Model Stitchwork:

Development of a Statewide Model for Application in the SC Multimodal Transportation Plan

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Outline

- Model Background
- Stitchwork Approach
- Stitchwork Application
- Lessons Learned
- Next Steps

Model Stitchwork

MODEL BACKGROUND

History

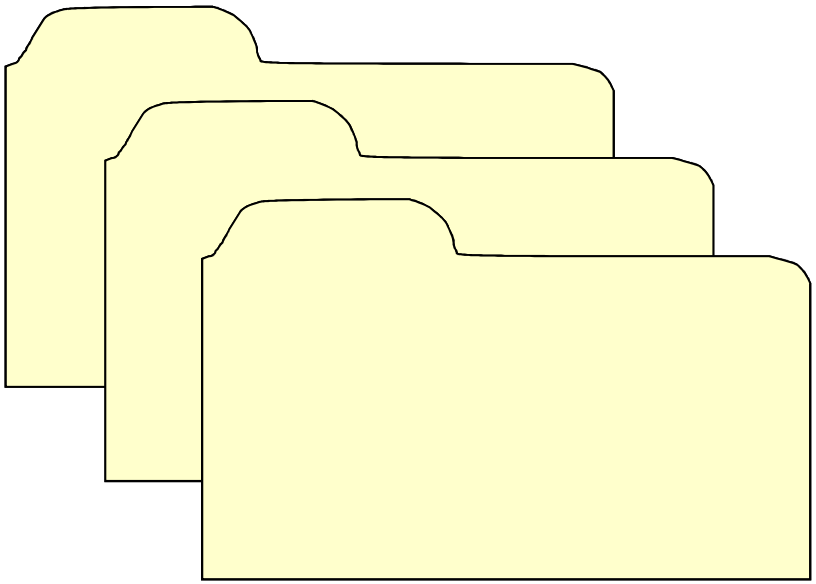
- 1995 Statewide Model
  - Tranplan
  - 293 internal zones and 43 external zones
  - External model components (.xls and fortran)
  - 2015 E+C Scenario
- 2010 Statewide Model
  - Multimodal Transportation Plan (MTP), “Charting a Course to 2040”
  - TransCAD 6r2
  - 6,345 internal zones, 100 dummy zones and 97 external zones
  - 2040 E+C Scenario

Why Statewide Model?

- South Carolina Multimodal Transportation Plan
  - Interstate Plan, Strategic Corridor Plan, Freight Plan, Transit Plan
- Economic project prioritization
  - grouped corridor-level infrastructure improvement
  - travel patterns (time/miles traveled, delay, capacity needs, etc.)
  - travel-efficiency benefits
- Support other refined transportation and traffic analysis

Why Statewide Model?

- Management of data
- Management of models within the state
- Standardized modeling platform



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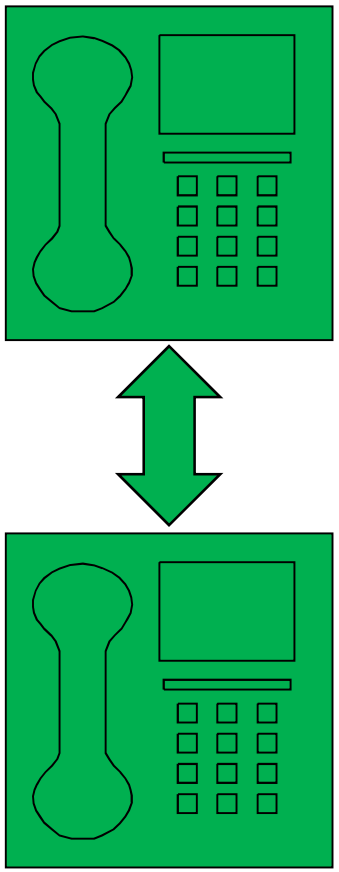
STITCHWORK APPROACH

Benefits

- State of practice
  - NCHRP Synthesis 358: Statewide Travel Forecasting Models – Statewide and Urban Model Integration: “Good linkage between statewide and urban models are desirable, but not necessary (pg. 31).”
- Efficiency in model development
- Efficiency in model updates
- High resolution for economic analysis

Benefits

- Urban models can “talk to” the statewide model
  - Up and Down integration
- Consistency / Compatibility
  - Geography
  - Attributes
- Tool for urban models
  - Reference for travel conditions
  - Estimates of external traffic
- Buy in from stakeholders



Challenges

- Communication with Urban areas
- Urban areas with different update cycles
- Different analysis years
- Different model structures
- Overlapping geographies

