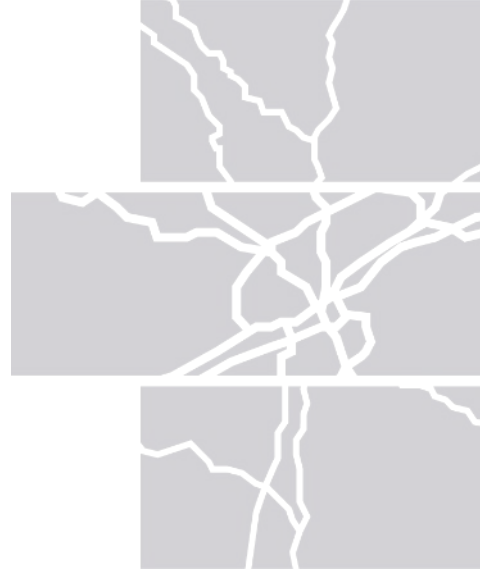


# Knoxville TPO Model Update

Overview of Network and Land Use Development for new 2022 Base Year

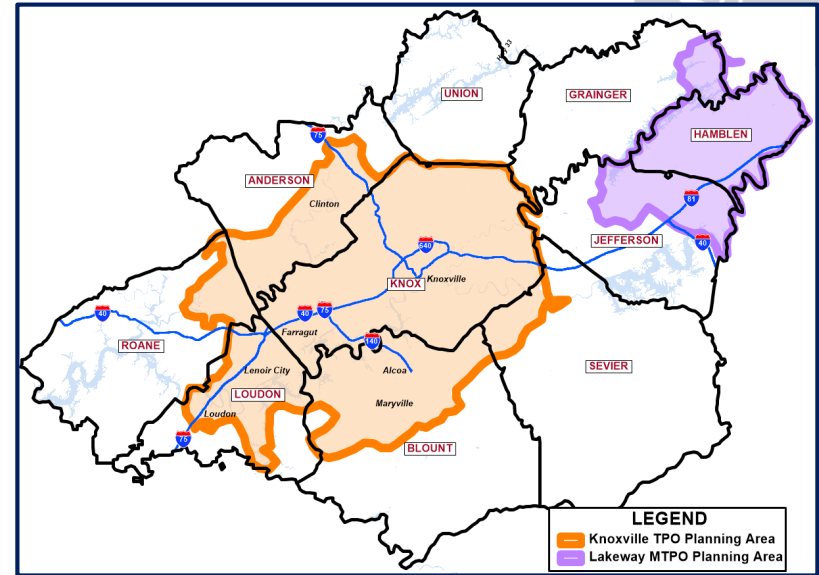
TNMUG MEETING

DECEMBER 4, 2024



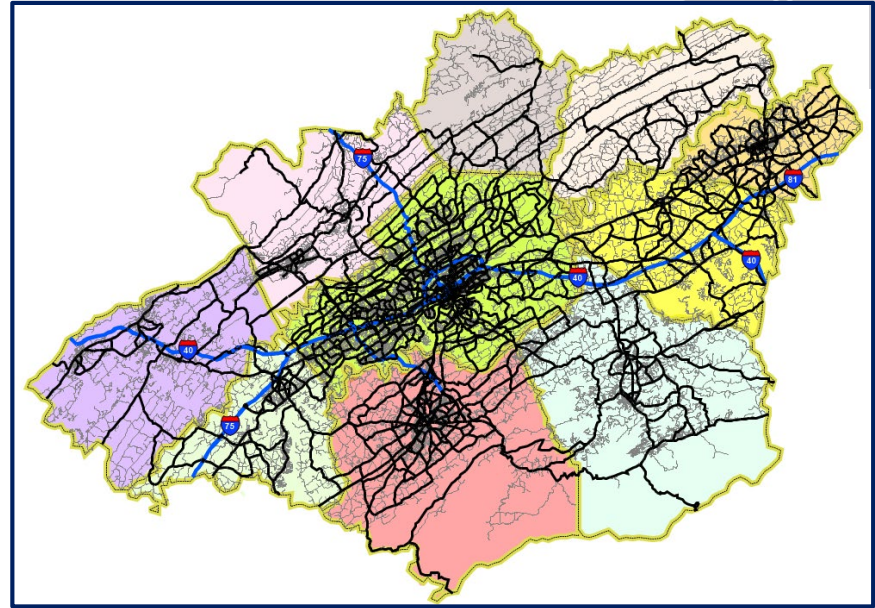
# TPO Regional Travel Demand Model Update Summary

