

**MIOH UTC Model Coordination
Meeting
October 5, 2010**

MDOT Modeling Overview

MDOT Statewide and Urban Travel Analysis Section,
Bureau of Transportation Planning



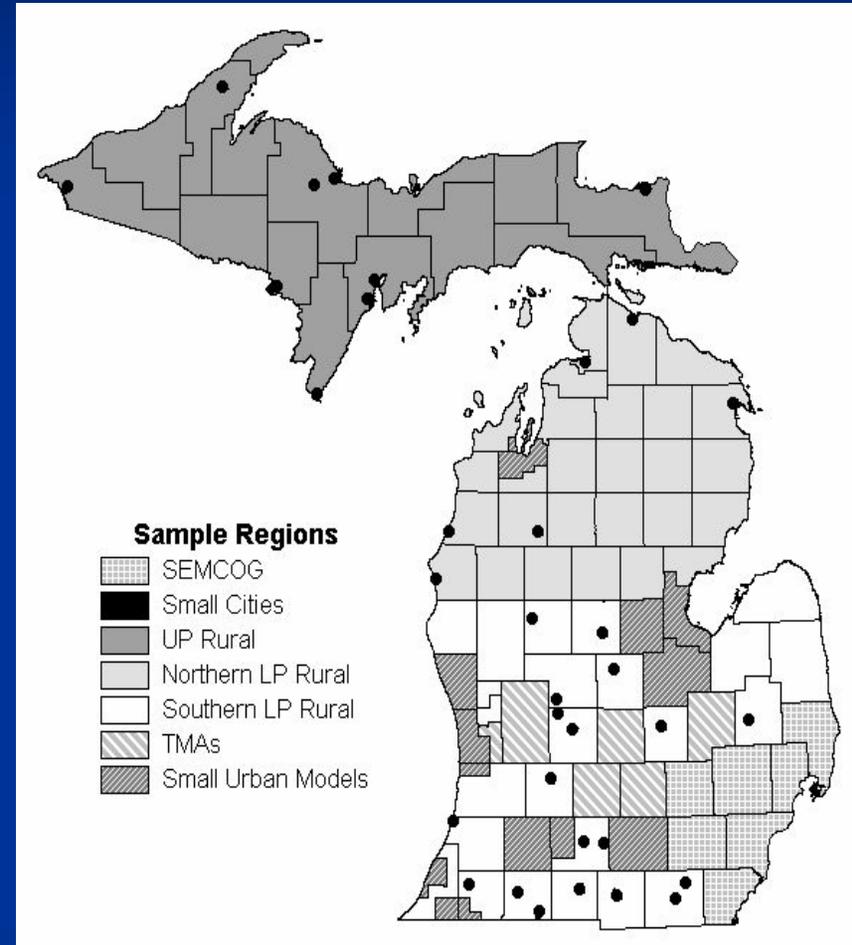
MDOT Modeling Responsibilities

- Statewide Passenger Model
- Small Urban Models
- Statewide Truck Model
- Small city models as necessary

- TMAs (MPOs > 200k pop) maintain their own models

Background info: MI Travel Counts

- Statewide household travel survey
- 2,000 households in each of 7 sample areas. 14,000+ households statewide in 2004-2005
- MI Travel Counts II – follow up survey 2,000 households in 2009



Background Info: Michigan Geographic Framework

- Geographic base map for the state
- Source for statewide and urban model networks

The screenshot displays the Michigan Department of Technology, Management & Budget (DTMB) website. The header includes the DTMB logo, the Michigan state logo, and the text "MICHIGAN.GOV Michigan's Official Web Site". The main navigation bar contains links for "Michigan.gov Home", "CSSTP Home", "DTMB Home", "Sitemap", "FAQ", "Inside CSSTP", and "Contacts". A search bar is located on the right. The page is titled "Geographic Information Standards" and features a section for "Executive Order No. 2001 - 3". The text of the executive order states: "WHEREAS, the creation of a new Department of Information Technology will strengthen central policymaking and direction-setting in all areas of information technology, bring about improved information management and data standardization.....". Below this, a paragraph explains that a significant implementation of this directive is the development, promotion, and implementation of all State surveying, mapping, and related geographic data standards. The page also includes several boxes with links to "Geographic Framework Documentation", "MGF Local Data Partnerships", "Geographic Metadata", and "Geographic Referencing". A sidebar on the left lists various services and tools, and a "Quick Links" section on the right provides access to various state resources.

