



IOWA STANDARDIZED MODEL STRUCTURE



Midwest Travel Model Users Group

Summer 2016 Meeting
Tuesday, July 19th, 2016



Project Status Update

ISMS Mission Statement

Provide a consistent comprehensive and standardized framework of best practices for the development and application of travel demand modeling and traffic forecasting tools. The tools will facilitate collaborative use in planning and designing transportation systems and facilities for the State of Iowa, promote sharing, and encourage continuing cooperation and good practice across the state.

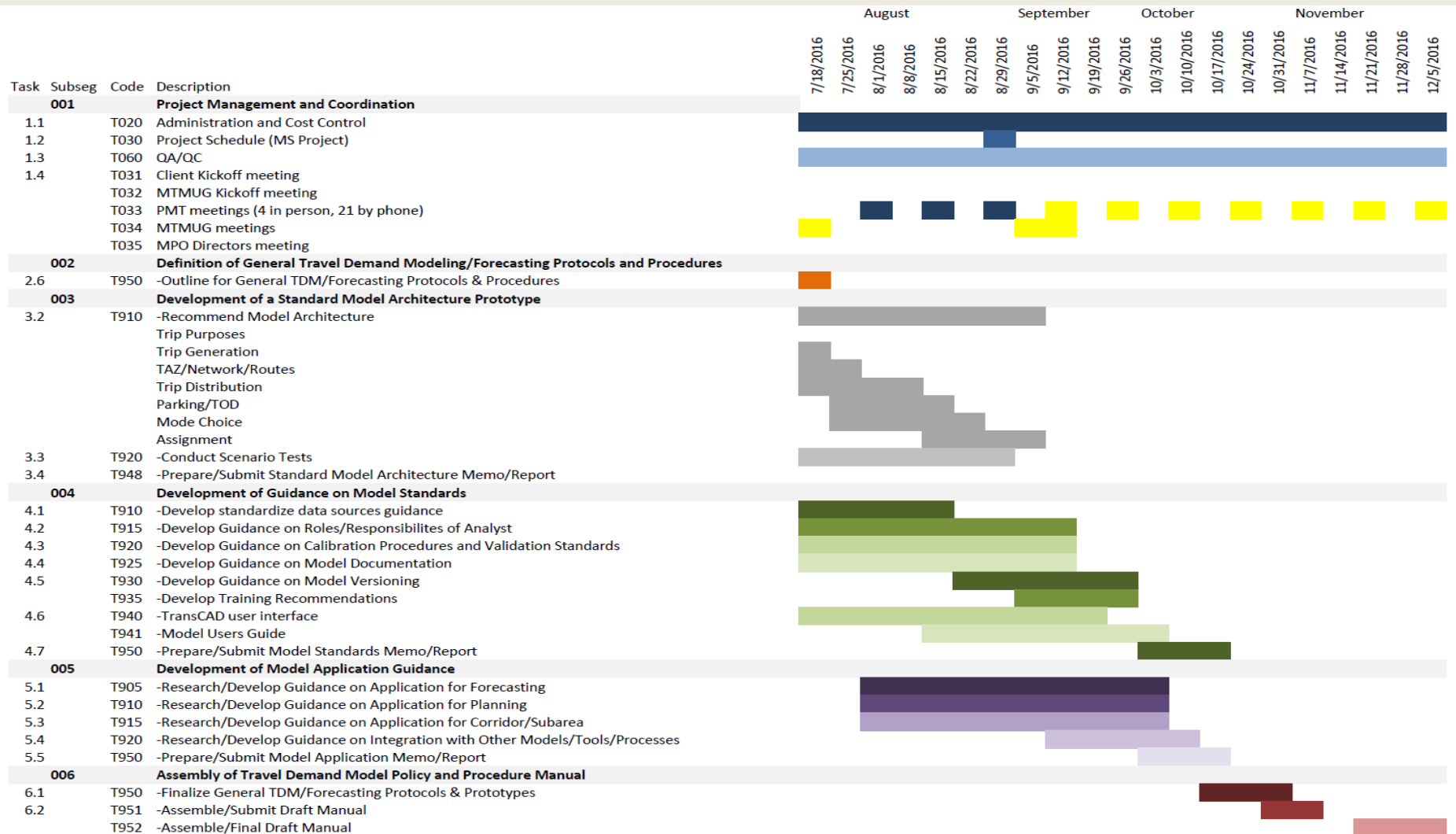
Goals of ISMS

- institutionalize the use of travel demand models in the MPO planning and prioritization processes;
- increase technical capabilities and understanding of MPO staff with regard to travel demand model development and application;
- develop clear guidance and expectations with regard to the roles and responsibilities of travel demand modelers;
- achieve a consistent approach to travel demand modeling across the state of Iowa's 9 MPOs;
- implement ongoing development and maintenance practices to ensure continual readiness and currency of MPO travel demand models

ISMS General Model Specifications

- Utilize Parcel Data for Trip Generation
- Four time periods (AM, MD, PM, NT)
- Separate Weekday and Weekend processes
- Detailed Trip Purposes
- Master Network Geographic File
- Utilize Intersection (Node) Delay
- Transit is Optional

Updated Project Schedule



Progress Since March MTMUG Meeting

- Trip purposes
- Intermediate stop process drafted
- Parcel-based land use methodology refinements
- Trip generation process
- Network attributes list drafted
- Intersection delay process refined
- Model reporting functionality

Trip Purposes

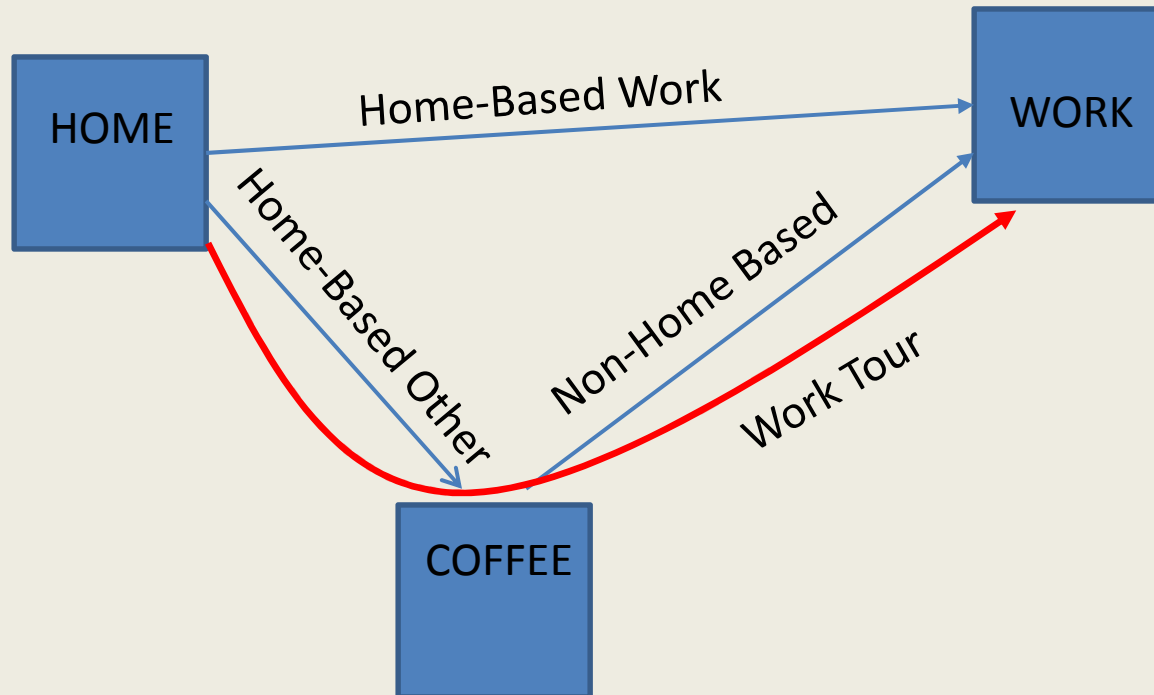
Generic Purpose	Specific Purpose	Benefits
Home-Based Work Tour *	Home-Based Work Low Income	Matches low income workers to low income jobs in trip distribution
	Home-Based Work Medium Income	Matches medium income workers to medium income jobs in trip distribution
	Home-Based Work High Income	Matches high income workers to high income jobs in trip distribution
Home-Based Non-Work	Home-Based K-12 School	Balance trips to know entity of school attendees. Destinations tied to specific locations. Most trips have specific temporal pattern
	Home-Based Shopping	Separates land uses that generate higher volumes of trips per unit Establish appropriate temporal factors
	Home-Based Other	
Non-Home Based	Work-Based	One end of trip tied to known location Temporal characteristics more defined
	Other-Based	
Special Purposes	University	Large generator with unique generation, parking, temporal and modal characteristics
	Hospital	Unique generators that draw trips from throughout and beyond the region
	Airport	
	Regional Recreation	
Trucks	Single Unit Truck	Quick Response Freight Manual provides methodology Generation, distribution rates vary by vehicle type
	Combination Truck	
External-External	Auto	Not tied to local land use
	Single Unit Truck	
	Combination truck	

