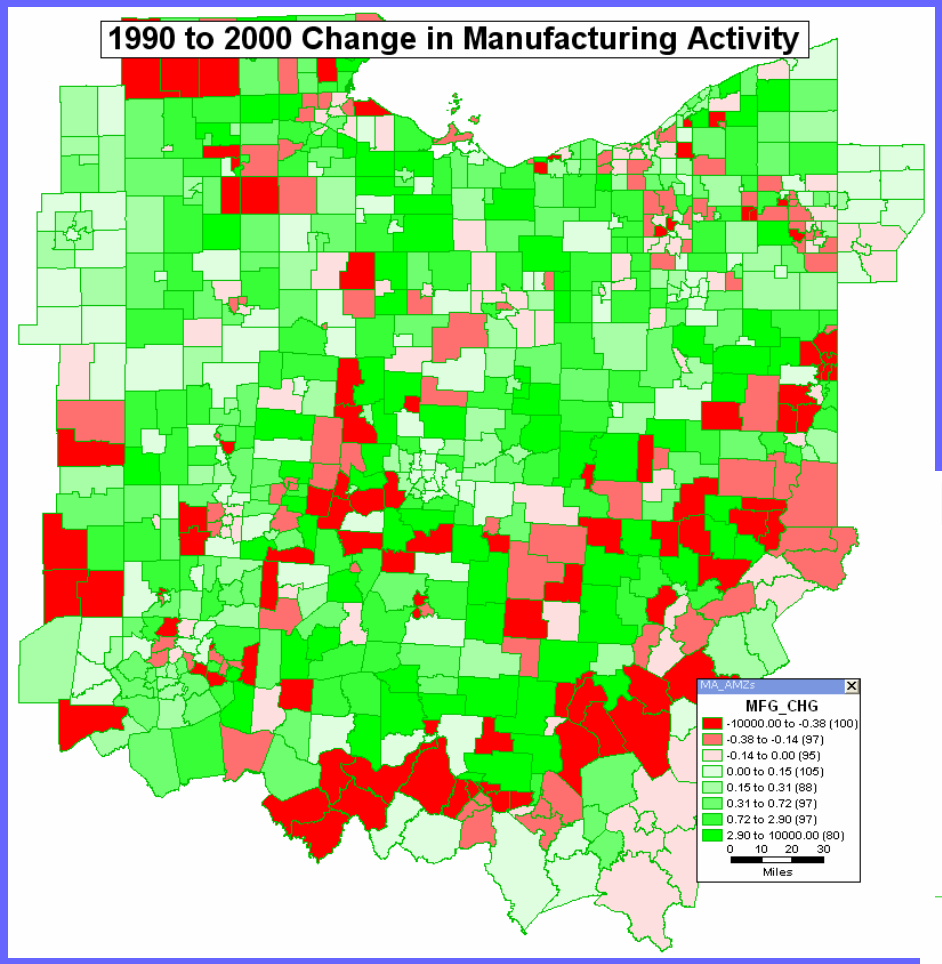


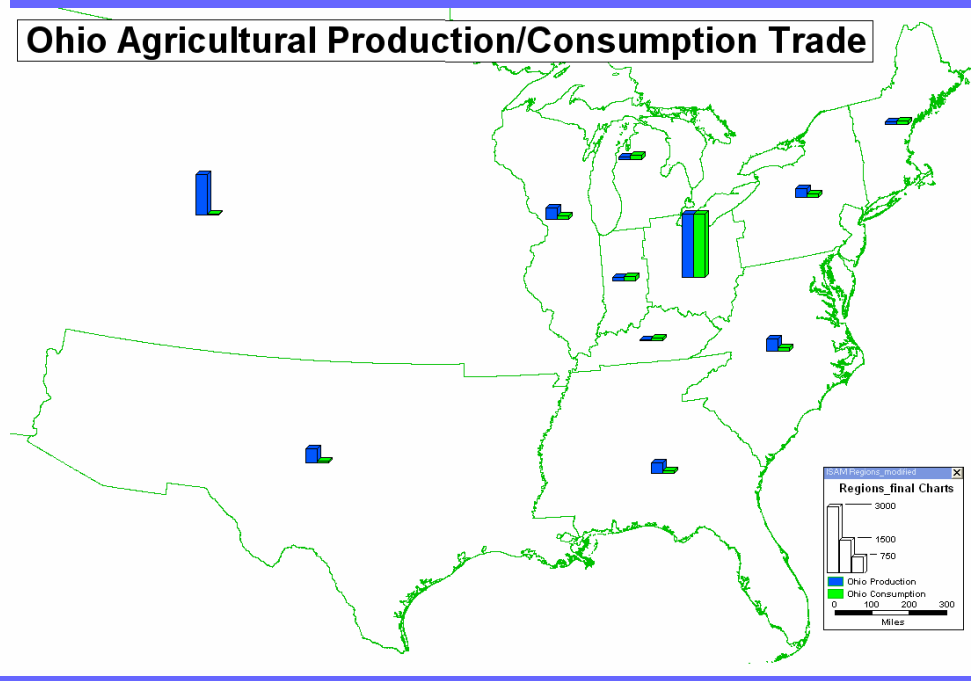
Eastown Road

Operational Level Analysis

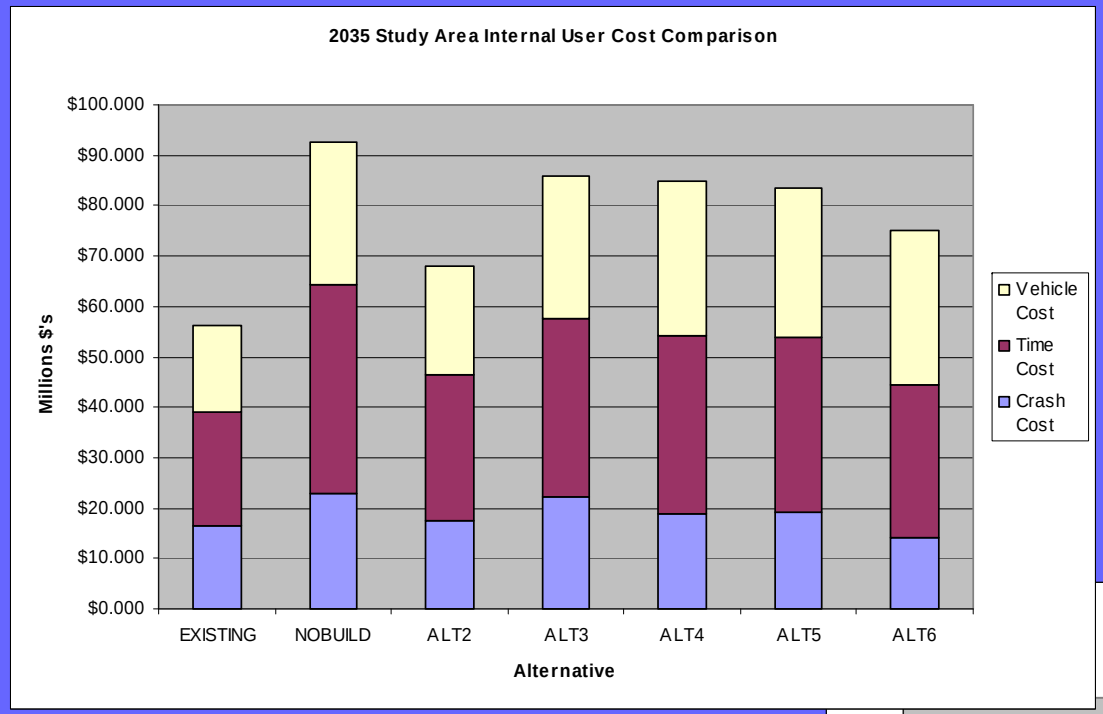


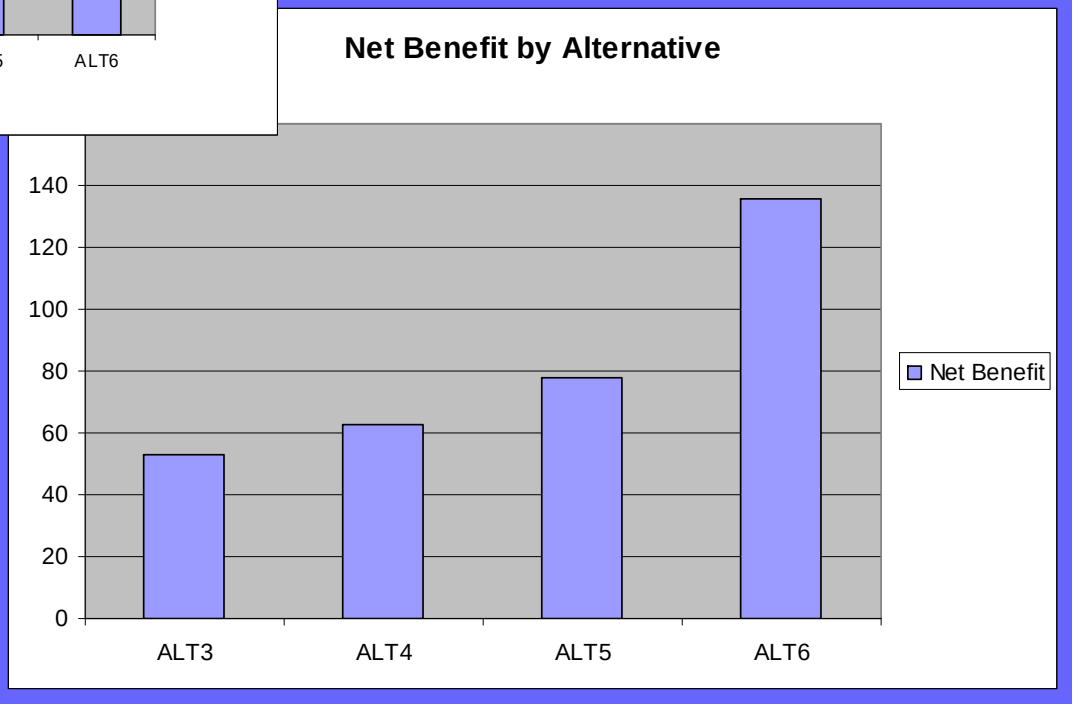
Economic Analysis



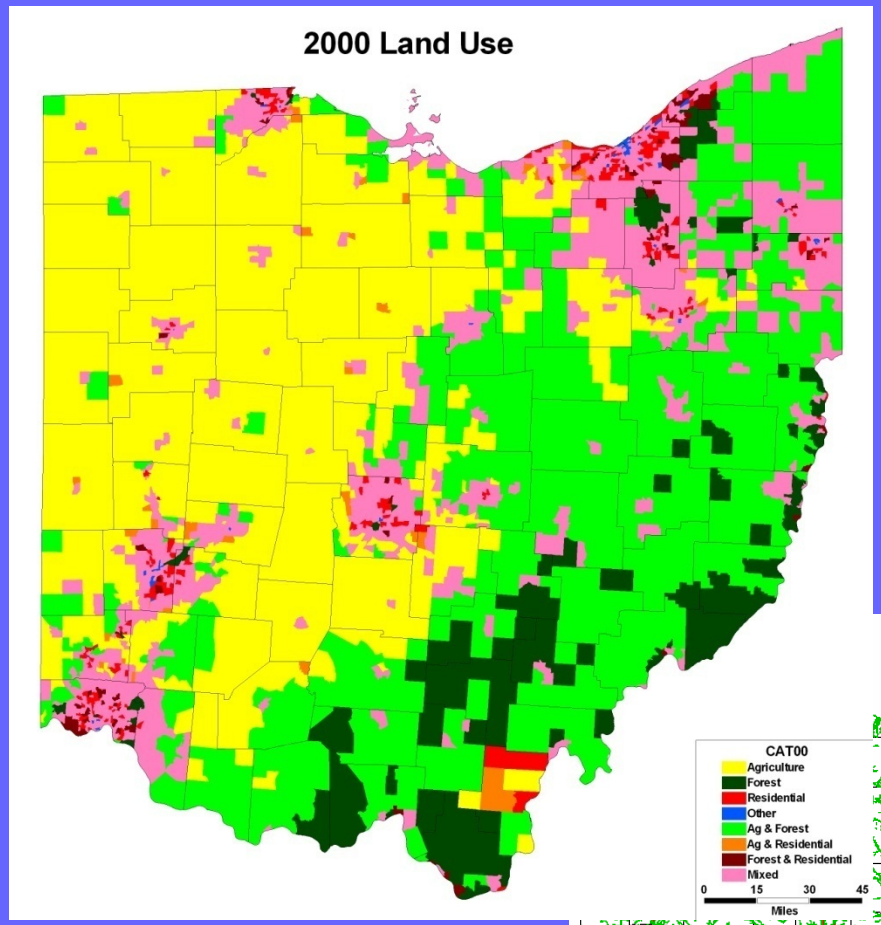