Model Stitchwork

STITCHWORK APPLICATION

MPOs and COGs

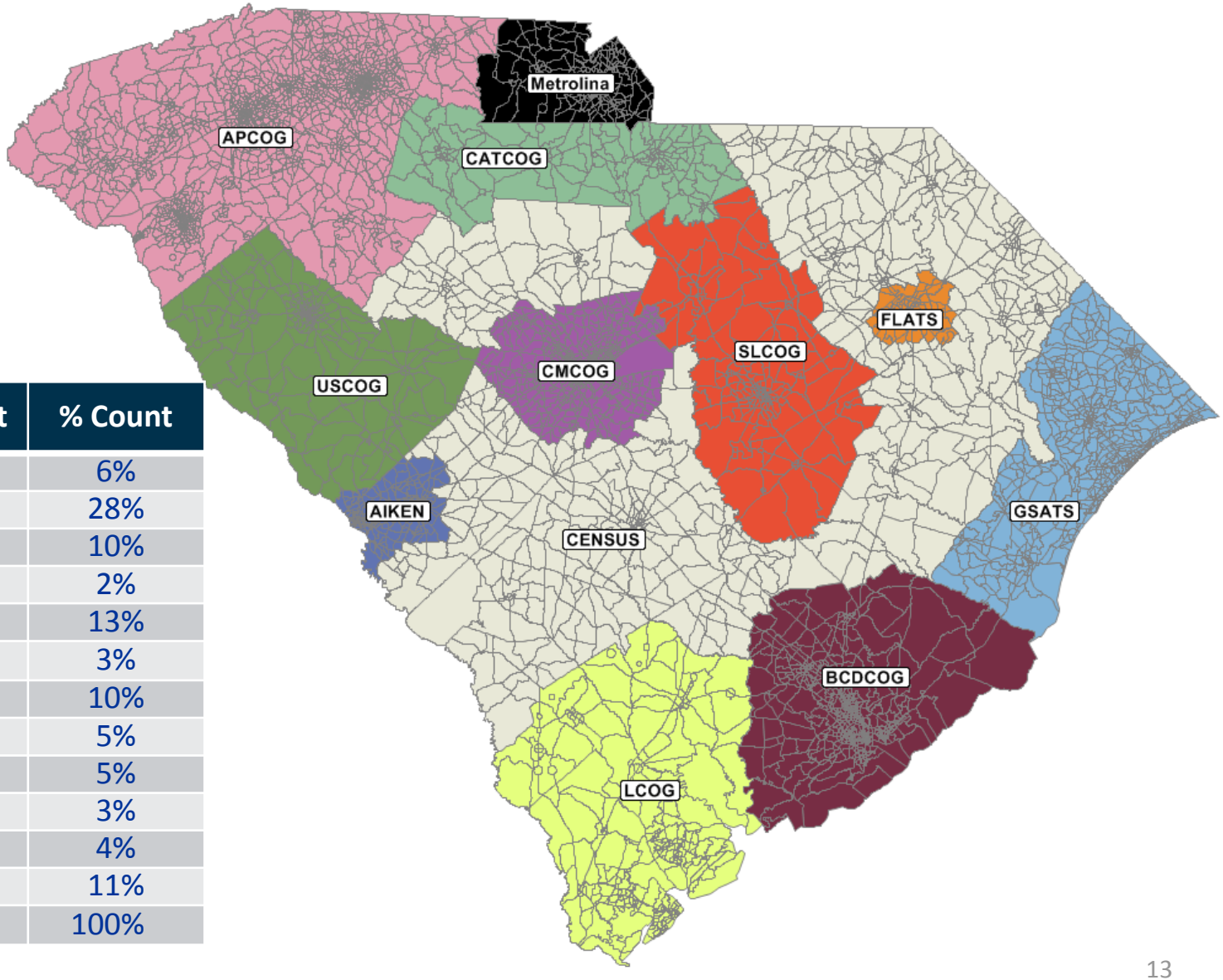
- 11 MPOs and 10 COGs
- Detailed review of the model data for use in the SC SWM
  - Model years
  - Model components
  - Trip purposes
  - Geographic extent
  - Input datasets
  - Parameters
  - Other

Urban Model	Base Year	Forecast Year
Aiken	2006	2035
APCOG	2010	2040
BCDCOG	2010	2035
CATCOG	2000	n/a
CMCOG	2005	2035
FLATS	2000	2035
GSATS	2010	2035
LCOG	2010	2040
Metrolina	2010	2040
SLCOG	2009	2035
USCOG	2010	2030

- This analysis resulted in eleven different urban models appropriate for stitching together to form the SC SWM.