- Knoxville TPO Maintains a 10-County Regional Travel Demand Forecasting Model that includes all areas subject to Air Quality Conformity
  - Includes both the Knoxville TPO and Lakeway MTPO Planning Areas
- Model runs in TransCAD software version 9
- Current effort to support Mobility Plan 2050 involves updating and validating to new base year 2022 conditions from previous model base year of 2018 – a “minor” update
  - TPO staff updated network and socioeconomic data
  - Caliper Corporation retained to recalibrate and validate model travel behavior relationships



# Roadway Network Update - Overview

- Model network updated from 2018 base year to 2022 with completion of roadway projects (widening and new roadways)
- Base year traffic volumes from TDOT and TPO roadway counts used to validate model outputs.
  - Focus on high-volume I-40/75 counts for adjustments (see next slide)
- Development of “Existing plus Committed” (E+C) network that is used to determine needs & deficiencies
  - More conservative approach on definition of “committed”



# Roadway Network Update – Interstate Count Review and Adjustment

- I-40 and I-75 are conjoined for 16 miles through west Knox County
- Results in Knox County having 4 out of top 5 AADT's in all of TN
  - Highest 2022 AADT = 218,583 vpd
  - Highest 2023 AADT = 204,861 vpd
- Some of the Base Year 2022 Interstate AADTs appeared abnormally high and out of balance between a few interchanges
- Replicated TDOT's ramp balancing and adjusted several locations throughout system – results more in line with 2019-2023 average values
- Suggestion is to add more ATR locations where possible to supplement ramp balancing



# Base Year Land Use and Socioeconomic Data Update - Overview

- Establish County-level “control” totals for base year and future conformity analysis years
  - Presented CBER and Woods & Poole Projections to Technical Committee, selected W&P
- Allocate to smaller “Traffic Analysis Zone” (TAZ) geography for base year
  - Decennial Census population and households available at Census Block level, but not for intercensal years like 2022
  - Employment data purchased by TDOT from Data Axle, aka InfoGroup – geocoded to actual establishments
- Couple of Items to Compare Notes with TNMUG Group:
  - How best to derive TAZ Intercensal Population and account for Census Disclosure Proofing?
  - What is the definitive Employment data source?

County, Population	2022 <sup>1</sup>	2030 <sup>2</sup>	2040 <sup>2</sup>	2050 <sup>2</sup>
Anderson	78,913	81,214	83,170	84,591
Blount	139,958	150,620	163,105	175,416
Grainger	24,277	25,115	26,202	27,337
Hamblen	65,168	67,885	70,579	72,878
Jefferson	56,727	60,473	64,714	68,779
Knox	494,574	525,477	559,996	592,702
Loudon	58,181	63,414	69,770	76,239
Roane	55,082	56,264	57,079	57,511
Sevier	98,789	108,778	121,217	134,155
Union	20,452	21,166	22,094	23,062
<b>Total</b>	<b>1,092,121</b>	<b>1,160,406</b>	<b>1,237,926</b>	<b>1,312,670</b>

1 - From Census Annual County Population Estimates data series, 2022 vintage (as of July 1, 2022)