User Benefits

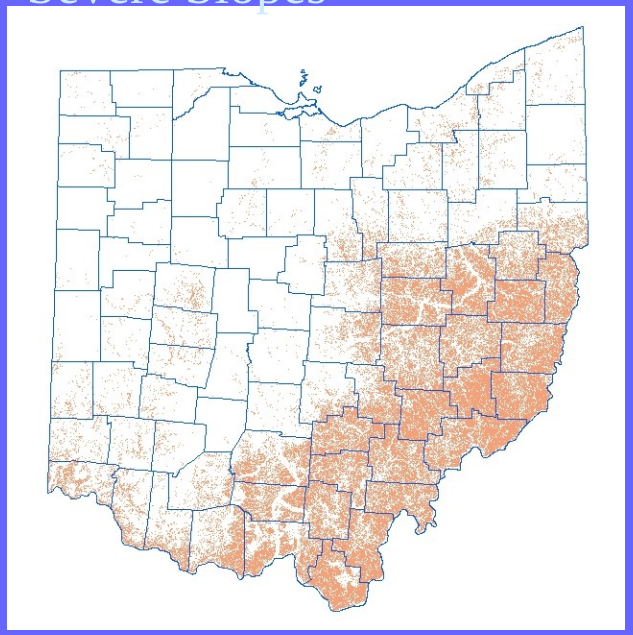




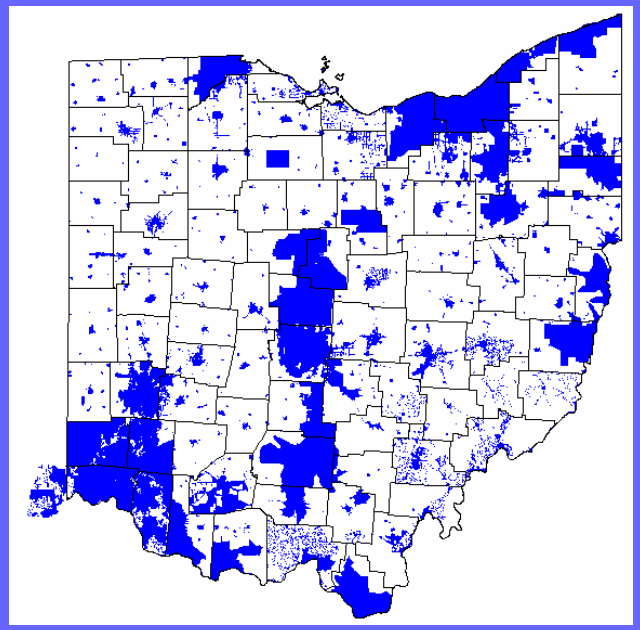
Land Use Analysis

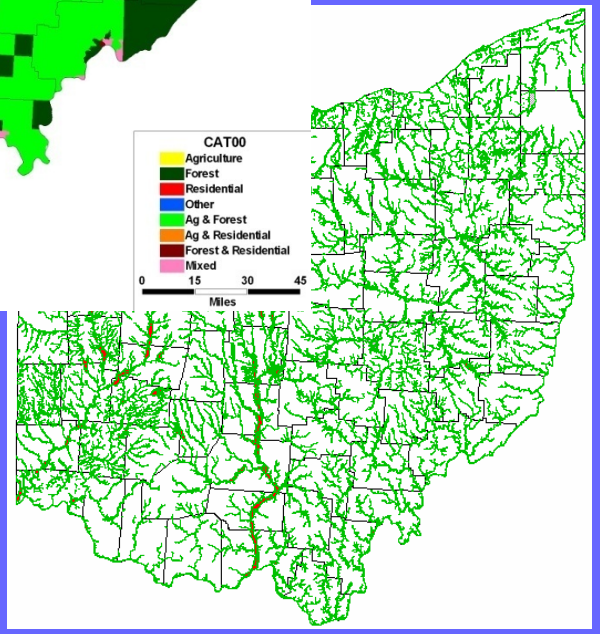


Severe Slopes



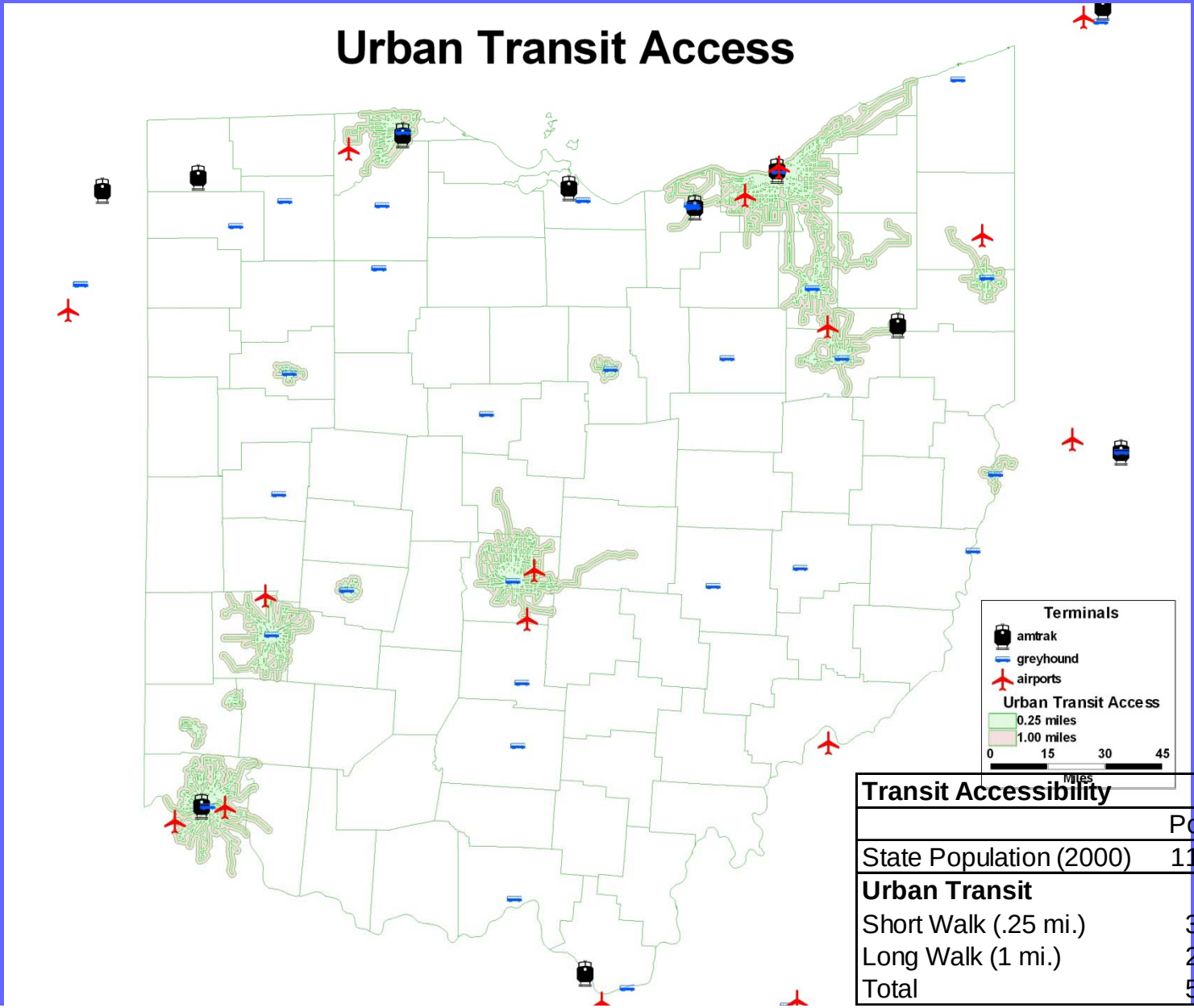
Water Service Areas





