MWCOG Gen3 Model Update

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Overview

- Model Functionality Updates

- Recent MWCOG Training

- Model Calibration and Validation Status

- Sensitivity testing

Model Functionality Updates

Improved Error Checking

- Ensure that all model errors are trapped and exit the model flow

- Remove all PAUSE statements

- Coming soon: disk space check

Model Revisions and Bug Fixes

- Removed inflation adjustments (costs/fares now updated to 2018)

- Removed conflicting lines from Mandatory Tour Frequency Spec

- Revised stop frequency model to use income correctly (comparing income-in-thousands to income-in-dollars)

- Revised transit fare subsidy application

Automated Vehicle Modeling

- Added Automated Vehicle (AV) Ownership Model – HH model runs before auto ownership
  - Predicts share of households that own at least 1 autonomous vehicle
  - Can be calibrated to represent AV scenarios (e.g. x% of private fleet is AV by scenario year)
  - HHs that own AVs required to have 1 or more autos, less likely to have 3 or more
- Mode Choice Adjustments:
  - Lower minimum age for driving alone (to 13)
  - Reduced IVT perception to reflect increased productivity, less stress (0.75 multiplier)
  - Reduced parking cost to reflect increased likelihood of sending auto home or to remote parking (0.5 multiplier)
  - Reduced terminal time to reflect reduction of parking search time (0.65 multiplier)
- All factors and driving age added to ActivitySim constants file so that they can be easily edited by user
- Adjustments only apply to AVs as determined by vehicle type and availability models
- Note: Model does not currently reflect
  - Speed or capacity changes due to vehicle-to-vehicle or vehicle-to-signal communications
  - Vehicle repositioning to serve household or non-household members after completing trips
  - These would be enhancements to the existing Gen3 Phase 2 model

Model User and Model Calibration Training

On-site training session

DAY 1

9:00 AM - 9:30 AM	Introductions, logistics, etc.
9:30 AM - 10:30 AM	**Model Installation and Running** • Required software • GitHub use • Server setup • Running the model
10:30 AM - 10:45 AM	Break
10:45 AM - 12:00 PM	**Model Inputs and Outputs** • Location of major model input files • ActivitySim inputs • Major model outputs • ActivitySim outputs
12:00 PM - 1:00 PM	Lunch
1:00 PM - 2:15 PM	**Input Updates and Model Setup for New Scenarios** • Updating network and land use file • Updating ActivitySim files (synthetic population) • Visualizer setup • Items to check prior to running the model
2:15 PM - 2:30 PM	Break
2:30 PM - 4:00 PM	**What to do When Things Go Wrong?** • Common errors • Where to check first • ActivitySim log files • ActivitySim tracing (model errors) • Model summary/analysis scripts for troubleshooting

- Wednesday May 3 and Thursday May 4
- Internal COG staff training
- Focused on model setup, inputs, outputs, debugging/troubleshooting
- Included session on model calibration