Traffic Analysis Zones

Model Area	TAZ Count	% Count
AIKEN	365	6%
APCOG	1,768	28%
BCDCOG	664	10%
CATCOG	148	2%
CMCOG	825	13%
FLATS	165	3%
GSATS	646	10%
LCOG	304	5%
Metrolina	305	5%
SLCOG	211	3%
USCOG	264	4%
Rural	680	11%
Statewide	6,345	100%



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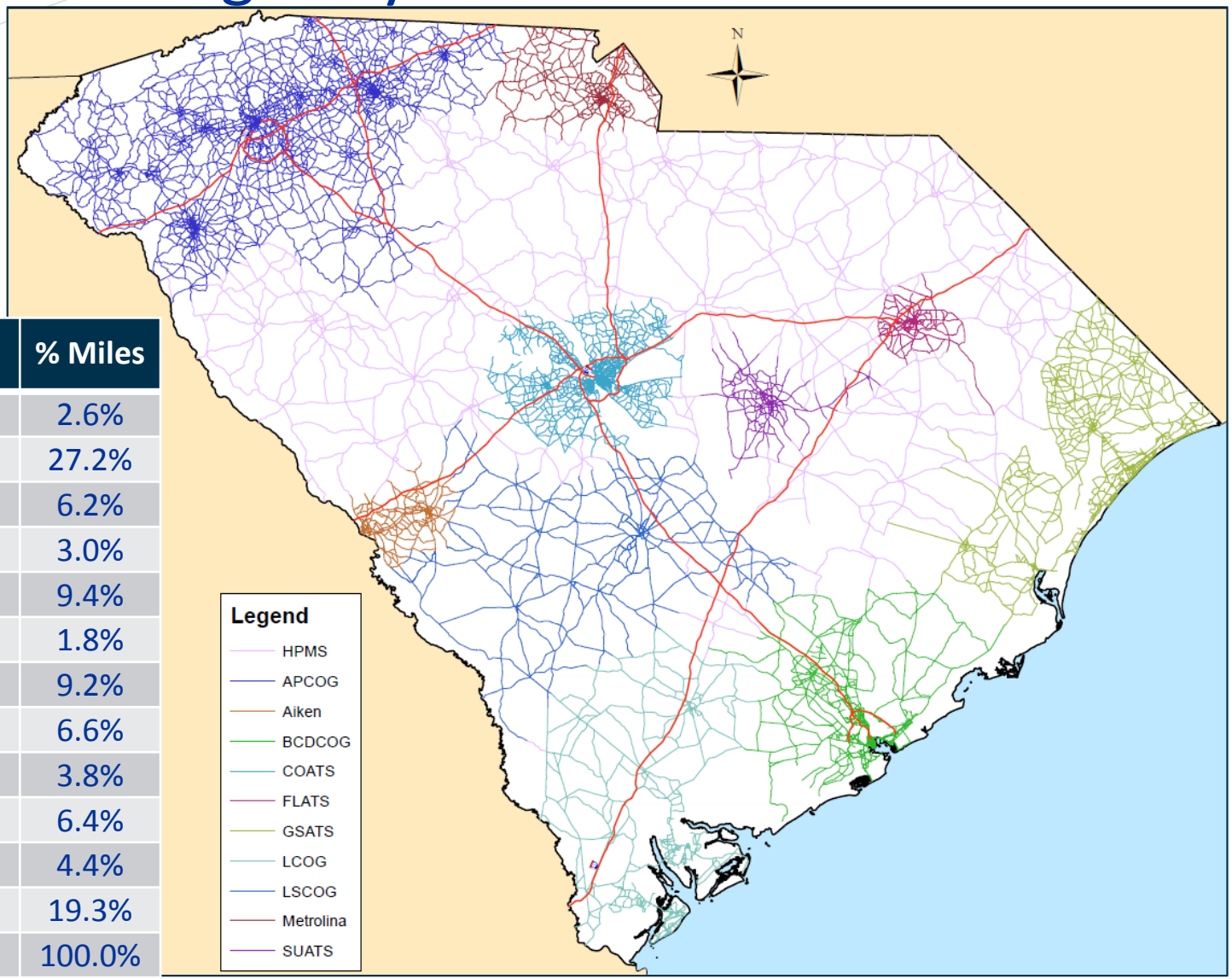
Highway Network

Model Area	Centerline Miles	% Miles
AIKEN	485	2.6%
APCOG	5,047	27.2%
BCDCOG	1,147	6.2%
CATCOG	564	3.0%
CMCOG	1,741	9.4%
FLATS	331	1.8%
GSATS	1,696	9.2%
LCOG	1,231	6.6%
Metrolina	706	3.8%
SLCOG	1,195	6.4%
USCOG	809	4.4%
Rural	3,573	19.3%
Statewide	18,524	100.0%