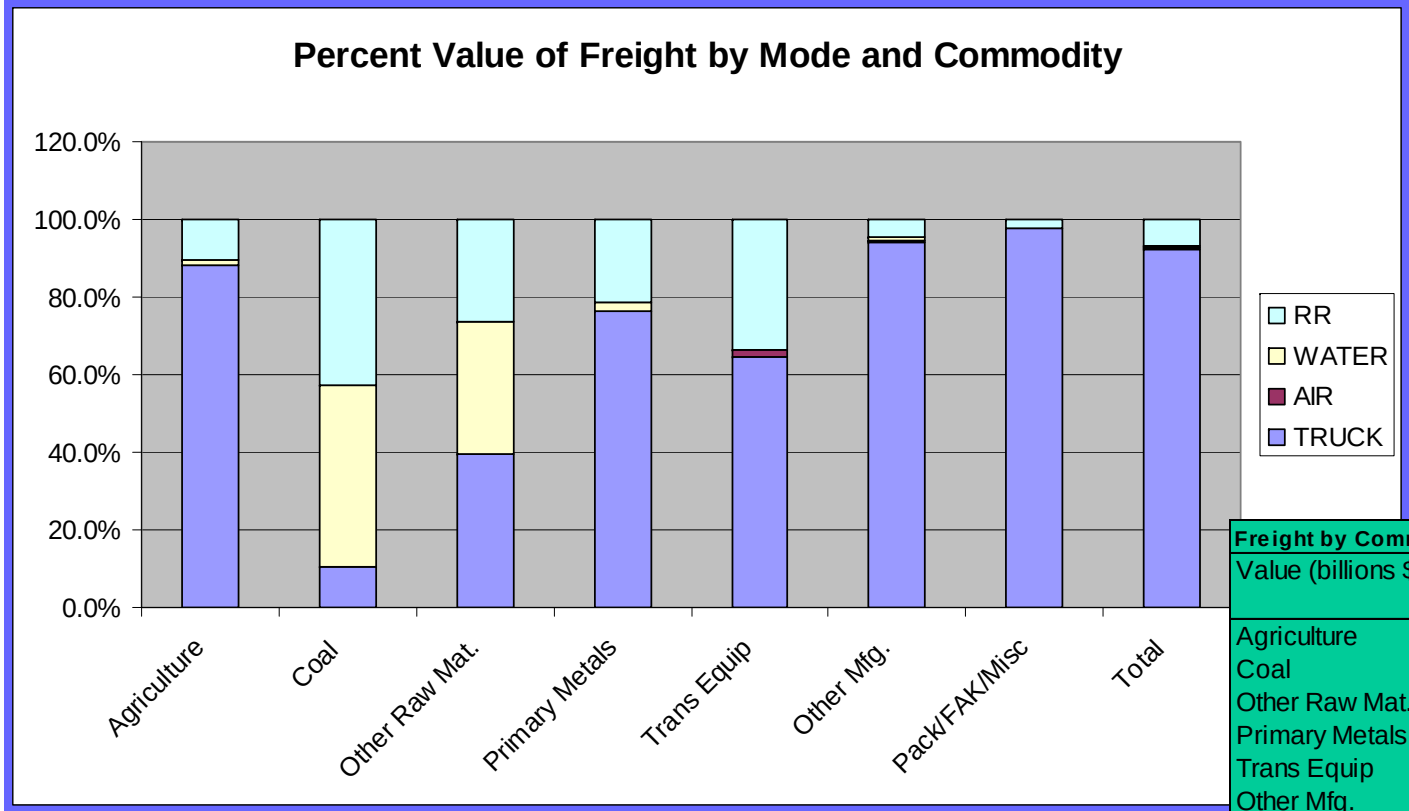
Flood Plains

Accessibility Analysis



Transit Accessibility		
	Population	Percent
State Population (2000)	11353140	
Urban Transit		
Short Walk (.25 mi.)	3921307	34.5%
Long Walk (1 mi.)	2037710	17.9%
Total	5959017	52.5%