DAY 2

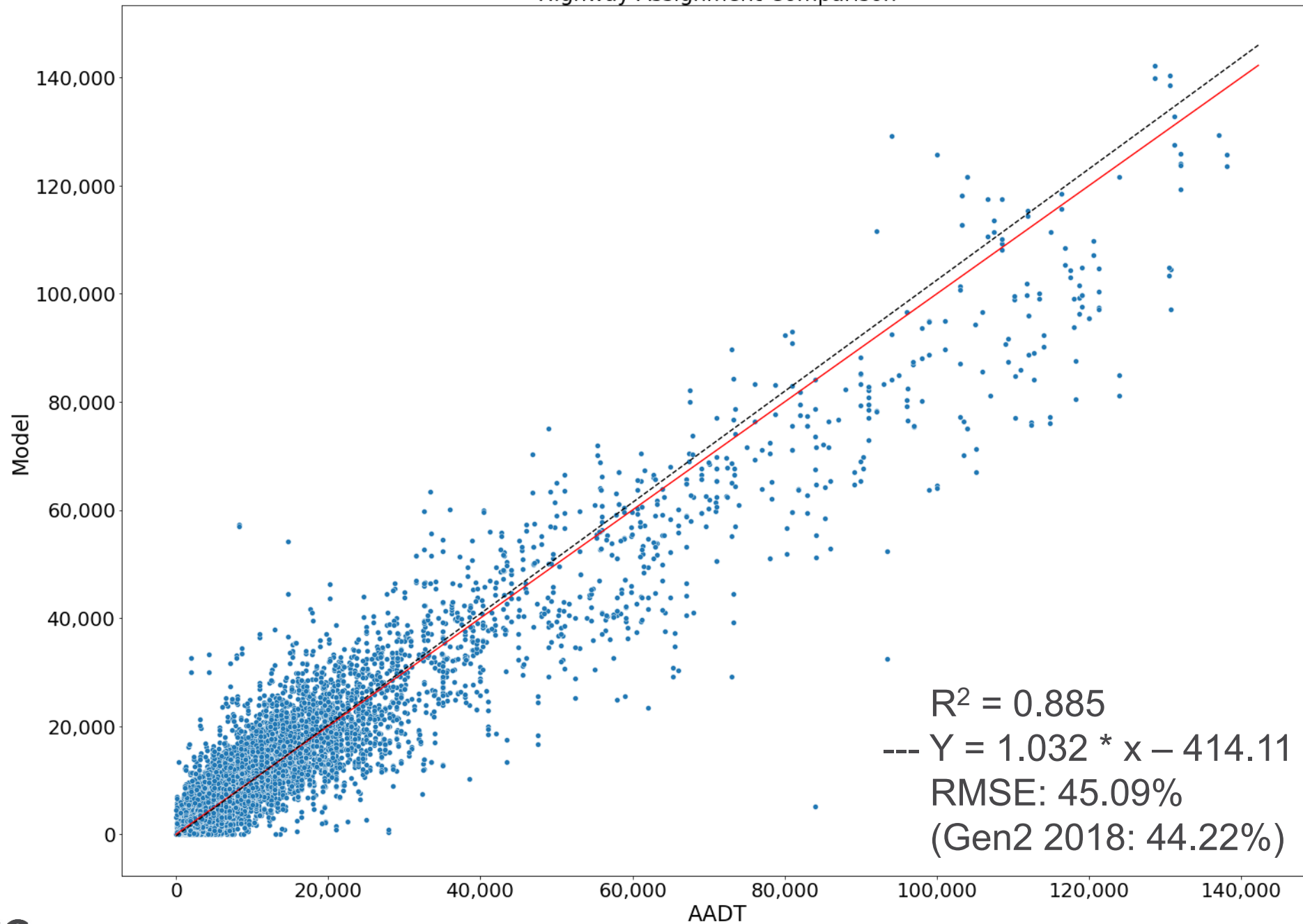|	
9:00 AM - 9:30 AM	**Day 1 Review**
9:30 AM - 10:30 AM	**Advanced ActivitySim** • Annotation Files • Binary vs. Multinomial vs. Nested Logit Models in ActivitySim • Changing model configurations • Changing model coefficients • Mode choice model coefficients templates
10:30 AM - 10:45 AM	Break
10:45 AM - 12:00 PM	**Advanced ActivitySim (continued)** • Transit subsidy model adjustment • ActivitySim tracing (model troubleshooting) **Q&A and Conclusion**
12:00 PM – 12:30 PM	Optional Mode Choice Model Calibration

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Gen3 Phase 2 Sensitivity Tests