2 - From Woods & Poole Economics, 2023 Regional Projections and Database

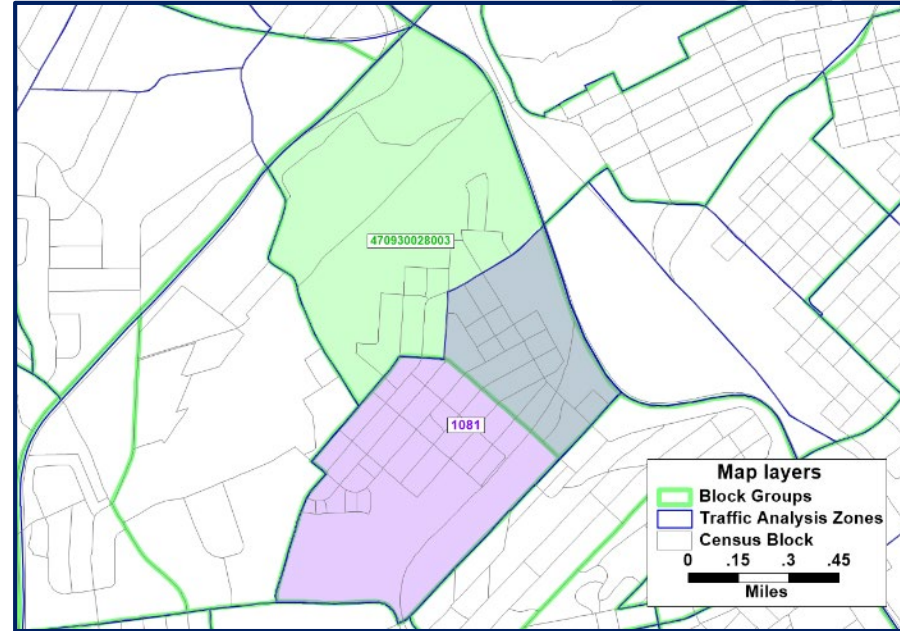
County, Employment	2022 <sup>1</sup>	2030 <sup>2</sup>	2040 <sup>2</sup>	2050 <sup>2</sup>
Anderson	49,750	51,281	53,413	54,834
Blount	66,473	75,592	87,766	101,240
Grainger	6,760	7,029	7,450	7,834
Hamblen	38,475	40,477	42,718	44,869
Jefferson	19,139	20,727	23,005	25,356
Knox	306,232	339,499	381,864	424,343
Loudon	22,555	24,118	26,987	30,001
Roane	24,296	25,820	27,538	28,913
Sevier	62,834	72,500	85,817	100,899
Union	4,477	5,035	5,719	6,502
<b>Total</b>	<b>600,989</b>	<b>662,078</b>	<b>742,277</b>	<b>824,791</b>

1 - Developed from an adjustment of Bureau of Economic Analysis (BEA) and Bureau of Labor Statistics (BLS) employment data

2 - From Woods & Poole Economics, 2023 Regional Projections and Database - used percent growth to generate projection factor for 2022 base year

# TAZ-level Intercensal Population Estimating

- Two Issues to Cover:
  - How to derive small geographic area population and HH counts
  - Correcting for Census Disclosure Proofing which introduces error especially at smaller geographic scales
- 1. Population and HH Counts
  - TAZs are consistent (nest) with Blocks but do not always align with Block Group boundaries
  - Block-level data only available with Decennial Census products making it a challenge to establish TDM base years that do not coincide
  - Typical process has been to rely on combination of ACS data, building permits and other factoring methods
- 2. Census Bureau implemented new initiative for 2020, the Disclosure Avoidance System (DAS) to artificially inject noise into public-use data to protect privacy
  - Top-line population counts at county/state level unaffected, but lower levels of geography contain errors by design
  - Housing Unit counts remain accurate but population counts and associated demographic characteristics are not
- **Knoxville TPO's Solution to both issues – Acquired Data Products from demographic data vendor, Applied Geographic Solutions, Inc. (AGS)**



# Examples of Census DAS Impacts & AGS Data Solutions

- From AGS, Inc. Blog Post discussing Census Data impossibilities:
  - Ghost Blocks – Contain Occupied Housing Unit but no People
  - Mermaid Blocks – Contain People but no Dwelling Units (often in water-only blocks)
  - Baseball Team Blocks – Average number of people per Household is enough to field a team (HH size > 9)
  - Lord of the Flies Blocks – Contains people but none with Age 18+
- Out of 25,520 Census Blocks in 10-County TPO TDM region there are approximately 10% that fit into one of the above categories
- AGS methodology uses proprietary “matrix balancing algorithms” to re-balance 2020 block-level data into logical and consistent values
- AGS develops **current year** estimates rely on USPS delivery counts, ZIP+4 locations and biannual Census Bureau Current Address Count Listing Files to help track population growth and new housing developments