Modal Analysis/ Freight



Freight by Commodity

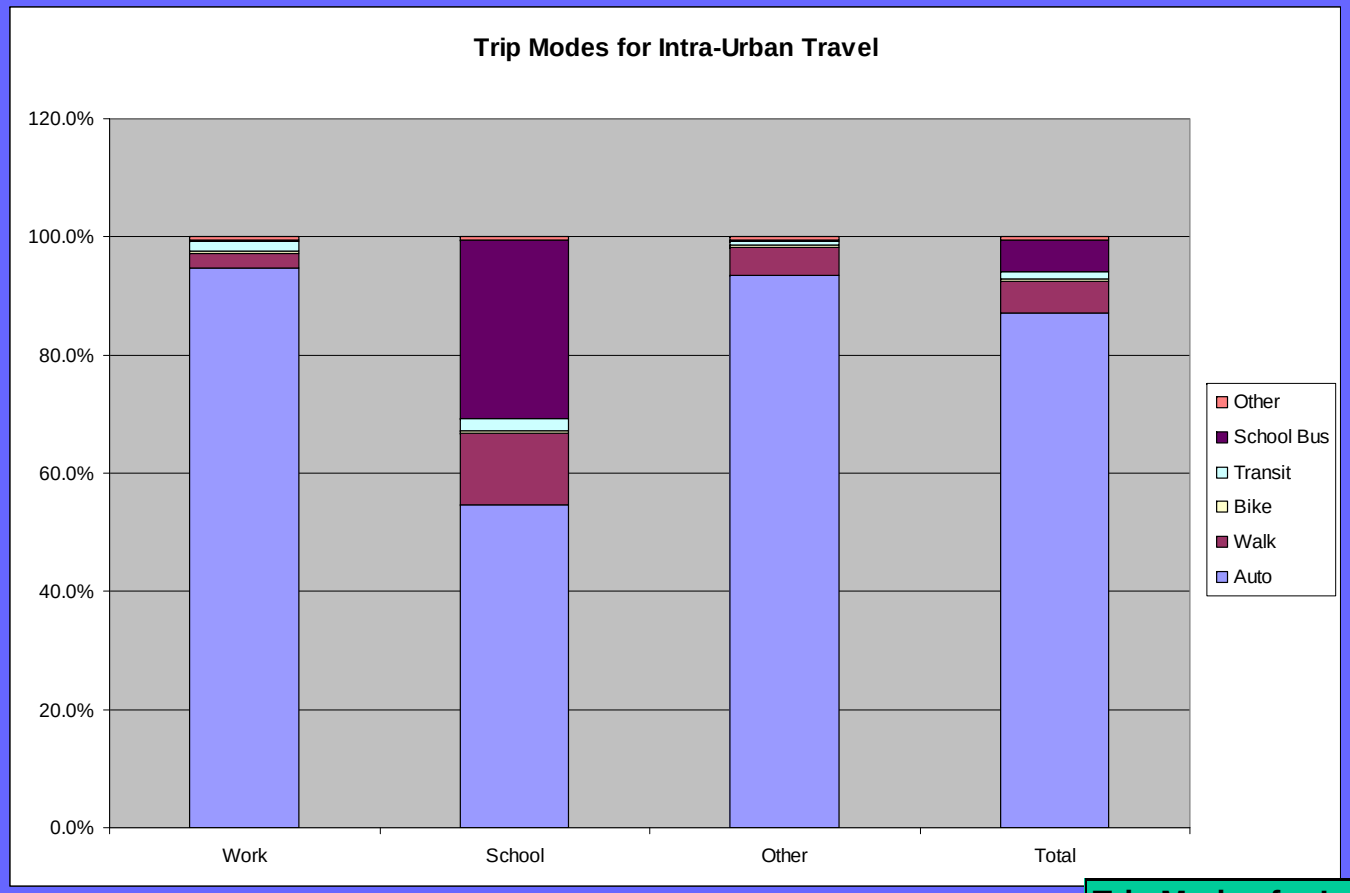
Value (billions $)

	TRUCK	AIR	WATER	RR	TOT
Agriculture	12	0	0	1	13
Coal	0	0	2	1	3
Other Raw Mat.	2	0	2	1	5
Primary Metals	72	0	2	20	94
Trans Equip	124	3	0	65	192
Other Mfg.	703	3	6	34	746
Pack/FAK/Misc	1010	0	0	21	1032
Total	1923	6	12	144	2084

Percentage

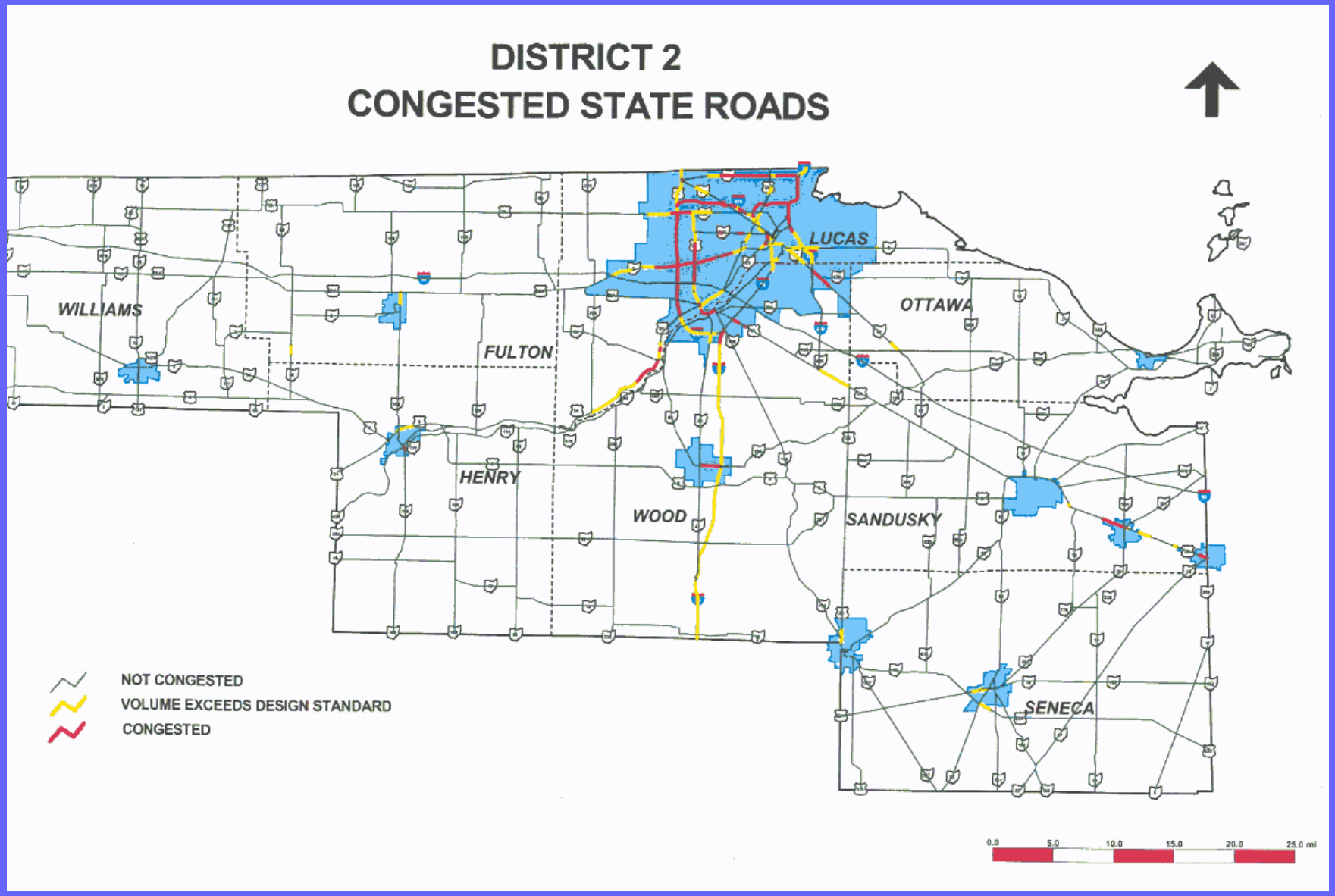
	TRUCK	AIR	WATER	RR	TOT
Agriculture	88.1%	0.0%	1.3%	10.6%	
Coal	10.6%	0.0%	46.7%	42.7%	
Other Raw Mat.	39.6%	0.0%	34.3%	26.2%	
Primary Metals	76.5%	0.0%	2.0%	21.5%	
Trans Equip	64.7%	1.5%	0.1%	33.8%	
Other Mfg.	94.2%	0.4%	0.8%	4.5%	
Pack/FAK/Misc	97.9%	0.0%	0.0%	2.1%	
Total	92.2%	0.3%	0.6%	6.9%	