[Quick Response Freight Manual](#), Version 2, Publication No., FHWA-HOP-08-0102007.

Intermediate Stops

- * Note that Home-Based Work is defined as a Tour, which includes Work Tours that have an intermediate stop, which under strict trip definitions would constitute one Home-Based Other trip and one Non-Home Based trip. Maintaining these two subtour trips as part of a Work Tour allows for direct comparison to Journey to Work defined trips, and allows for the unique characteristics of work trips to be passed to these two subtour trips.

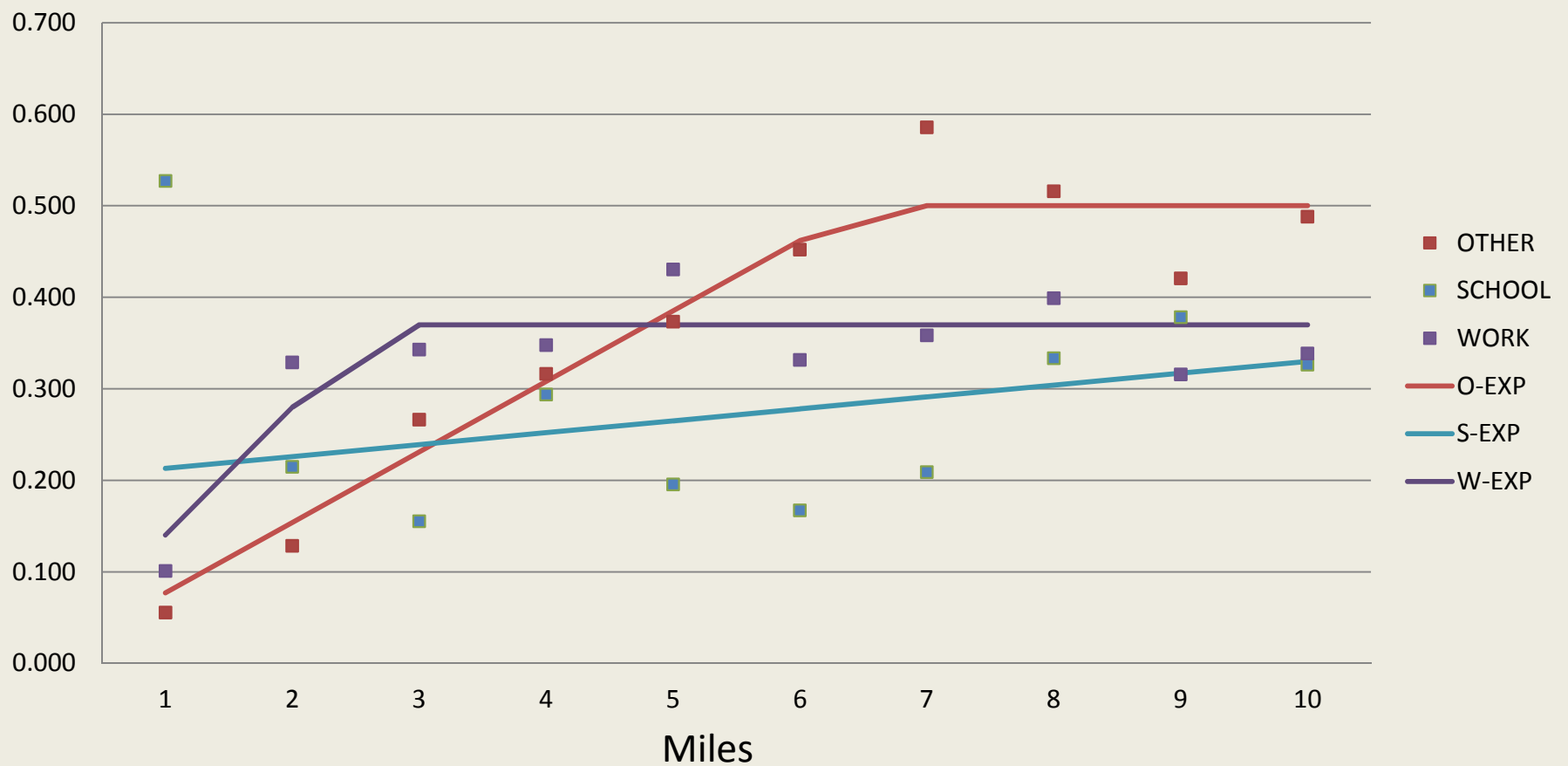
Intermediate Stops



Distribute HBW, then determine likelihood and location of intermediate stop in Tour

Intermediate Stops

Likelihood of Intermediate Trip by Purpose and Length of Trip



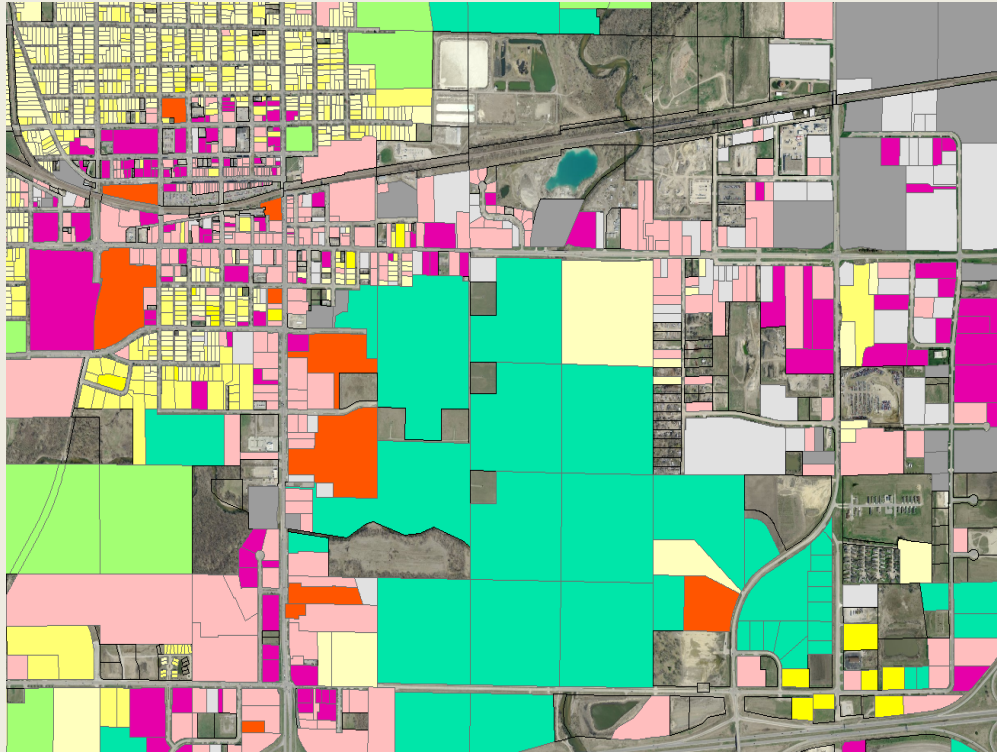
Intermediate Stops

- Working with Caliper to implement
 - Hefty memory requirement
 - Current TransCAD process requires zones aggregated to districts
 - Caliper implementing refinement in TransCAD 7
 - Work in Progress...