Sensitivity Testing Plan for Phase 2

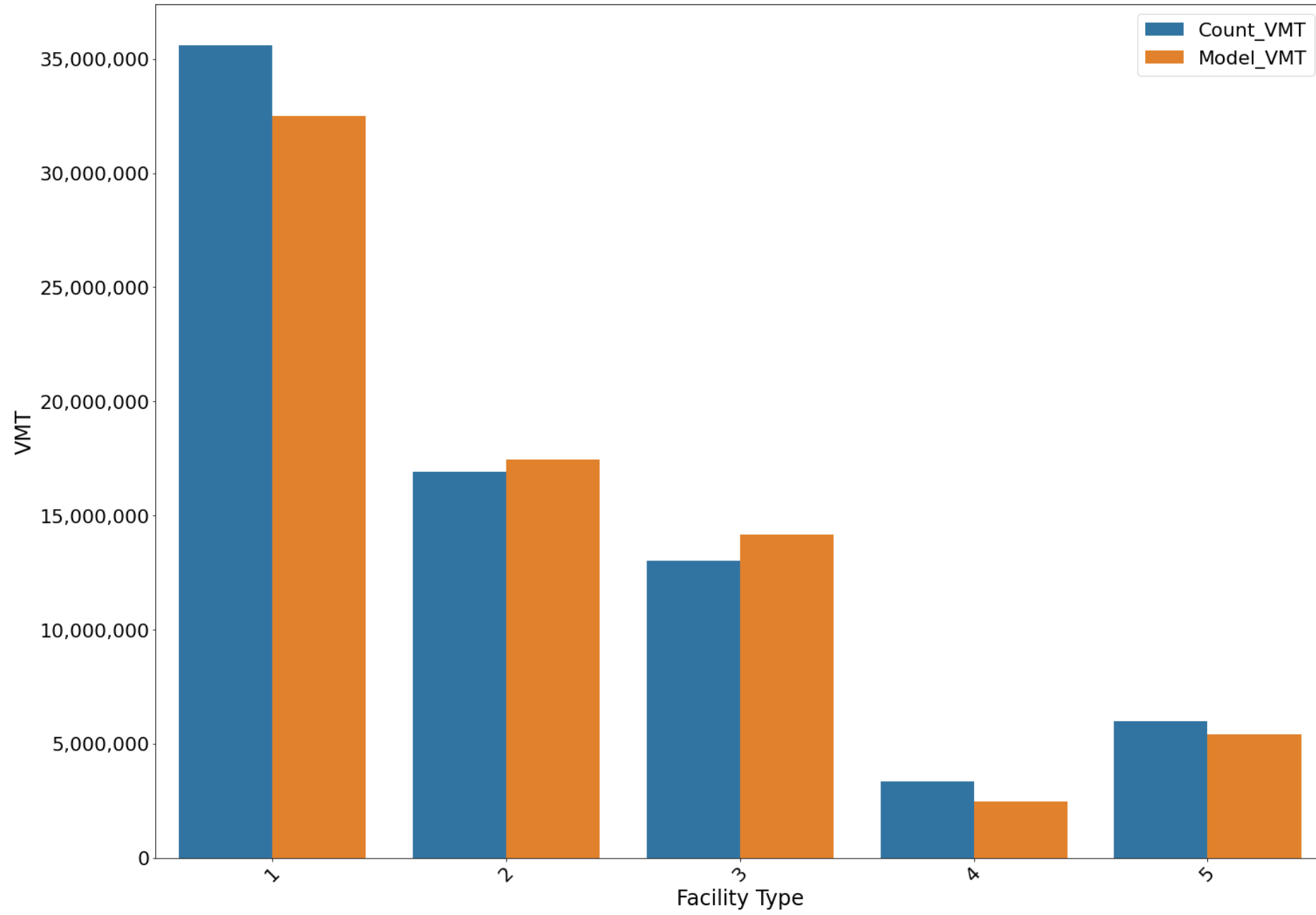| Test	Description	Responsible Party	Tested in Phase 1?
Telecommute change	Increase telecommute share for workers in DC	Baseline Mobility	Yes
Vehicle miles of travel (VMT) tax	Increase auto operating cost (per mile) by 10 cents across all vehicle types	Baseline Mobility	Yes
Arlington Memorial Bridge	Close the bridge to auto traffic	Baseline Mobility	Yes
High-Capacity Transit (HCT) frequency	Double the frequency of all high-capacity transit in the region	Baseline Mobility	Yes
Autonomous vehicles	Calibrate AV ownership model to represent 20% private AV fleet (2045 run)	MWCOG	No
Equity analysis	COG staff is developing Python scripts that compute select equity indicators for a target population group	MWCOG	No

Model Calibration and Validation Update

(Work in progress)

Highway Assignment Comparison

$R^2 = 0.885$

--- $Y = 1.032 * x - 414.11$

RMSE: 45.09%

(Gen2 2018: 44.22%)