Modal Analysis/ Passenger



Trip Modes for Intra-Urban Travel				
Percent				
	Work	School	Other	Total
Auto	94.7%	54.6%	93.5%	87.2%
Walk	2.4%	12.2%	4.6%	5.3%
Bike	0.5%	0.4%	0.5%	0.5%
Transit	1.7%	2.1%	0.6%	1.2%
School Bus	0.1%	30.1%	0.2%	5.3%
Other	0.5%	0.6%	0.6%	0.6%

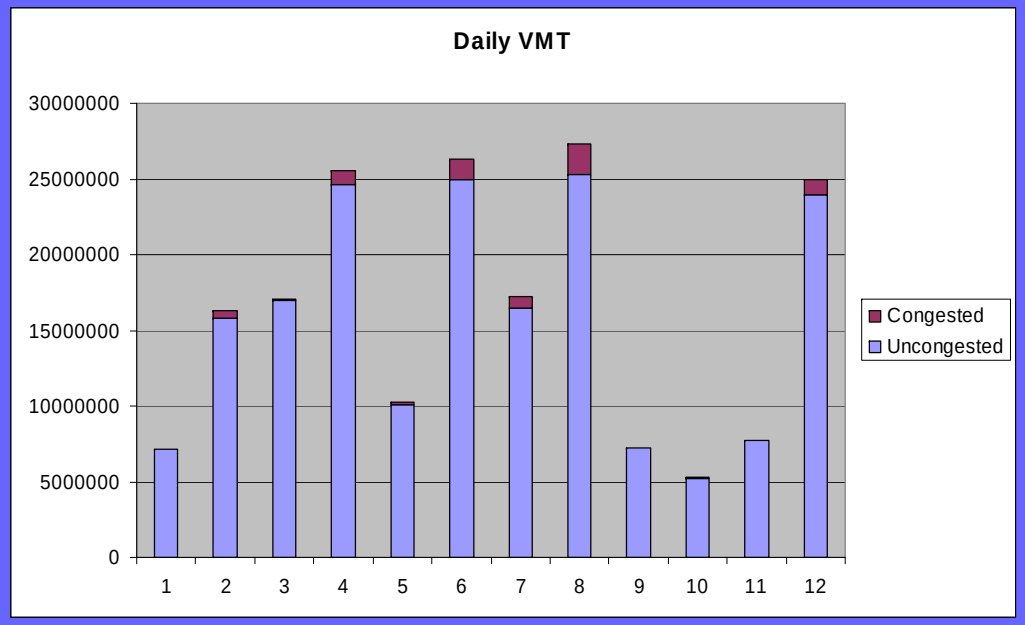
Congestion Management



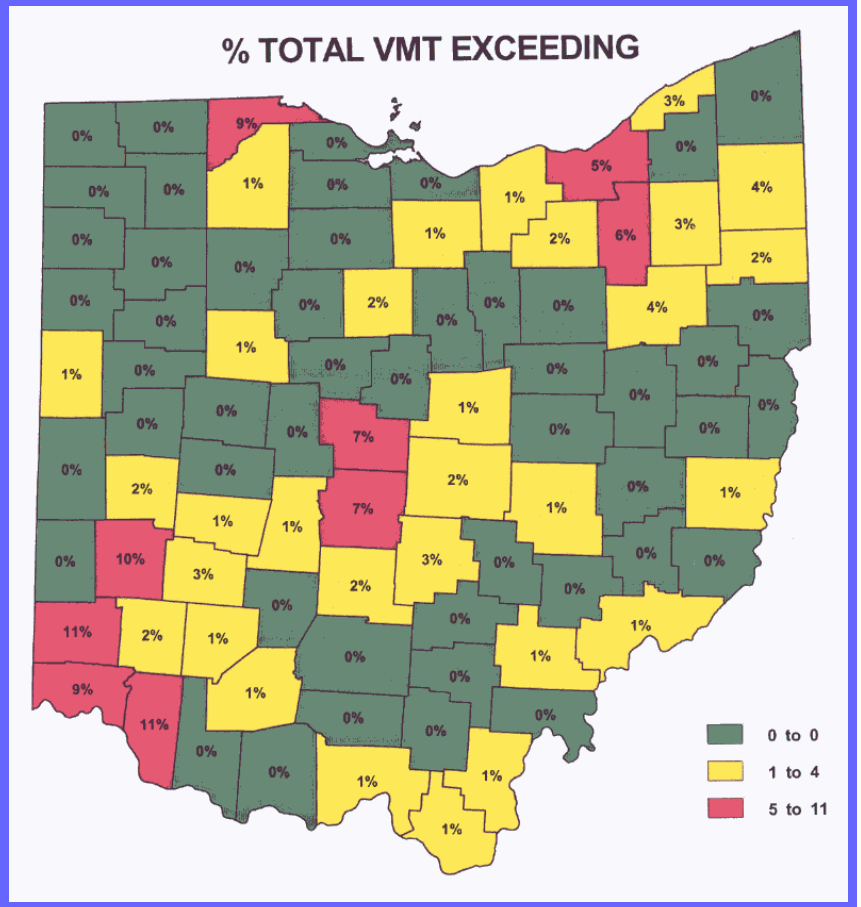
Congestion Management

Congestion Comparisons

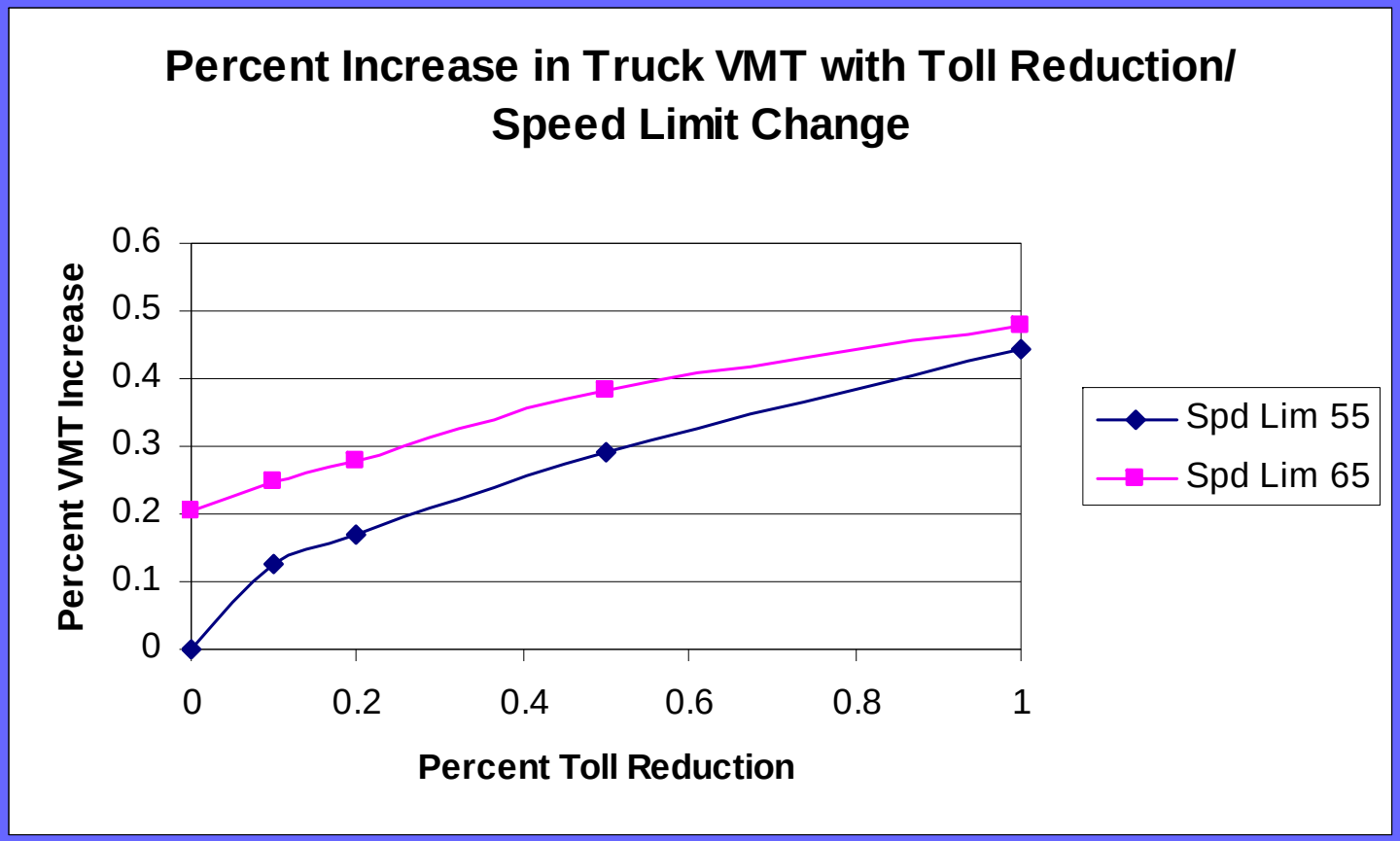
By ODOT Districts



For Ohio Counties



Sensitivity Analysis



New Developments

- MORPC Tour/Activity Based Model
- New Small/Medium MPO Models
- Move Towards Operational Level Detail on Networks
- Use of Techniques such as Matrix Estimation for Project Modeling
- Statewide Integrated Economic/Landuse/Travel Model
- Use of GPS Technology for Household Travel Surveys