October 2019



April 2022



2020 Census

Pop = 0

HU = 151

Occ HU = 11

2022 AGS

Pop = 320

HU = 154

Occ HU = 144

# Employment Data Control Totals – What is best Source?

- Significant Discrepancy between total employment counts in Knoxville Region for various data sources including Bureau of Economic Analysis (BEA) and Bureau of Labor Statistics (BLS)
- Since TPO relies on W&P for projections the preference is to use BEA since that is basis for W&P, but is it too high?
  - Significant factoring needed for InfoGroup data
- Main discrepancy appears to be from treatment of “Sole Proprietorships” that show up in Service categories such as Real Estate and Professional Services
- Refer to NCHRP 08-36, Task 098 and Task 127 reports for detailed documentation on Employment data sources for Planning

6-County Knoxville TPO Region (Anderson, Blount, Knox, Loudon, Roane & Sevier)				
2022 Employment Total Comparison between Woods&Poole and BLS				
	Employment by 2-Digit NAICS Code	BEA (W&P)	BLS	Difference
NAICS	Farm Employment	7,515	7,515	0
11	FORESTRY, FISHING, RELATED ACTIVITIES	1,124	1,048	76
21	MINING	1,108	436	672
22	UTILITIES	454	3,196	-2,742
23	CONSTRUCTION	38,738	24,701	14,037
31	MANUFACTURING	56,759	59,588	-2,829
42	WHOLESALE TRADE	20,157	18,453	1,704
44	RETAIL TRADE	73,450	62,867	10,583
48	TRANSPORTATION and WAREHOUSING	25,412	20,267	5,145
51	INFORMATION	7,661	6,356	1,305
52	FINANCE and INSURANCE	29,153	14,395	14,758
53	REAL ESTATE and RENTAL and LEASE	31,321	7,056	24,265
54	PROFESSIONAL and TECHNICAL SERVICES	45,179	29,958	15,221
55	MANAGEMENT of COMPANIES and ENTERPRISES	9,937	8,276	1,661
56	ADMINISTRATIVE and WASTE SERVICES	51,531	34,256	17,275
61	EDUCATIONAL SERVICES	10,820	36,242	-25,422
62	HEALTH CARE and SOCIAL ASSISTANCE	66,780	59,493	7,287
71	ARTS, ENTERTAINMENT, and RECREATION	17,842	10,625	7,217
72	ACCOMMODATION and FOOD SERVICES	65,496	60,435	5,061
81	OTHER SERVICES, EXCEPT PUBLIC ADMINISTRATION	36,865	13,216	23,649
92	GOVERNMENT	69,283	17,895	51,388
<b>TOTAL</b>		<b>666,585</b>	<b>496,274</b>	<b>170,311</b>
Knoxville TDM Summary Employment Categories		BEA (W&P)	BLS	Difference
Basic		48,939	36,896	12,043
Industrial		102,328	98,308	4,020
Retail		138,946	123,302	15,644
Service		376,372	237,768	138,604
<b>TOTAL</b>		<b>666,585</b>	<b>496,274</b>	<b>170,311</b>