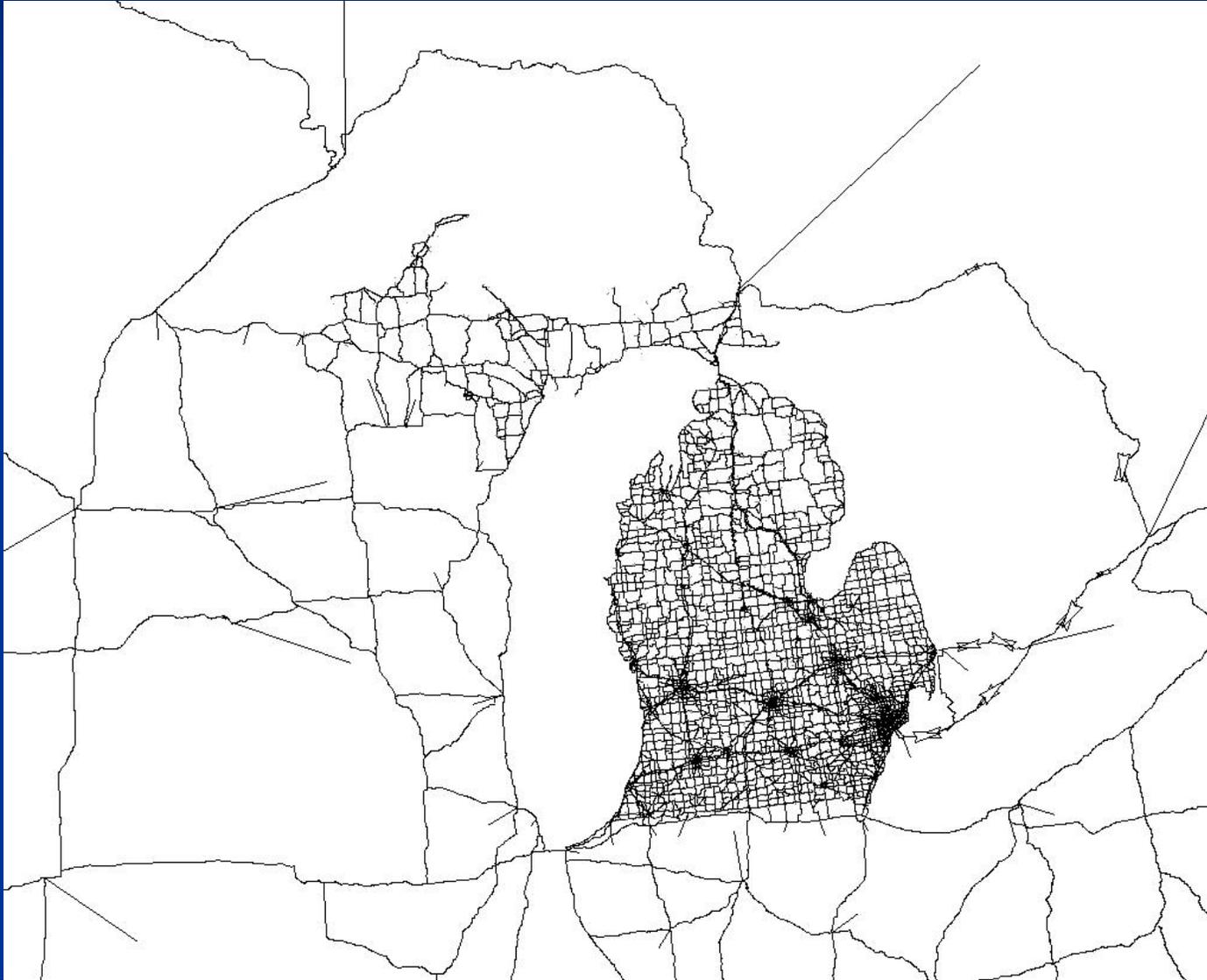
MDOT Statewide Passenger Model

Karen Faussett, Statewide Model Specialist

faussettk@michigan.gov

Michigan Department of Transportation
Statewide and Urban Travel Analysis Section