MORPC Model

- Demand Side Microsimulation
- Tour Based Approach

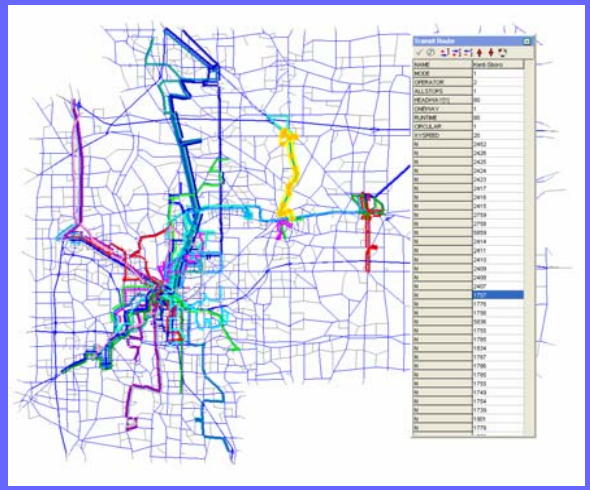
Traditional Approach

Input	Model	Output
Aggregates of People/Employees by Zone	Trip Rates Probabilities of Trip Length Probabilities of Mode	Fractional Trips by Destination and Mode for Every Possible Combination

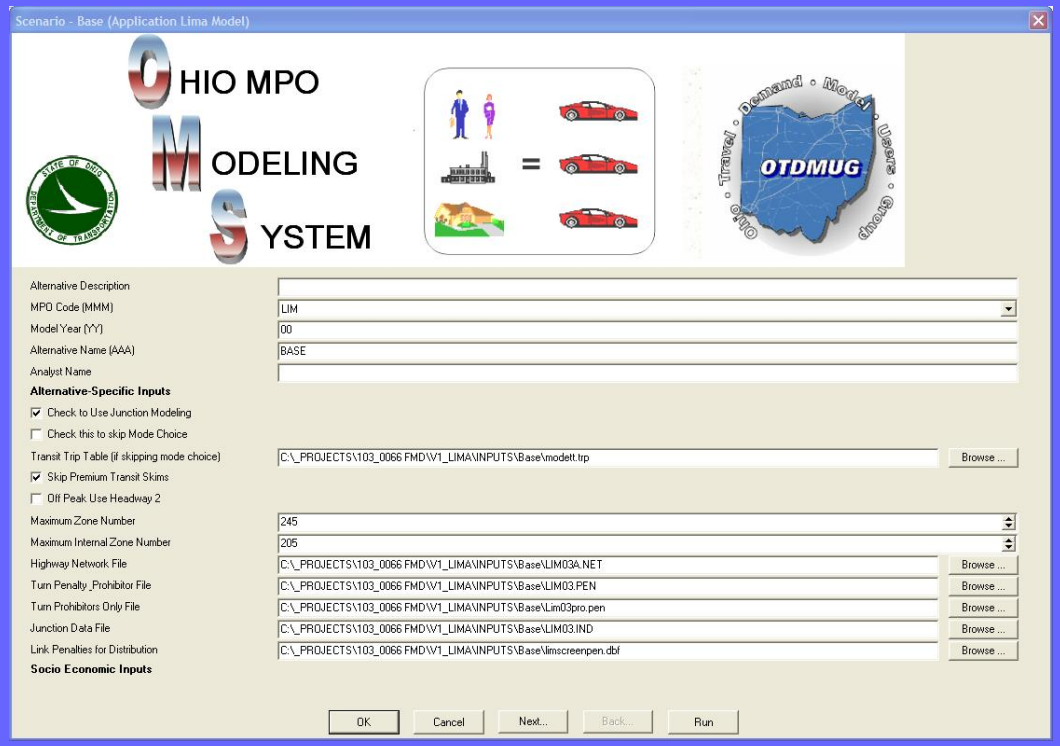
New Approach

Input	Model	Output
Individual People	Activity Probabilities Probabilities of Trip Length Probabilities of Mode	Specific Combination of Activities/Travel Destinations etc. for Each Person Randomly Selected Based on the Probability

Small/Medium MPO Models



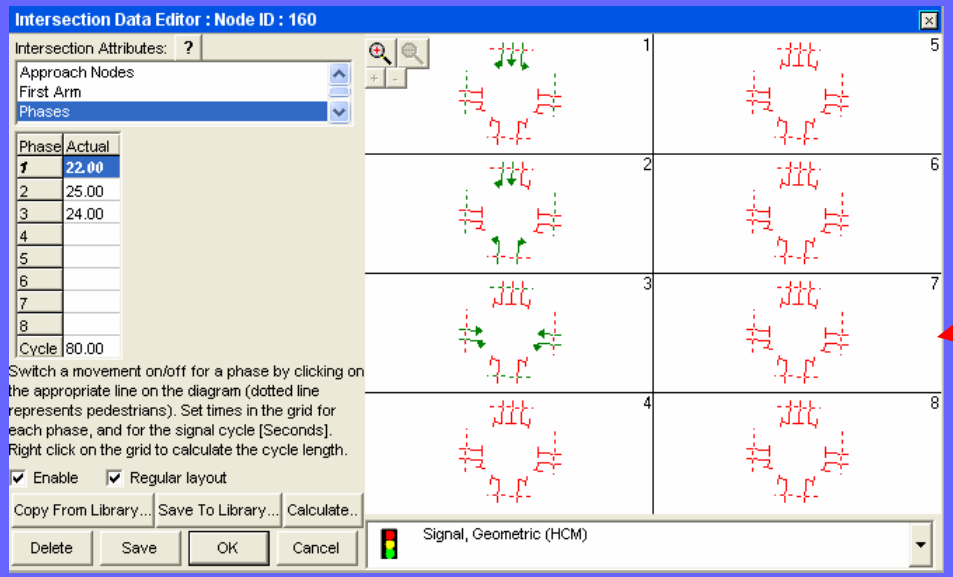
- Improved Four Step Models
- Improved features Include:
  - Addition of non highway passenger modes
  - Explicit intersection delay modeling
  - Truck and commercial vehicle model
  - Time of day modeling

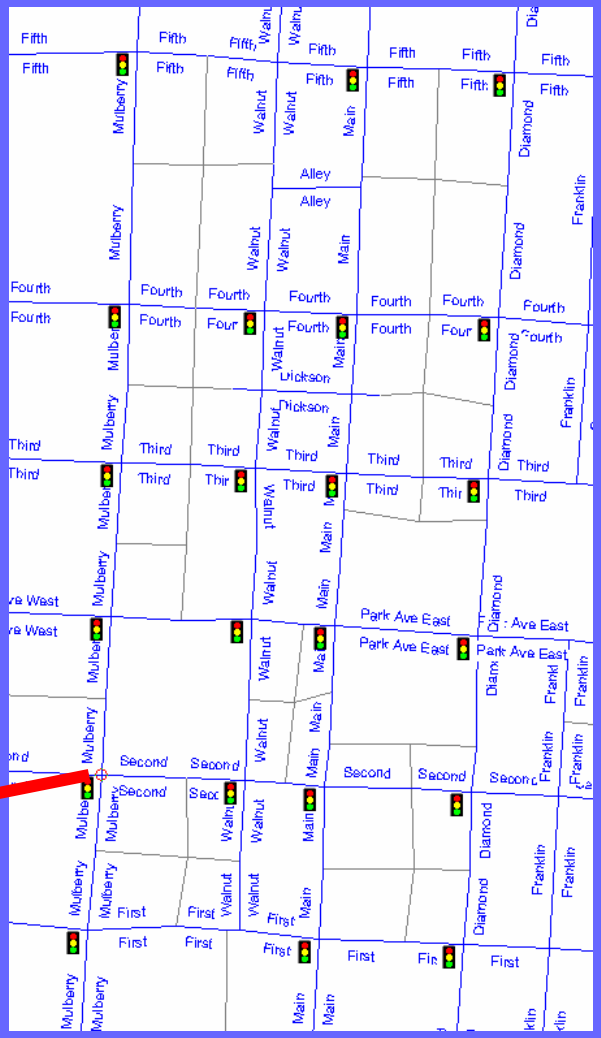


Dynamic Intersection Delay

- Now code intersection control in regional model networks
- Intersection delay dynamically determined from model turn volumes using HCM type methods
- Can also use this input data to employ more sophisticated operational models