Parcel-based Land Use

- Square footage as predictive variable
- Rates by Land Use Code
- Predictive variables for generation

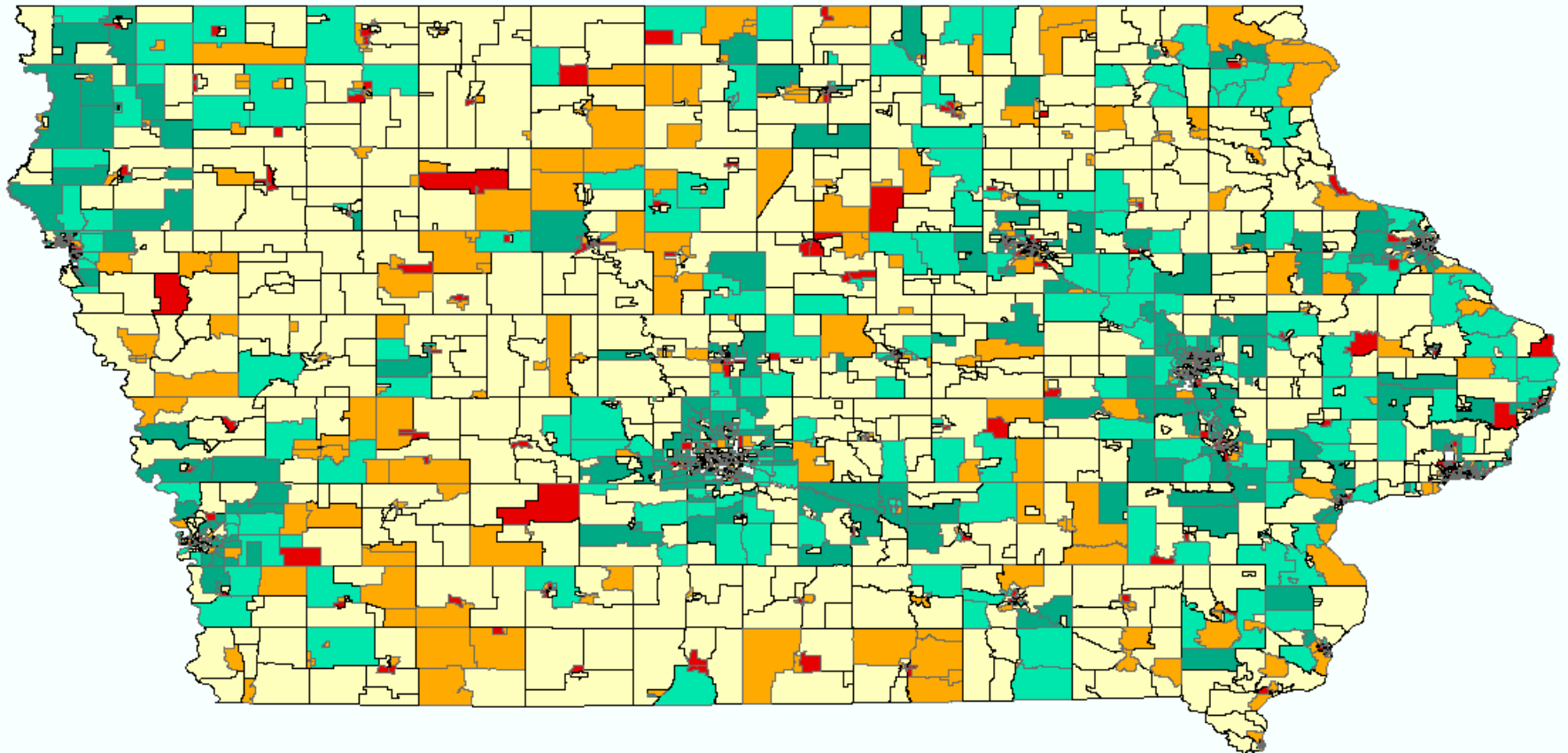
Parcel File



Trip Rates

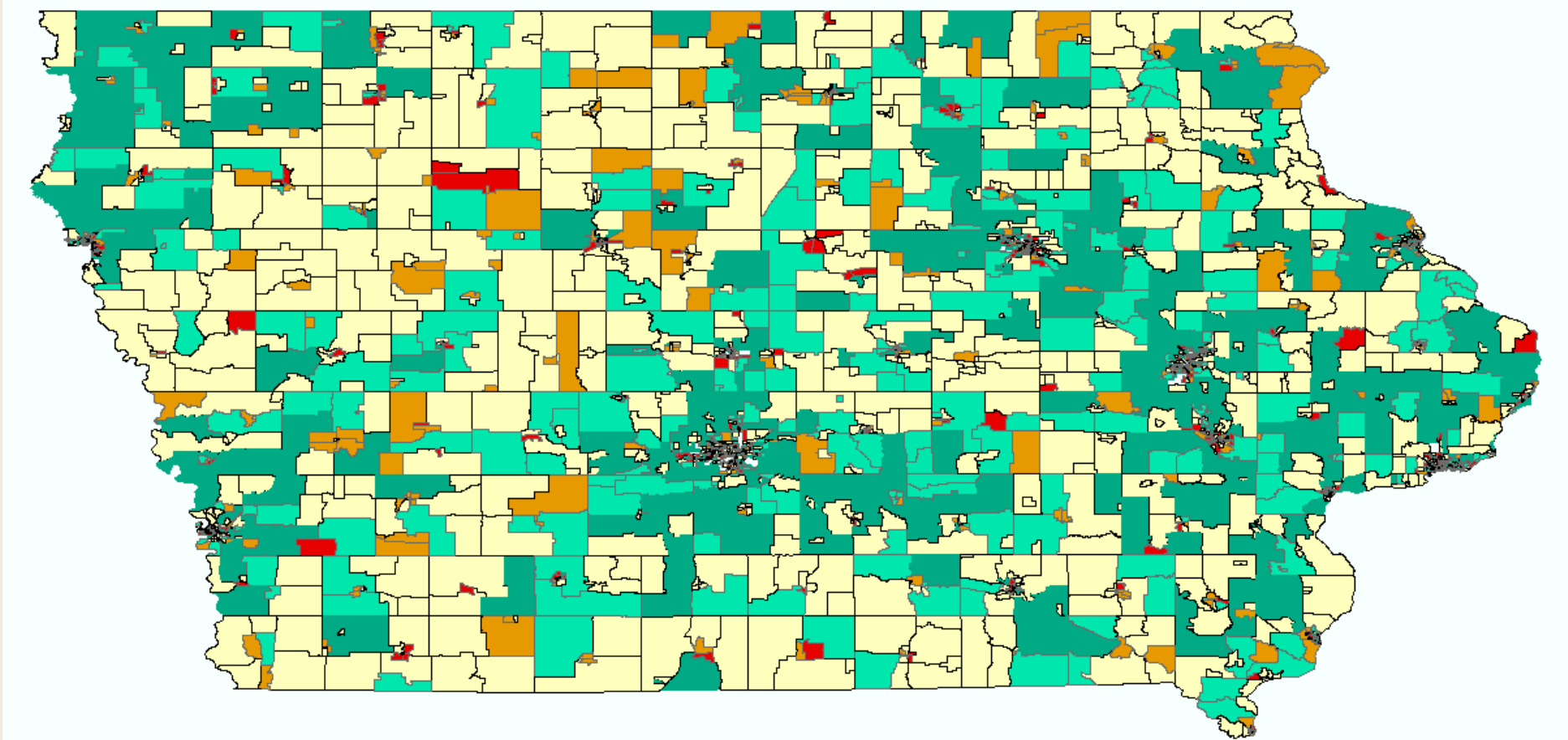
- Productions
 - Vehicle availability vs. income level as predictive variable
- Attractions
 - Parcel building area (1000 square feet) as predictive variable
 - Rates by land use code