Statewide Model Network



Statewide Model General Stats

- 24-hour Passenger model
- 2,307 internal zones
- 85 out-state zones
- In-state network of trunkline and county primary roads.
- 2005 base year, 5 year forecasts to 2035

Data Sources

- REMI Forecast from U-M
- US Census Data/ACS
- Claritas/Hoovers Employment Data
- Bureau of Economic Analysis
- Traffic Count Data
- Origin and Destination Studies
- MI Travel Counts

Trip Generation: Trip Purposes

- 10 Trip purposes
 - Home and Non-home based
 - Work
 - School
 - Shopping
 - Social-recreation
 - Other

Trip Production

- Cross classification by purpose
 - Household size
 - Income
 - MI Travel Counts sample area

Trip Attraction

- Based on:
 - Manufacturing employment
 - Retail employment
 - Service employment
 - Other basic employment
 - School employment
 - Other employment
 - Residential
 - By sampling area

Out-state Productions and Attractions

- Based on the number of households per state/province
- Uses forecasted population for each state.

Trip Distribution

- Trip length distributions (TLDs) generated from MI Travel Counts by purpose (10) and region (7)
- Differences examined and TLDs reduced to 16
- Friction Factors calibrated using lookup table for first 150 minutes of trips. Gamma functions from previous model used for trips >150 minutes
- Resulting TLDs are within 1% of MI Travel Counts

Passenger vs. AADT

- Statewide Passenger model reflects passenger ADT.
- Truck model will reflect commercial ADT.
- Passenger + Truck = AADT
- Currently adjust passenger volume to AADT based on commercial percentage if requested.

Traffic Assignment

- All-or-nothing
 - Due to sparse network and few alternate routes
 - V/C ratios and congested speeds post-processed for analysis purposes

Model Calibration and Validation

- Origin/Destination studies
- Network density factors
- Matrix estimation K-factors
- MDOT Calibration Standards
 - Volume Group
 - NFC
 - Sample area (region)

Model Applications

- MI Transportation Plan
- Economic Benefit Analysis
- Growth Rates
- Corridor Studies
- Work Zone Analysis
- Proximity Analysis
- Air Quality Conformity inputs
- Urban Area Model Cordon data

Future Directions

- Update to 2008 base year
- Network and TAZ review
- New REMI forecast
- 2010 calibration after release of 2010 Census data
- MI Travel Counts III
- Consider equilibrium assignment
- Gather additional data
 - O&D studies on high volume roads