Signal phasing editor





Project Modeling Refinements

- ODOT uses models as the basis for forecasts on major projects
- M&F section has guidelines for project level forecasting and design traffic designations
- Much refining of regional (or statewide) models are needed to produce good project forecasts
- Recently, Matrix Estimation techniques have gained widespread popularity

PID 81258

Ohio Department of Transportation

Office of Technical Services

Ohio Certified Traffic Manual

By: Wilbur Smith Associates
March 30, 2007
Final Draft

Percent Root Mean Square Differences

Comparison	Model Adjusted	Junction	Equilibrium
2000 No Build w.r.t. Counts	24%	73%	83%
2030 No Build w.r.t 2000 No Build	33%	40%	27%
2000 Alt. 1 w.r.t. to No Build	101%	110%	63%
2000 Alt. 3 w.r.t. to No Build	105%	101%	66%

Model Definitions

Adjusted	Sub-area model described in this document
Junction	Original validated model with junction based assignment
Equilibrium	Original model with equilibrium assignment using link impedances only

Statewide Model

- Development Begins in mid 90's

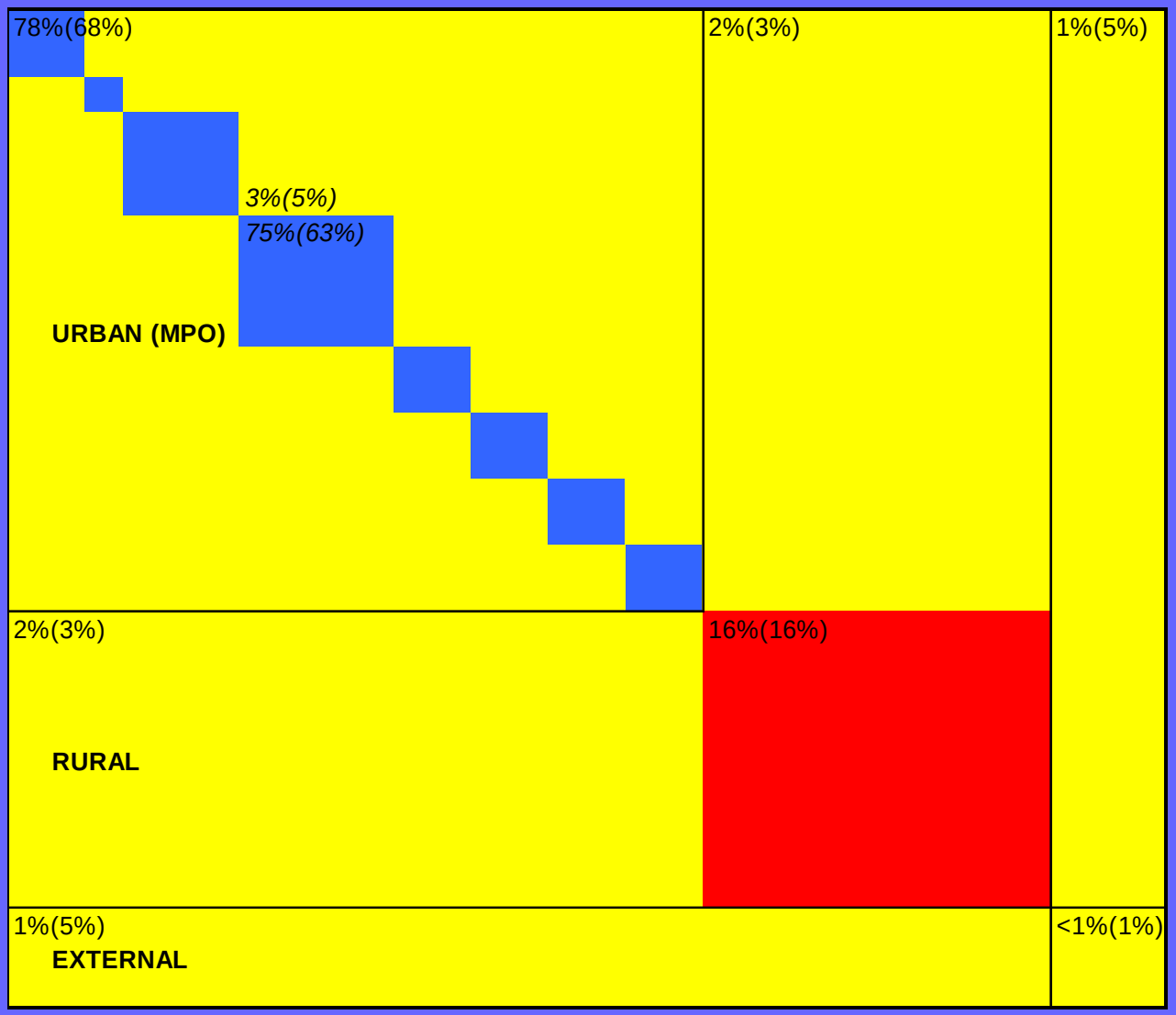
- Phase 1 Needs Study Identifies 3 Priorities:
  1. Truck/Freight Flow
  2. Economic Vitality
  3. Traditional Congestion Measures

- Therefore, an Advanced Model was Proposed Incorporating:
  1. Econometric Models
  2. Demand Micro-simulation
  3. Land Use Modeling

- This Ambitious Model Took Years to Complete Necessitating an Interim Capability

Interim Model

Seed Trip Table Data Source Schematic



Percentages show the proportion of trips in each region of trip table, values in parentheses are trucks

- Roadside Surveys
- MPO Trip Table (cars)/ QRFM (trks)
- QRM/QRFM

•Developed Seed Car & Truck Trip Tables as a Composite of 3 Sources

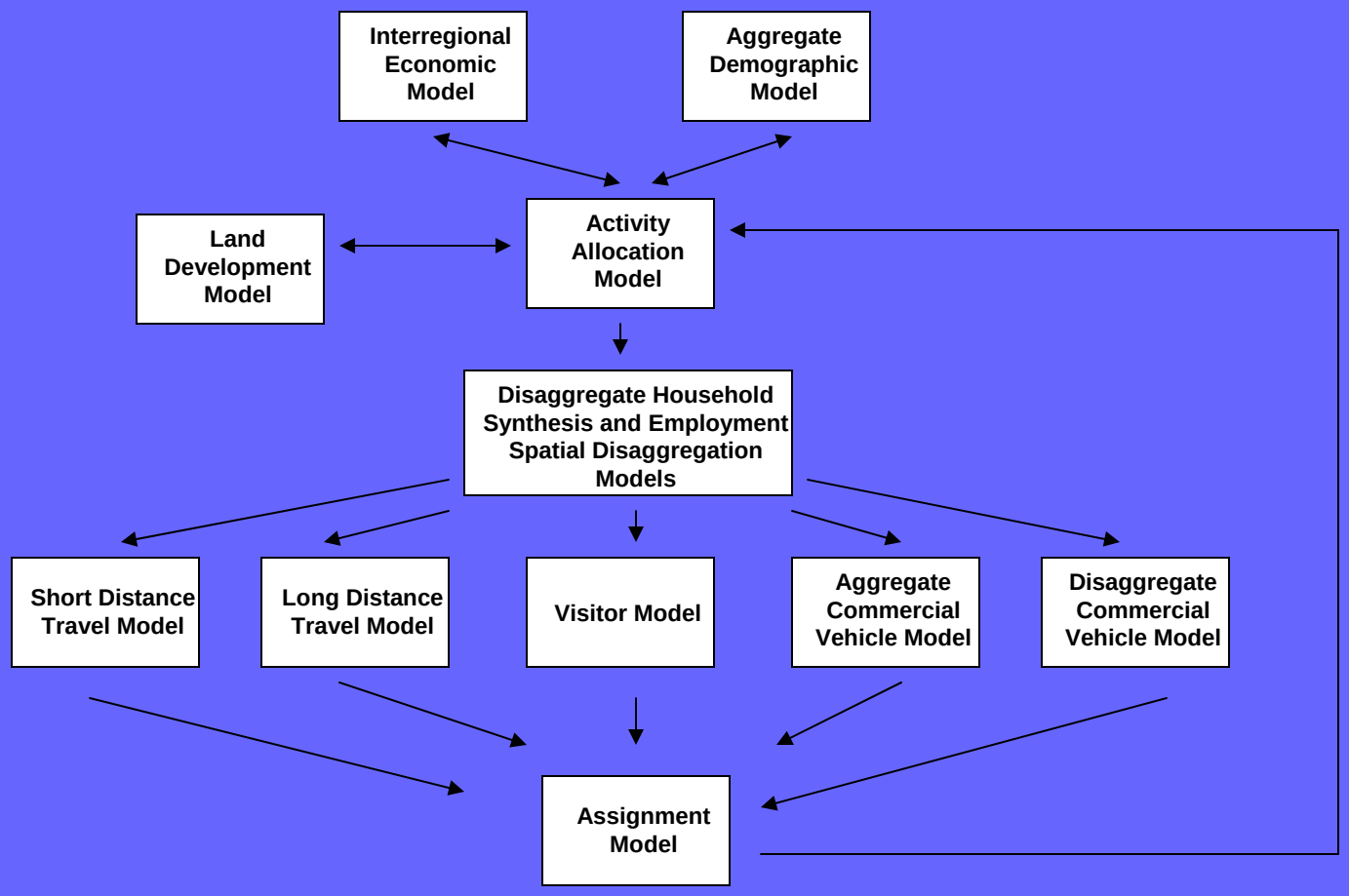
1. Roadside Surveys Around All MPO Cordons & State Line