# Employment Data Control Totals – Final



## 10-County Knoxville TPO Travel Demand Model Area

2022 Employment Total Comparison between Woods&Poole (BEA) and BLS

2-Digit NAICS	Employment Category Description	Year 2022 Total Employment			Source	Rationale
		W&P(BEA)	BLS	Final Estimate		
N/A	Farm Employment (BEA only)	7,515		7,515	BEA	only one estimate available
11	FORESTRY, FISHING, RELATED ACTIVITIES	1,124	1,048	1,124	BEA	reasonable proprietorships
21	MINING	1,108	436	772	average	BEA too high
22	UTILITIES	454	3,196	3,196	BLS	Keep public utilities employees under utilities
23	CONSTRUCTION	38,738	24,701	38,738	BEA	expected to have significant proprietorships
31	MANUFACTURING	56,759	59,588	58,174	average	unknown reason for difference between BEA & BLS
42	WHOLESALE TRADE	20,157	18,453	19,305	average	proprietorships expected to be low
44	RETAIL TRADE	73,450	62,867	73,450	BEA	reasonable proprietorships
48	TRANSPORTATION and WAREHOUSING	25,412	20,267	25,412	BEA	reasonable proprietorships
51	INFORMATION	7,661	6,356	7,661	BEA	reasonable proprietorships
52	FINANCE and INSURANCE	29,153	14,395	21,774	average	BEA too high
53	REAL ESTATE and RENTAL and LEASE	31,321	7,056	10,584	1.5*BLS	known issue with BEA estimates
54	PROFESSIONAL and TECHNICAL SERVICES	45,179	29,958	37,569	average	proprietorships expected to be lower than BEA
55	MANAGEMENT of COMPANIES and ENTERPRISES	9,937	8,276	9,107	average	proprietorships expected to be lower than BEA
56	ADMINISTRATIVE and WASTE SERVICES	51,531	34,256	42,894	average	proprietorships expected to be lower than BEA
61	EDUCATIONAL SERVICES	10,820	36,242	36,242	BLS	keep public educators under education
62	HEALTH CARE and SOCIAL ASSISTANCE	66,780	59,493	66,780	BEA	reasonable proprietorships, non-profits
71	ARTS, ENTERTAINMENT, and RECREATION	17,842	10,625	14,234	average	BEA too high
72	ACCOMMODATION and FOOD SERVICES	65,496	60,435	65,496	BEA	reasonable proprietorships
81	OTHER SERVICES, EXCEPT PUBLIC ADMINISTRATION	36,865	13,216	19,824	1.5*BLS	BEA seems very high
92	GOVERNMENT	69,283	17,895	41,119	BEA	Subtracted Utilities and Educators
<b>TOTAL</b>		<b>666,585</b>	<b>496,274</b>	<b>600,968</b>		

Knox County	Original Woods & Poole (BEA)	Modified Employment Control Total	InfoGroup
Basic	21,370	22,676	19,848
Industrial	41,997	41,671	41,671
Retail	65,660	65,660	65,660
Service	211,418	176,225	176,225
<b>Total</b>	<b>340,445</b>	<b>306,232</b>	<b>303,404</b>

## Summary by 4 Major Categories used by KRTM

Basic	48,939	29,381	51,345	higher because of public utilities and proprietorships
Industrial	102,328	98,308	102,891	essentially same as BEA
Retail	138,946	123,302	138,946	BEA
Service	376,372	237,768	307,786	essentially split the difference between BEA and BLS
<b>TOTAL</b>	<b>666,585</b>	<b>496,274</b>	<b>600,968</b>	

# In Closing:

## Employment Data –InfoGroup (Data Axle) QC Review Tips

- InfoGroup, aka Data Axle, establishment data provided by TDOT is great resource to develop TAZ-level estimates of employment, but needs significant “cleaning”
- Main QC Check is the Match Level Code:
  - 2 = Assigned based on first 2-digits of ZIP
  - 4 = Assigned based on ZIP4
  - X = Matched based on 5-digit ZIP
  - 0 = Exact Match
  - P = Parcel
- Review Major Employers such as > 150 employees
  - 315 out of 45,000 Records meet this criteria in 10-County Knox Region
  - Watch out for Duplicates
- Utilize as many other sources as possible:
  - LODES data – Employment by 2-digit NAICS at Block-level
  - Request QCEW establishment-level data from TN Dept of Labor (same data that feeds LODES program)
  - New big data sources such as Overture Maps (just started exploring)
  - Google Satellite Layer in TransCAD



U.S. DOE Employment in City of Oak Ridge:  
Y-12 = 7,800  
Oak Ridge National Laboratory (ORNL) = 6,000