Urban Travel Demand Models

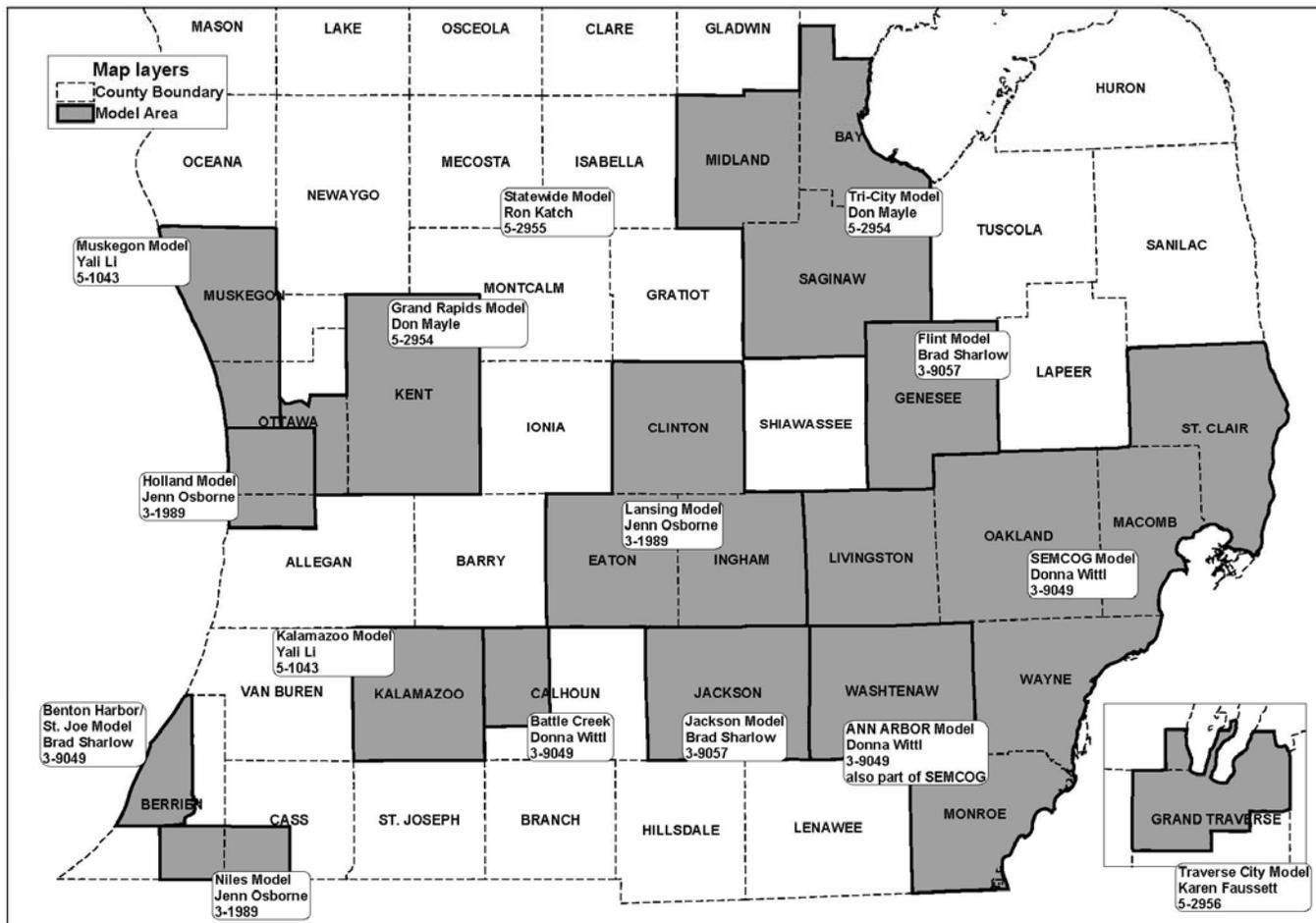
Bradley Sharlow, Senior Transportation Planner

sharlowbr@michigan.gov

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MPO Model Boundaries

Travel Demand Forecast Model Contact Information: December 2008



MPO Model Characteristics

Model Area	Sq. Miles	#TAZs	Population	Households	Employment
Statewide Model	56,800.00	2,392	10,002,486	3,810,801	5,397,807
Small MPOs					
Battle Creek	217.19	292	94,275	38,544	53,842
Bay-Midland-Saginaw	1,791.68	990	408,721	165,288	197,042
Benton Harbor/St. Joseph	195.76	316	88,204	33,961	63,561
Holland-Zeeland	283.51	278	133,831	49,124	67,039
Jackson	722.59	329	163,700	65,605	74,814
Kalamazoo	579.25	515	234,736	96,343	140,440
Muskegon	548.96	646	233,317	88,180	91,019
Niles	231.14	207	54,604	21,668	20,784
TMA s					
Tri-County - Lansing	1,711.57	1,081	451,728	181,205	281,983
Genesee County - Flint	648.26	676	447,189	178,211	211,662
Kent County - Grand Rapids	1,010.32	840	681,015	260,017	374,715