Income Range



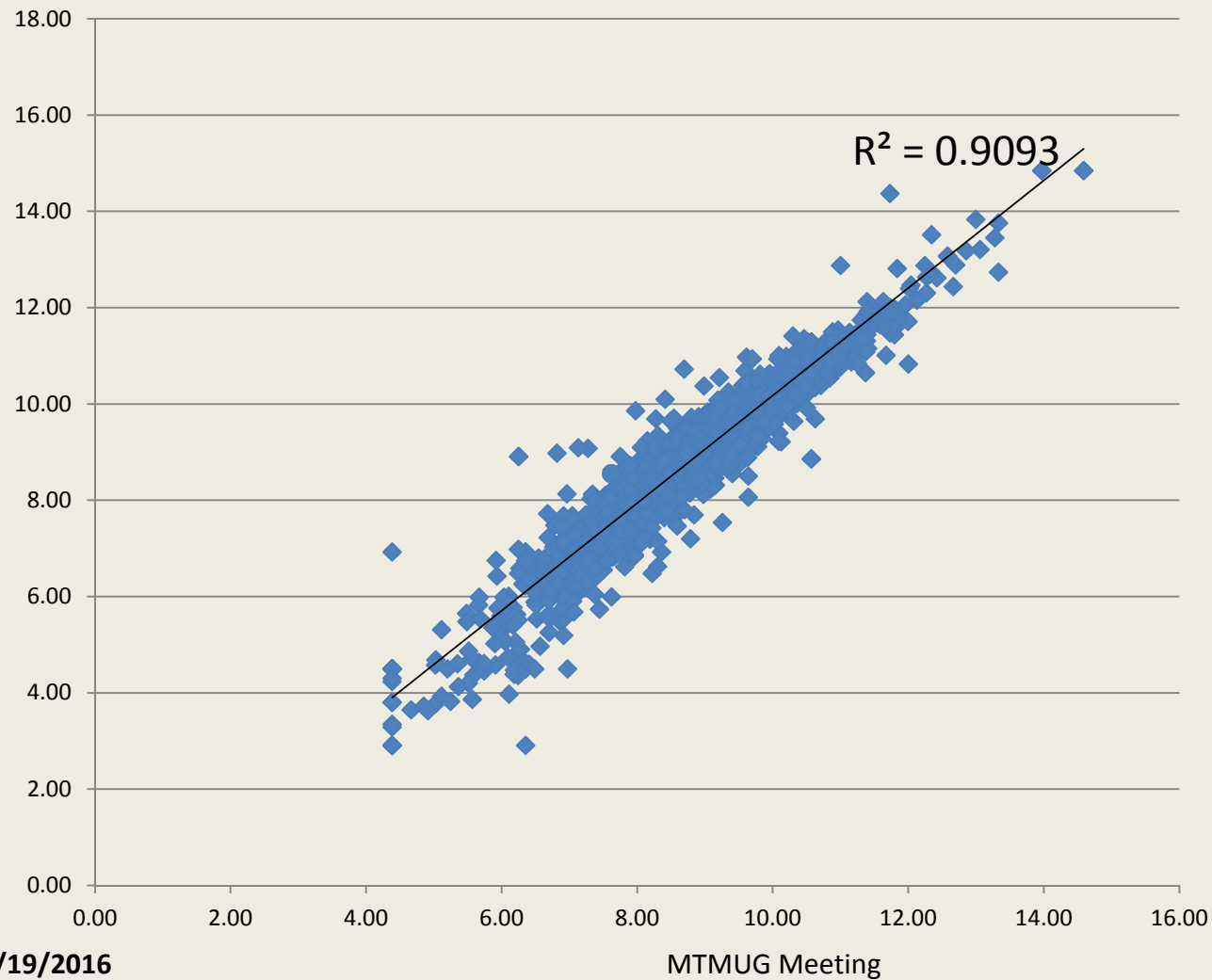
Red=Very Low, Orange=Low, Buff = Average, Light Green=High , Dark Green=Very High

Vehicle Availability



Red=Very Low, Orange=Low, Buff = Average, Light Green=High , Dark Green=Very High