2. Compressed MPO Trip Tables

3. Quick Response Method (QRM) Generation/Distribution to Fill in Holes in Rural Areas

•Matrix Estimation then Adjusts to Counts

Final Model


Interregional Economic Model
Aggregate Demographic Model
Land Development Model
Activity Allocation Model
Disaggregate Household Synthesis and Employment Spatial Disaggregation Models
Short Distance Travel Model
Long Distance Travel Model
Visitor Model
Aggregate Commercial Vehicle Model
Disaggregate Commercial Vehicle Model
Assignment Model

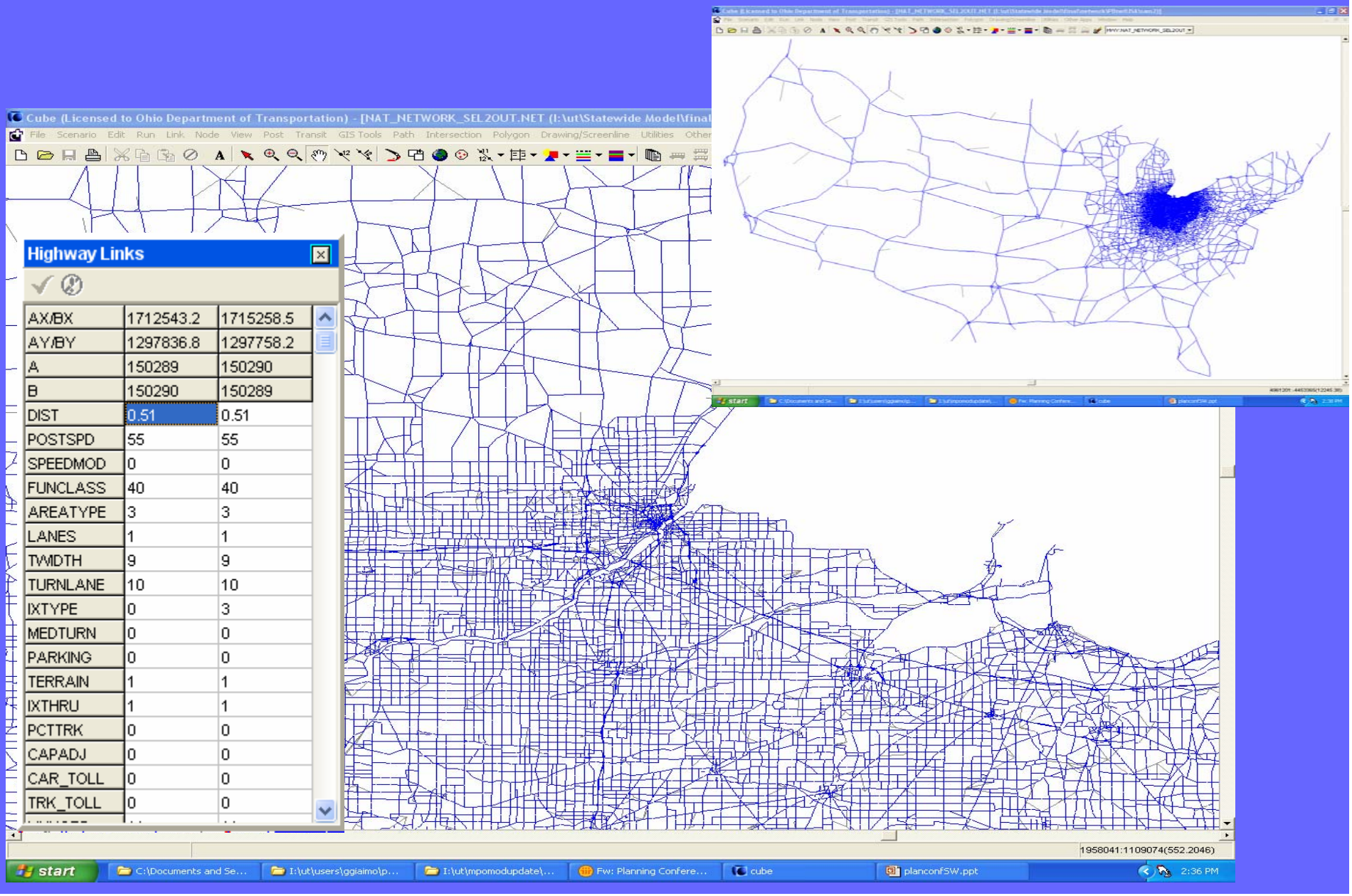
Model Modules

- **Interregional economic model** of production & consumption by economic sector reflecting national forecasts
- **Demographic model** tied to economic activity reflecting migration and changes in population & household composition
- **Activity allocation model** to distribute model area economic and demographic forecasts to analysis zones with the related flows of goods, services & labor among zones from which travel demands are derived
- **Land development model** simulating developer behavior in response to demands & prices by type by zone consistent with zoning & other development constraints
- **Personal & household travel model** reflecting person & household characteristics, zonal characteristics, inter-zonal economic flows & transport system supply characteristics, 2 components: short distance which looks like an activity/tour based urban area model and long distance, also tour based with purposes: business, recreation, other

Model Modules

- **Aggregate model of goods and services** transport arising from economic and demographic activity by zone very similar to the typical DOT commodity based transport model
- **Disaggregate model of business-related person travel** related to management functions, sales & support activities, provision of services and some short distance goods delivery.
- **Model of visitor travel** within and into the model area made by non-residents
- **Transport system supply model** incorporating air, intercity bus/rail, MPO transit & roadway networks with their corresponding level-of-service characteristics

Statewide Model Network



GPS Household Travel Surveys

•Household Travel Surveys are the major data source for travel demand models

•Traditionally, the data is obtained by interviewing the public at home (either in person or on the phone)

•GPS survey recruits people on the phone to carry for several days which records all of their travel

•Device is smaller than a cell phone and is carried individual thus recording all travel

Future Directions

- Continue movement towards “operational” model of traffic flow
  - Next step will add finer temporal disaggregation via “dynamic traffic assignment” (meso or micro scale)
- Continue development of micro-simulated demand models
  - Add long term choice models
  - Improve temporal granularity
  - Explicit linkages with supply models
  - Improve behavioral fidelity of the demand model structure
- Focus on improvements to Statewide model such as:
  - Improved freight representation, especially rail
  - Improve economic linkages particularly with respect to Ohio’s competitiveness with rest of world
  - Improve land use data
  - With faster computers, disaggregate zones (maybe to parcel level)