Data Information

- US Census Data
- Claritas/Hoovers Employment Data
- Traffic Count Data (Trunkline/Local)
- REMI Forecast Model
- Michigan Geographic Framework Data
- MI Travel Counts Survey

Capacity

- Past: Tri-County Capacity Calculator or lookup tables
- UMIP: New Capacity Lookup Table
- TMAs: All have their own methods

Trip Generation: Trip Purposes

- Past

- HBW, HBO and NHB (NCHRP 365)

- UMIP

- HBW (three income groups), HBR, HBS, HBO and NHB

- TMAs

- HBW (2-3 income groups), HBSH, HBSCH, HBU, and NHB

Trip Production

- Cross Classification Method
 - Past: HH size, # of Workers and # Autos (or income)
 - UMIP: HH size, # of Workers, # Autos, Income (work trips), and # Children (school)
 - TMAs: HH size, # workers, income or # autos, # children.

Trip Attraction

- Regression equations
 - Total occupied households
 - Total employment
 - Retail employment
 - Service employment
 - Other (non retail or service) employment
 - Area type
 - School enrollment (school trips)

External Trips

- Use of Statewide model to determine % I-E/E-I and E-E trips
- Past: I-E/E-I were modeled with I-I trips, while E-E were modeled separately
- UMIP: I-E/E-I and E-E will be modeled separately
- TMAs: further breakdown of I-E/E-I into different purposes (e.g., work vs. nonwork)

Trip Distribution

- Gravity model
 - Past: Based on NCHRP 365 friction factors
 - UMIP: Based on MITC Small Urban sample
 - New calibration targets created based on trip purpose and model area size
 - Trip Length Frequency Distributions
 - Average Trip Lengths
 - TMAs: Based on MITC TMA sample
 - New friction factor curves, and targets have been created

Mode Choice

- Past: Auto Occupancy Factors only
- UMIP: Two approaches
 - Nested Logit Model (full transit)
 - Simplified Mode Choice (no transit network)
 - Factors will be applied by mode
 - Transit Access by TAZ
- TMAs: All have transit model components, and full mode choice.

Time of Day

■ Past

- Primarily daily models only
- Lansing and Holland had time periods (3-4 periods).

■ Currently

- All TMAs have 3-4 time periods
- UMIP: 4 time periods
 - AM Peak, Mid-Day, PM Peak and Off-Peak

Time of Day

■ Peak Periods

- AM Peak - 7am-9am, 6am-9am (Flint)
- PM Peak - 3pm-6pm
- Off Peak - all other hours (Lansing, Holland)
- Mid-Day – 9am-3pm (SEMCOG, AA, Flint)
- Evening-7pm-6am (SEMCOG, AA)
- Evening-6pm-6am (Flint)

Truck Component

- New to Urban Models
 - Models will have truck component based on
 - Modified QRFM rates
 - Truck Flows based on Statewide Freight Model (for external trips) and TranSearch Data
 - TMAs: Lansing and Flint have truck components

Traffic Assignment

- Methods
 - User Equilibrium
 - Modified BPR Curve
 - Implementation of Feedback Loop back to trip distribution to compare travel times

Model Calibration and Validation

- MDOT Calibration Standards
 - Volume Group
 - Link Type
 - Traffic Operation
 - NFC
 - Screenlines/Cutlines

Model Applications

- LRTP Deficiency Analysis
- LRTP Testing of Alternatives
- Project Selection
- Large Scale Project Analysis
- Corridor Studies
- Air Quality Analysis
- Work Zone Analysis
 - Diversion rate analysis, detour analysis

Future Directions

- Summary of Models (after UMIP)
 - Documentation
- Increased Data Needs
 - Further improving SE Data
 - Speed Studies
 - Survey specifically for urban areas
 - Hourly and Classification Counts on local roads
 - O&Ds along high volume corridors and at external stations
- Coordinate with Metro Region on Micro-simulation