Trips/Household Vehicle Availability vs. Income

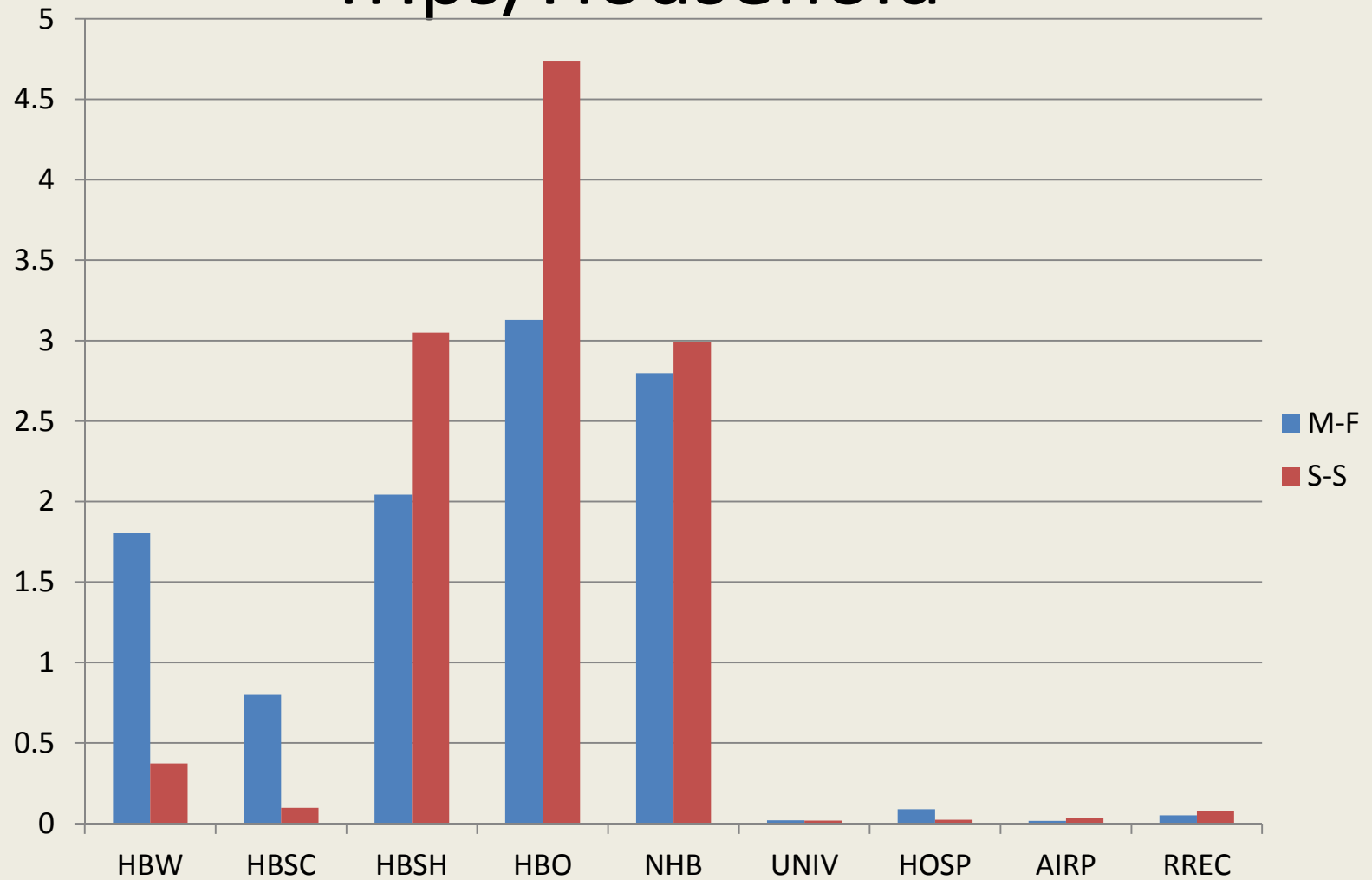


Trip Generation

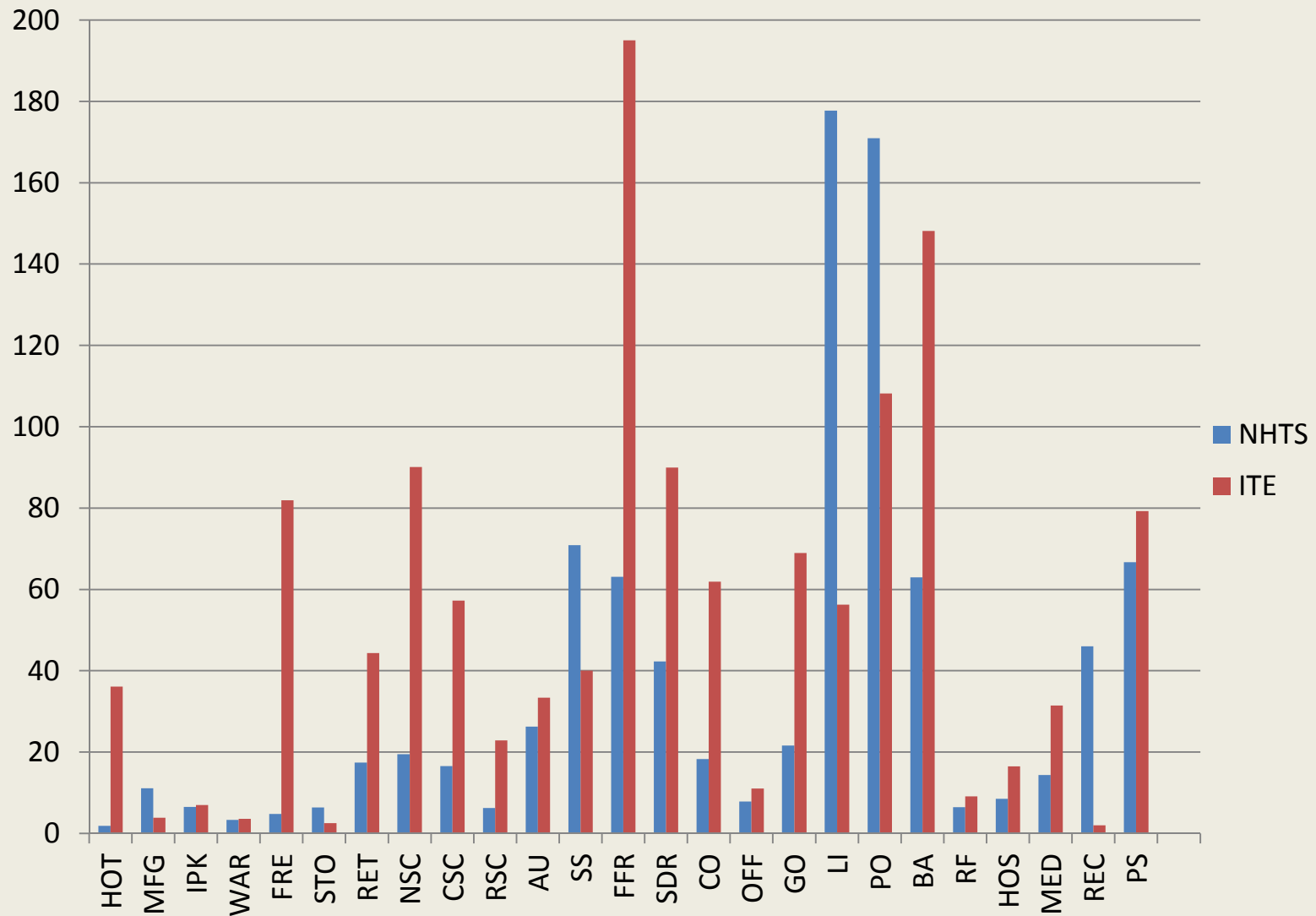
- Production rates
- Attraction rates

Trip Production Rates

Trips/Household

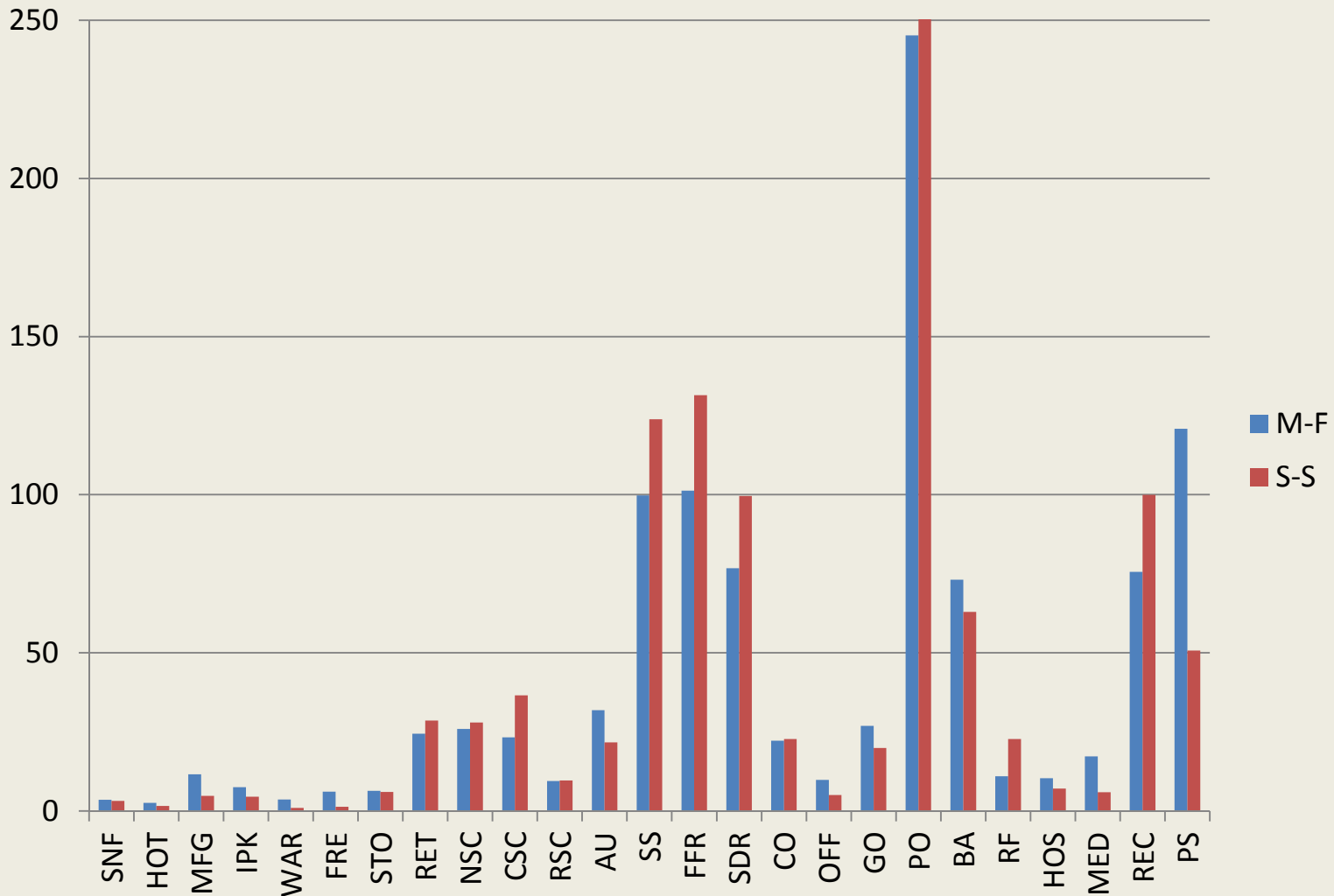


Trip Attraction Rates

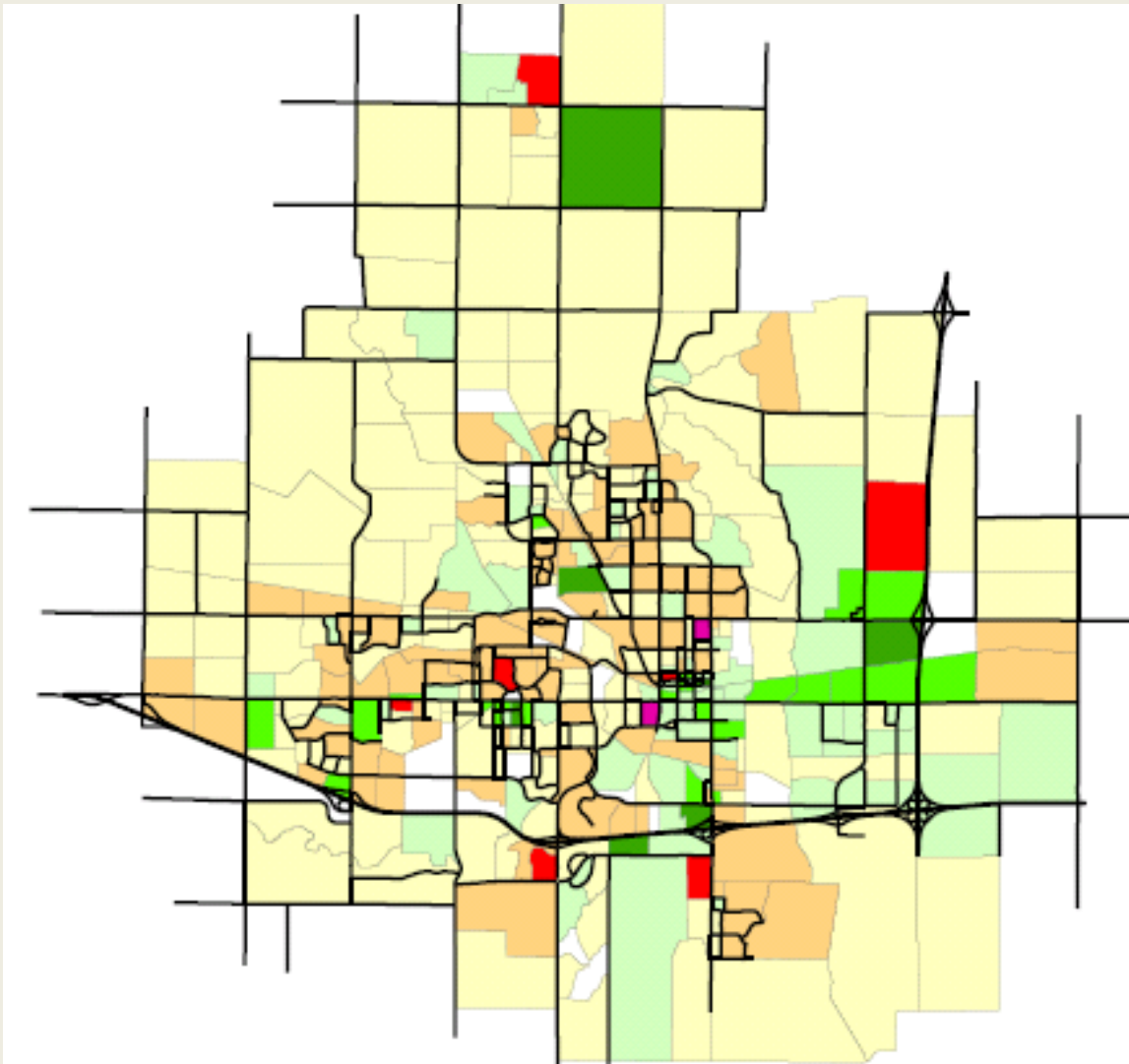


Trip Attraction Rates

Trips/Thousand Square Feet



Trip Attraction Differences



7/19/2016

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23

Network Elements

- TAZ
- Node
- Link
- Observed Counts
- Observed Speeds

TAZ's

- Rules of Thumb for TAZ Development
- Listing of Attributes
 - Area
 - HH and Square Footage Sums
 - Density (activity per square mile)
 - Parking Capacity
- Recommend Trip Generation Data in Separate Tables to be Joined as Needed

Nodes

Attribute Name	Format	Responsible Party	Description
Control (-)	Integer	MPO*	Represents the intersection control type: 0 or Null = No control/shape point 1 = Yield/roundabout 2 = Stop control 3 = Signalized control (sequential) 4 = Signalized control (actuated) 5 = Other delay (RR crossing, school crossing, etc.) 6 = Centroid loader 7 = Transit stop 8 = Internal centroid 9 = External centroid
AM cycle (-)	Integer	MPO	Value representing the cycle length of the intersection's traffic signal
PROJNO1	Character	MPO	Project number for the first implemented project on the node; used to join to the project master list.

* Recommend use of the Intersection Control Editor.

NOTE: (-) indicates attribute has 3 subsequent entries for project-specific updates. Only non-zero values in these columns will be used directly in project analysis.