Geographic ID Linkage

Network Attributes
ID
Model_Area_TAZ
Model_Area_Net
MPO_LinkID_Net
MPO_AT
MPO_Divided
HPMS_ID_Net
HPMS_File

Zone Digit	Zone ID Description	
Digits 1-2 (##000000)	County FIPS ID (1-91)	
Digits 3-4 (00##0000)	Model Area ID 1 – AIKEN 2 – APCOG 3 – BCDCOG 4 – CATCOG 5 – CENSUS 6 – CMCOG 7 – FLATS	 8 – GSATS 9 – LCOG 10 – Metrolina 11 – SLCOG 12 – USCOG 13 – Dummy 14 – External
Digits 5-8 (0000####)	TAZ ID - MPO/COG model zone IDs - New zone IDs for CENSUS areas	
Digits 1-8 (########)	County / Model Area / Zone	

Other Model Components

- Parameters
  - Trip Rates
  - Gamma Parameters
  - Vehicle Occupancy Rates
- Trip Tables
- External volumes
- Truck Model
- Assignment Model

Class Count	Combination 1	Combination 2	Combination 3	Combination 4
1	Urban HBW	Auto	Urban Auto	Work Auto
2	Urban HBO	Truck 1	Rural Auto	Non-Work Auto
3	Urban NHB	Truck 2	Auto External	Auto External
4	Rural HBW		Truck 1	Truck 1
5	Rural HBO		Truck 2	Truck 2
6	Rural NHB			
7	Auto EI			
8	Auto EE			
9	Truck 1 II			
10	Truck 1 EI			
11	Truck 2 II			
12	Truck 2 EI			
13	Truck 2 EE			

How Do Results Compare?

SWM

Area	Count	% RMSE
AIKEN	201	33.9
APCOG	2,202	36.3
BCDCOG	521	19.7
CATCOG	251	25.7
CMCOG	952	15.1
FLATS	181	19.3
GSATS	413	18.0
LCOG	443	23.9
Metrolina	307	39.2
SLCOG	687	29.2
USCOG	285	20.4
Rural	1,151	25.3
Statewide	7,594	27.4

SWM vs Urban Models

2010	APCOG		LCOG		BCDCOG*	
	Urban Model	SWM	Urban Model	SWM	Urban Model	SWM
Population	1,238,011	1,238,011	246,577	246,577	621,662	637,352
Households	482,545	482,545	96,027	96,027	249,569	249,260
Employment	601,531	601,531	87,920	87,920	307,809	303,431
TLD (time)						
HBW	19.2	19.0	20.6	22.8	21.2	18.6
HBO	15.4	13.4	17.3	17.6	16.43	12.6
NHB	14.5	12.3	13.6	14.6	14.78	11.5
Auto Trips	3,499,794	4,400,382	628,447	840,229	1,656,638	2,274,654
Truck Trips	119,102	118,172	18,290	23,995	114,941	59,798
VMT	33,770,980	33,763,016	9,240,832	8,631,029	15,540,141	14,590,250
VHT	763,916	846,682	208,329	206,859	361,874	484,243
Avg Speed	44.2	39.9	44.4	41.7	42.9	30.1
%RMSE	17.7	36.3	21.9	23.9	26.5	19.7

*BCDCOG updated model statistics; not used in the development of the SC SWM

Model Stitchwork

LESSONS LEARNED

Lessons Learned

- Reduce / limit complexity
- Order to merge data
- Methods to conform inputs for common years
- Methods to conform model designs
- Two-way linkage
- Managing updates

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NEXT STEPS

Moving Forward

- Data management
- Verify the goal of consistency
  - Asses linkage after urban model updates
  - Compare results from statewide and urban models

Statistic	Summary Level
SE Data (Pop, HH, EMP)	Regional
Person Trips	Regional, by Purpose
Trips per HH	Regional, by Purpose
Average TLD	Regional, by Purpose
Vehicle Trips	Regional, by Purpose
Vehicle Occupancy Rates	Regional, by Purpose
Lane-Miles; Centerline Miles (non-CC)	Regional, by Func. Class
VMT, VHT, Avg Speed	Regional, by Func. Class
Sum of ADT at Externals	Regional, by Func. Class

- Enhance model components

Moving Forward

- COG Model Extraction Tool
  - Prepare model structure
  - Prepare parameter files
  - Prepare input files
  - Execute model

Questions?

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