Michigan Statewide Truck Model Update

Jesse Gwilliams, Freight Movement Specialist

gwilliamsj@michigan.gov

Michigan Department of Transportation,
Statewide & Urban Travel Analysis Section

History

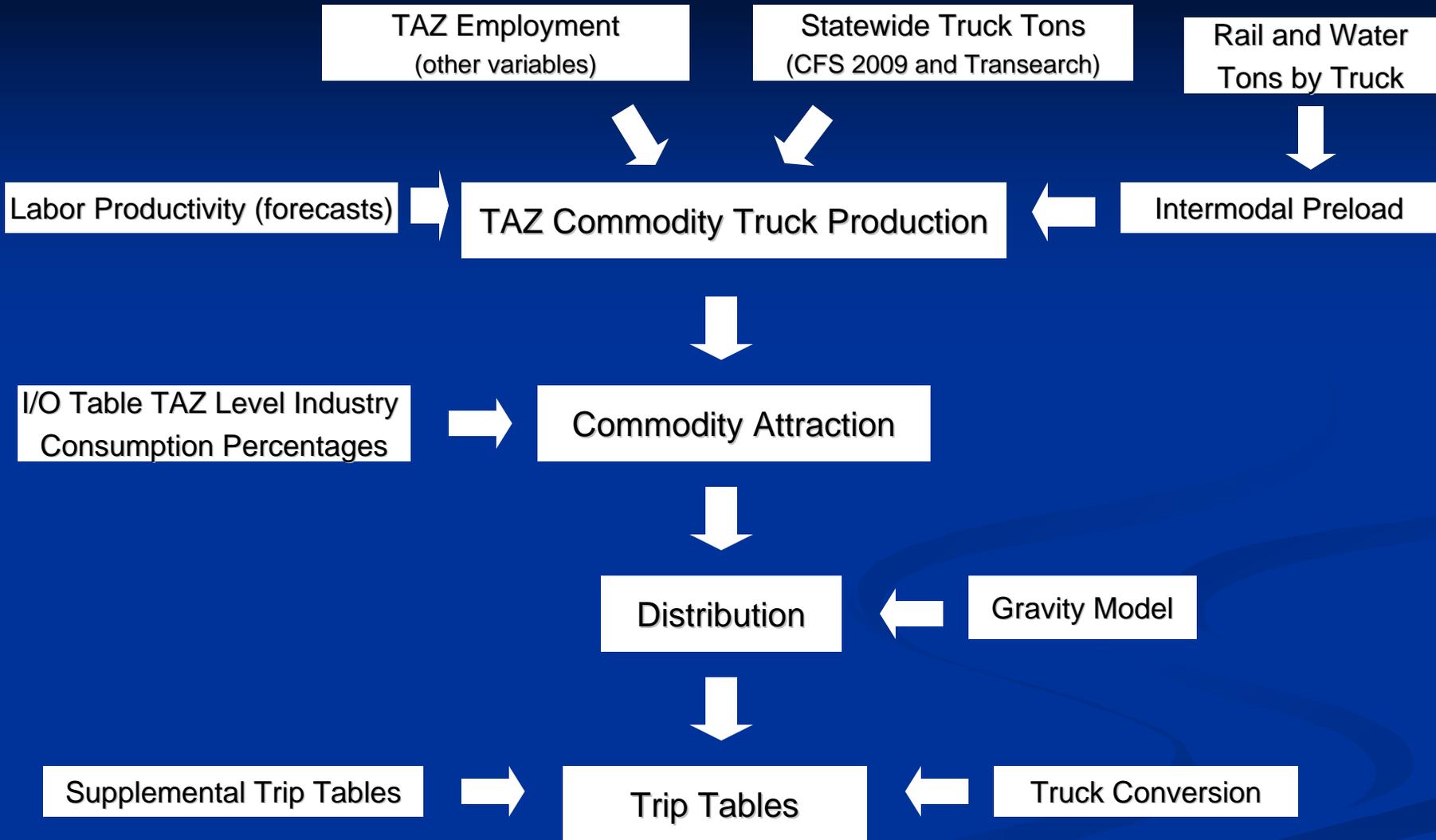
- The Michigan Statewide Truck Travel Forecasting Model – 1998
 - Parameters
 - Data Sources
 - Strengths and Weaknesses