Links

- Required Attributes for ISMS Execution:
 - DIR & Length
 - FACTYPE
 - MEDIAN
 - ACCESS
 - RSTRCT
 - PSPEED
 - BLANES
 - CNT

Required Link Attributes

Attribute Name	Format	Responsible Party	Description
FACTYPE (-)	Integer	DOT provides FEDFUNC; MPO to reclassify to more detailed FACTYPE	ISMS Functional classification of facility: 0 = Not in existing model 1 = Interstate 2 = Freeway 3 = Expressway 4 = System ramp 5 = Service ramp 6 = Principal arterial 7 = Minor arterial 8 = Collector 9 = Minor collector 10 = Local 11 = Gravel 12 = Centroid connectors 13 = Bus only 14 = Walk link

Required Link Attributes

Attribute Name	Format	Responsible Party	Description
MEDIAN (-)	Integer	DOT provided from RAMS; MPO verified	Median type: 1 = Wide divided median (>20 feet) 2 = Narrow divided median (<20 feet) 3 = Center turn lane 4 = Undivided
ACCESS (-)	Integer	DOT provided from RAMS; MPO verified	Level of access along link, measured in number of mid-block access points per mile: 1 = No access 2 = Low access (<5 per mile, per direction) 3 = Medium access (5-10 per mile, per direction) 4 = High access (>10 per mile, per direction) Data available from RAMS
RSTRCT (-)	Integer	DOT provided from RAMS; MPO verified	Restrictions on link: 1 = No restrictions 2 = No trucks 3 = Trucks only

Required Link Attributes

Attribute Name	Format	Responsible Party	Description
PSPEED (-)	Real	DOT provided from RAMS; MPO verified	Posted speed of facility in miles per hour
* BLanes (-)	Real	DOT provided from RAMS; MPO verified	Number of lanes open throughout the day, by direction
*_CNT	Integer	MPO ⁺	Intersection control at end of link (directional attributes) 0 or Null = No control 1 = Yield 2 = Stop control/roundabout 3 = Signalized control (sequential) 4 = Signalized control (actuated)

Optional Link Attributes

- Descriptive Attributes
 - Name
 - Secondary Name
 - County Number
 - Jurisdiction
 - System (DOT, County etc)
 - Area Type (CBD, etc)
- Lane Attributes
 - Add. Lanes (Parking)
- Intersection Attributes
 - No. of L, T and R Lanes
 - Length of Turn Bays

Observed Counts

- Maintain in Separate Geographic Database
- Utilize at Run Time for Reporting/Validation

ATTRIBUTE NAME	FORMAT	RESPONSIBLE PARTY	DESCRIPTION
LINKID	Integer	Model-generated	TransCAD link ID of corresponding roadway segment
AADT	Integer	MPO	Average annual daily traffic count
AADT_YR	Integer	MPO	Year of AADT
AADT_SR	Character	MPO	Source of AADT
AAWDT	Integer	MPO	Average annual weekday traffic count
AAWDT_YR	Integer	MPO	Year of AAWDT
AAWDT_SR	Character	MPO	Source of AAWDT
AAWET	Integer	MPO	Average annual weekend traffic count
AAWET_YR	Integer	MPO	Year of AAWET
AAWET_SR	Character	MPO	Source of AAWET
*_AM_CNT	Integer	MPO	Directional AM peak period count
AM_YR	Integer	MPO	Year of AM peak period count
AM_SR	Character	MPO	Source of AM peak period count

7/19/2016 Additional rows to serve as an archive of traffic counts for this link. MTMUG Meeting

Observed Speeds

- INRIX Data Available for Higher Class Facilities
- Generate Average Speed
 - Time Period,
 - Direction,
 - Weekday/Weekend
- Maintain in Separate Geographic Database
- Utilize at Run Time for Reporting/Validation

Intersection Delay

- Recommend incorporating intersection delay in addition to link delay
- TransCAD provides 3 levels of turn penalties
 - Global
 - Linktype
 - Specific

Intersection Delay

- Requires coding of intersection control
 - Control type on node
 - 0 or Null – No Control/Shape Point
 - 1 – Yield
 - 2 – Stop Control/Roundabout
 - 3 – Signalized Control (sequential)
 - 4 – Signalized Control (actuated)
 - Control type on link
 - AB and BA directions

Intersection Delay

- Linktype Penalties
 - Functional Class
 - Limited Access (Interstate, Freeway, System Ramps)
 - Arterial (Expressway, Principal, Minor Arterial, Service Ramps)
 - Collectors (Major and Minor)
 - Local (including Gravel, Centroid Connectors)
 - Intersection Control
 - Signalized
 - All-Way Stop Control
 - Two-Way Stop Control
 - Uncontrolled

Intersection Delay

- Assumes ~LOS C delays for Peak condition

From Linktype	To Linktype	Minutes of Delay per Turn (Peak)			
		Left	Right	Thru	UTurn
Limited Access	Ramps	0.15	0.15	0.15	99
	All Others	0.15	0.15	0.00	99
Signalized Arterial/ Ramp	Arterial/Ramp	0.50	0.15	0.25	0.50
	Collector	0.50	0.15	0.25	0.50
	Local/CC	0.35	0.10	0.15	0.40
AWSC Arterial / Ramp	Arterial/Ramp	0.30	0.10	0.30	0.30
	Collector	0.25	0.10	0.25	0.25
	Local/CC	0.20	0.07	0.20	0.20
TWSC Arterial / Ramp	Arterial/Ramp	0.45	0.15	0.35	0.45
	Collector	0.30	0.10	0.25	0.30
	Local/CC	0.25	0.10	0.20	0.25
Uncontrolled Arterial / Ramp	All Types	0.25	0.05	0	0.25

- LOS B for Off-Peak
- All defaults can be modified during calibration

Intersection Delay

- Specific Movement Penalties
 - Overrides linktype penalty
 - Values can be developed using:
 - Highway Capacity Software
 - Synchro or Comparable
 - Observed Delays
 - TransCAD's Volume-Dependent Delay Assignment

Intersection Delay

- Volume-Dependent Delay
 - Signalized Intersections
 - Utilizes Optional Link Attributes
 - Requires Signal Timing Data
 - Edited with TransCAD's Intersection Control Editor

Intersection Delay

- Intersection Control Editor

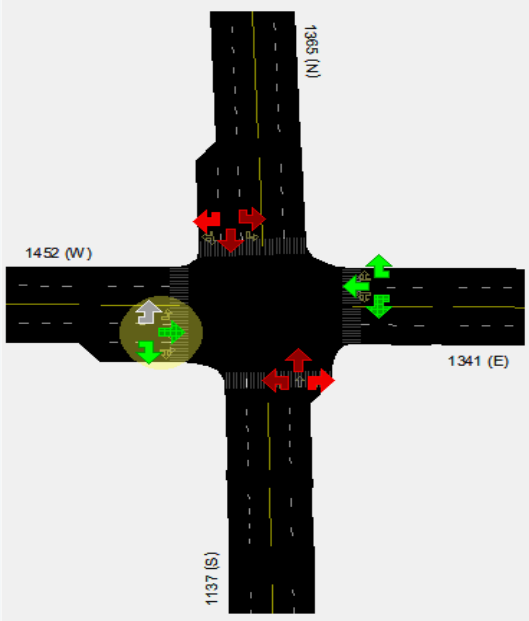
TransCAD (Licensed to HNTB)

Intersection Control Editor (C:\ames\full_study\vdd\SignalPlans5.tms)

Control: Pretimed (Concurrent Phasing) Start Time: 00:00:00 Change... Remove Based on Choose base plan... Node: 1435