Truck Model Update

- Follow Similar Steps to Old Model
- Data Sources
 - Transearch, Commodity Flow Survey 2009
 - Claritas/CBP/Statistics Canada
 - O&D Surveys
- Include Canada in Process
- Supplemental Truck Trips

Freight Model Commodities

CODE	COMMODITY	CODE	COMMODITY
1	Agriculture Crops	29	Petroleum or Coal Products
2	Agriculture Animal	30	Rubber and Plastics
8	Primary Forest Materials	31	Leather Products
10	Metallic Ores	32	Clay, Cement, Glass or Stone Products
11	Coal	33	Primary Metal Products
13	Crude Petroleum and Natural Gas	34	Fabricated Metal Products
14	Nonmetallic Ores and Minerals	35	Machinery
20	Food Products	36	Electrical Equipment
22	Textile Mill Products	37	Transportation Equipment
23	Apparel or Finished Textiles	38	Technical Instruments and Equipment
24	Lumber and Wood Products	39	Misc Manufacturing Products
25	Furniture and Fixtures	40	Waste or Scrap Material
26	Paper and Pulp Products	41	Misc Freight Shipments
27	Printed Matter	43	Mail
28	Chemical Products	50	Secondary Traffic



Commodity Production

- Truck
- Statewide Tons
 - 2009 CFS
 - Transearch
- TAZ Employment
- Select Commodity Production Equations
 - Agriculture
 - Forest Products

Intermodal Preload

- Truck Movements to/from Rail and Water
Special Generators
 - Waybill stations
 - Water Ports

Commodity Attraction

- Destination Choice Model
 - Input/Output Table
 - 2005 Annual Make/Use statistics from US Department of Commerce
 - TAZ Industry Consumption Percentages
 - TAZ Employment

Distribution

- Gravity Model
 - Impedence ?
 - K-Factors
- Trip Length Frequencies
 - 2009 CFS
 - Michigan Origin and Destination Studies
 - Transearch

Tons to Trucks Conversion

- Average Payloads
 - Michigan Origin and Destination Studies
 - 2009 CFS
 - Transearch

Supplemental Trip Tables

- Service Commercial Vehicles
 - Quick Response Supplement for Service Commercial Vehicles
- Municipal Waste
 - MDNRE Annual Solid Waste Report

Forecasting

- Current Statewide Model Industry Groups
 - REMI industry forecasting
- “Straight Line” some variables
- Labor Productivity
 - Trend Analysis

Calibration

- CADT
- Northern Michigan, U.P.
- Metro Detroit
- Urban Truck Models
- Origin and Destination Studies

Model Status

- Adjusting TAZ Employment for select industries
- Input/Output Table completed
- Updated payloads and trip lengths from O&Ds through 2009
- Completing TAZ rail – truck tons
- Jesse Frankovich, MDOT, programming in TransCAD
– completing test on one commodity (food products)
- Time? Calibrating around first of year

Future

- New Transearch data this fiscal year
 - For 2009 data
- Continue O&D Studies, Classifications
- Coordination with Urban Models
 - Further disaggregation
 - I-E and E-E trips
- More industry forecasts from REMI
- Develop new priority commercial network

Contact Information

<u>NAME</u>	<u>EMAIL</u>	<u>PHONE</u>
Susan Gorski	gorskis@michigan.gov	(517) 335-2958
John Watkin	watkinj@michigan.gov	(517) 373-9038
Ron Katch	katchr@michigan.gov	(517) 335-2955
Karen Faussett	faussettk@michigan.gov	(517) 335-2956
Jesse Gwilliams	gwilliamsj@michigan.gov	(517) 373-9355
Jennifer Osborne	osbornej@michigan.gov	(517) 373-1989
Bradley Sharlow	sharlowbr@michigan.gov	(517) 373-9057