General Geometry Turns Timing Ring and Barrier HCM Adjustments LOS

Phase 2+6 in Barrier 1



Ring and Barrier Table

Create from Template: <Choose template for a new ring and barrier table>

Number of Rings: 2 Barriers: 3

Rings \ Barriers	B 1	B 2	B 3
R 1	2	3	4
R 2	6	7	8

0 10 20 30 40 50 60 70 80 90

69.9 10 15.1
 ϕ 2 ϕ 3 ϕ 4
 69.9 10 15.1
 ϕ 6 ϕ 7 ϕ 8

Save Summary Close

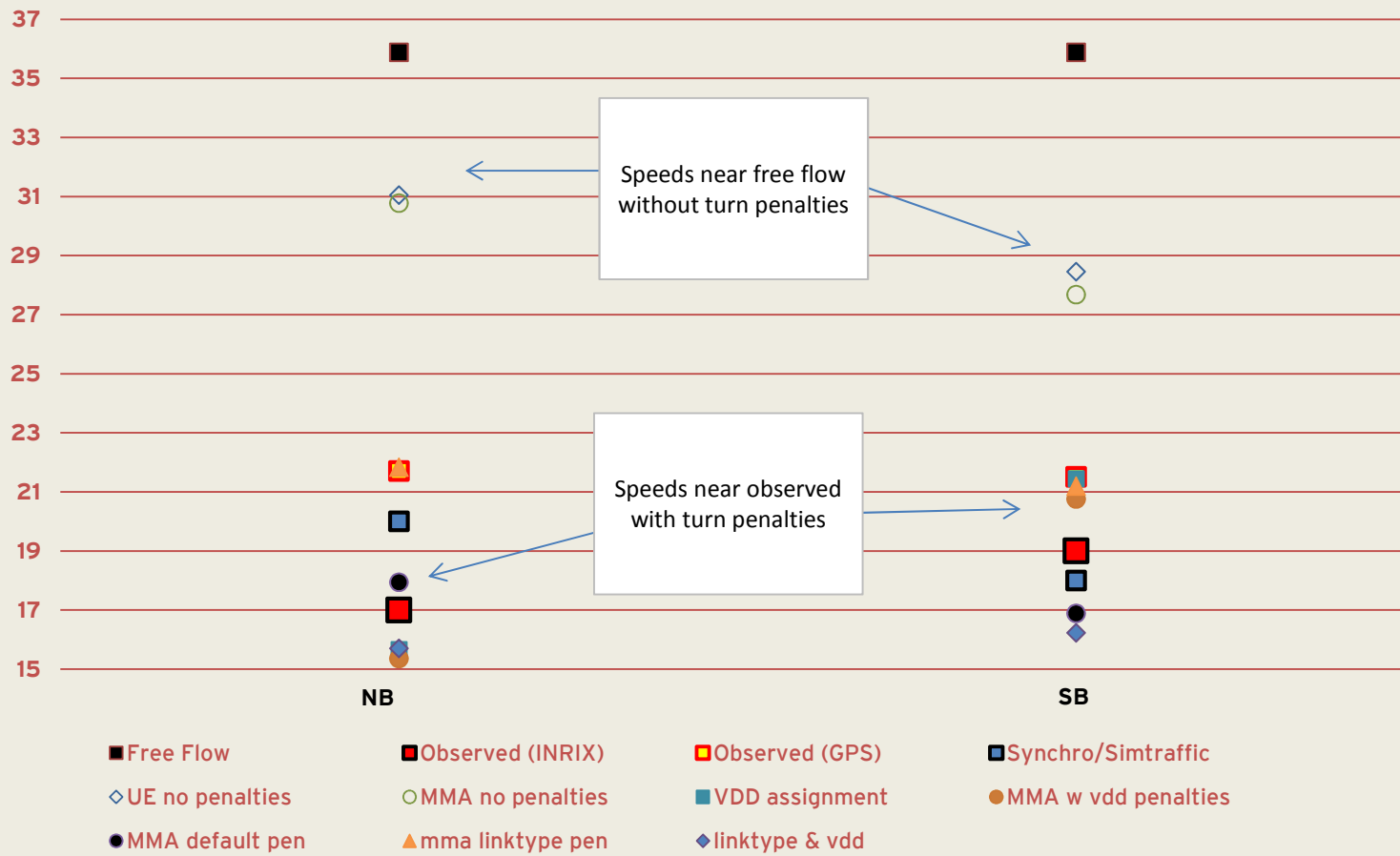
7/19/2016 = 0.28265 Miles (1:17,909)

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3:00 PM 5/10/2016

Intersection Delay

Duff Avenue Speeds- PM Peak Lincoln Way to 16th Street




7/19/2016

Note: VDD penalties capped at 1.25 minutes for use in subsequent assignments

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Draft Model Reporting

- Report generated in HTML format
- Provides hyperlinks to report sub-sections
- Provides users option to generate some or all summaries

**IOWA STANDARDIZED
MODEL STRUCTURE**

Summary Report for the MPO Travel Model
Developed by ISMS Team for the MPO

Scenario Name:
2010 Validation Run
Scenario Directory:
C:\AAMPO\AAMPO
Report File:
C:\AAMPO\AAMPO\All_Output\7 PostProcess\Summary.html
Report Created on:
Tuesday, March 15, 2016 at 3:08 pm
Scenario Description:
Model Validation Run for the Base Year (2010)

Table of Contents

- [0. Title Page](#)
- [1. Input Files and Parameters](#)
- [2. Input Network Summary](#)
- [3. Socioeconomic Data Summary](#)
- [4. Trip Generation Summary](#)
- [5. Trip Distribution Summary](#)
- [6. Mode Split Summary](#)
- [7. Assigned Trip Summary](#)
- [8. Daily Assignment Summary](#)
- [9. Assignment Speed Summary](#)
- [10. Validation Summary](#)

ISMS Project Team - MPO Travel Model - 2010 Validation
Input Network Summary Page 2.1

Draft Model Reporting

- Report tables can be easily copied to excel/word for further formatting
- Final report will also include screenline validation summary

Modeled Volume / Count Volume

MPO Model

	CBD	Urban	Suburban	Rural	Total
Freeway	--	--	--	96.5%	96.5%
Expressway	--	--	--	--	--
Major Arterial	--	91.3%	92.6%	98.6%	93.8%
Minor Arterial	--	79.9%	86.1%	96.4%	91.7%
Collector	44.7%	27.4%	61.2%	93.8%	81.0%
Ramps	--	--	--	138.3%	138.3%
Centroid Connectors	--	--	--	--	--
Total	44.7%	83.8%	88.3%	96.6%	92.9%

ISMS Project Team - MPO Travel Model - 2010 Validation
Model Validation Summary Page 10.4

Percent Volume Error

MPO Model

	CBD	Urban	Suburban	Rural	Total
Freeway	--	--	--	-3.5%	-3.5%
Expressway	--	--	--	--	--
Major Arterial	--	-8.7%	-7.4%	-1.4%	-6.2%
Minor Arterial	--	-20.1%	-13.9%	-3.6%	-8.3%
Collector	-55.3%	-72.6%	-38.8%	-6.2%	-19.0%
Ramps	--	--	--	38.3%	38.3%
Centroid Connectors	--	--	--	--	--
Total	-55.3%	-16.2%	-11.7%	-3.4%	-7.1%

% Root Mean Square Error

MPO Model

	CBD	Urban	Suburban	Rural	Total
Freeway	--	--	--	6.8%	6.8%
Expressway	--	--	--	--	--
Major Arterial	--	21.9%	18.1%	10.2%	16.9%
Minor Arterial	--	25.5%	30.8%	21.0%	24.5%
Collector	64.9%	--	48.7%	39.5%	47.3%
Ramps	--	--	--	61.7%	61.7%
Centroid Connectors	--	--	--	--	--
Total	64.9%	24.3%	23.8%	15.4%	20.3%

Next Steps

- Complete Trip Generation Process
- Develop Transit Network Standards
- Review Trip Distribution Options
- Develop Mode Choice Submodel
- Continue Documentation including Roles and Responsibilities

Questions?