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2018 Source: Page A-8, Seifu, Meseret, and Sanghyeon Ko. Memorandum to Feng Xie. "Year-2018 Validation of TPB Version 2.4 Travel Model." August 17, 2021.
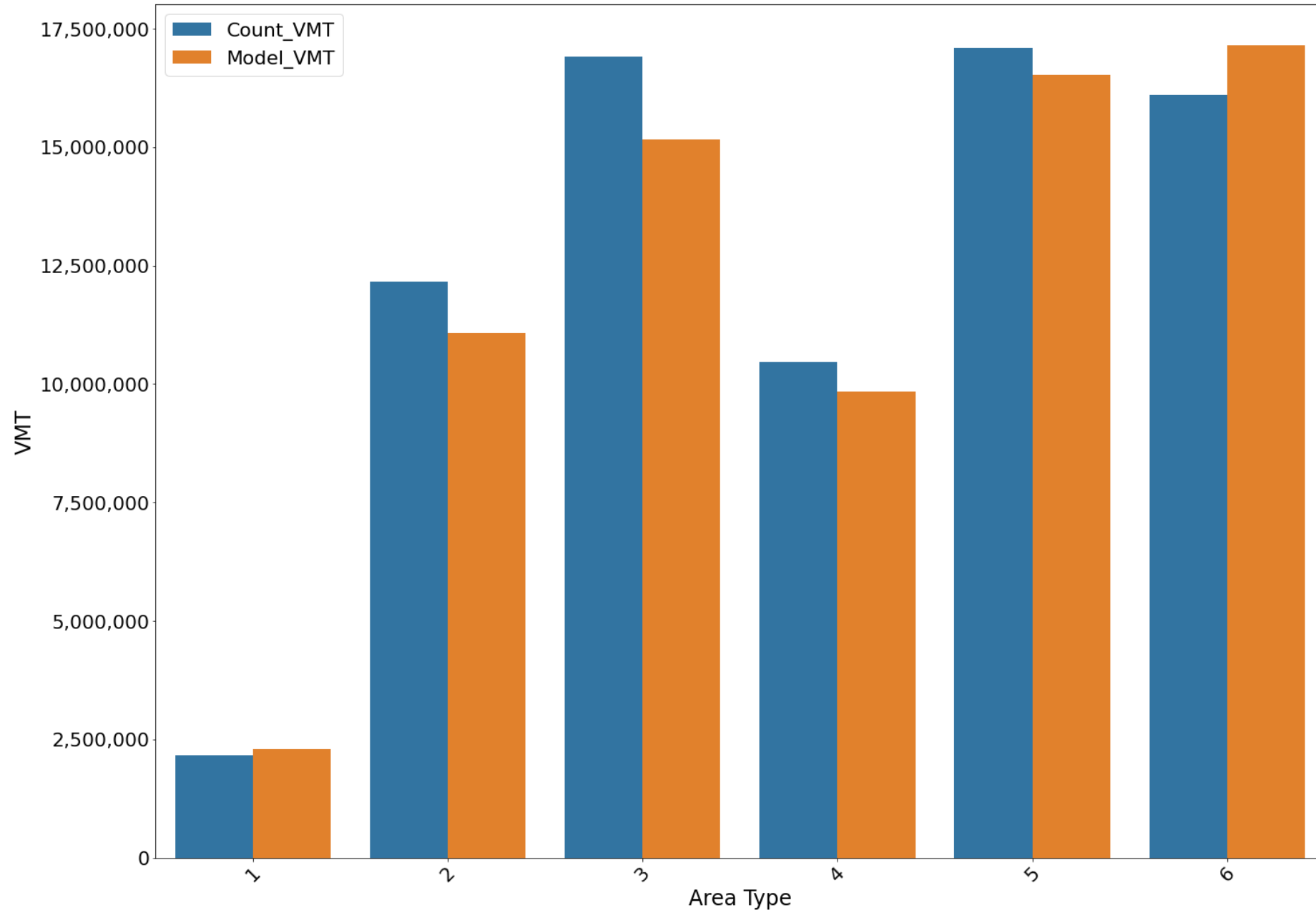
VMT by Facility Type

VMT by Facility Type (Est-Obs Ratio), Comparison to Gen2 / Ver. 2.4 (2018)

| FTYPE	Gen3	Gen2.4 (2018)	Standard (Acceptable)	Standard (Preferable)
Freeway	0.91	1.05	0.07	0.06
Major Arterial	1.03	1.07	0.15	0.10
Minor Arterial	1.09	1.09	0.15	0.10
Collector	0.76	0.74	0.25	0.20
Expressway	0.91	0.89	0.15	0.01
Total	**0.96**	**1.03**	**0.05**	**0.02**

VMT by Area Type

VMT by Area Type (Est-Obs Ratio) Comparison to Gen2 / Ver 2.4 (2014)

| ATYPE	Gen3	Gen2.4 (2014)	Standard (Acceptable)	Standard (Preferable)
AT 1 (CBD)	1.06	1.03	0.25	0.15
AT 2	0.91	0.95	0.25	0.15
AT 3	0.90	0.96	0.25	0.15
AT 4	0.94	1.02	0.25	0.15
AT 5	0.97	1.11	0.25	0.15
AT 6 (Exurban)	1.07	1.22	0.25	0.15
Total	0.96	1.06	N/A	N/A

Gen3 Phase 2 - 05/11/2023

- Significantly Under Estimated (0.01 - 0.75)
- Under Estimated (0.76 - 0.89)
- Good Fit (0.90 - 1.10)
- Over Estimated (1.11 - 1.25)
- Significantly Over Estimated (1.26 - 2.50)
- Jurisdiction Boundaries
- Municipalities
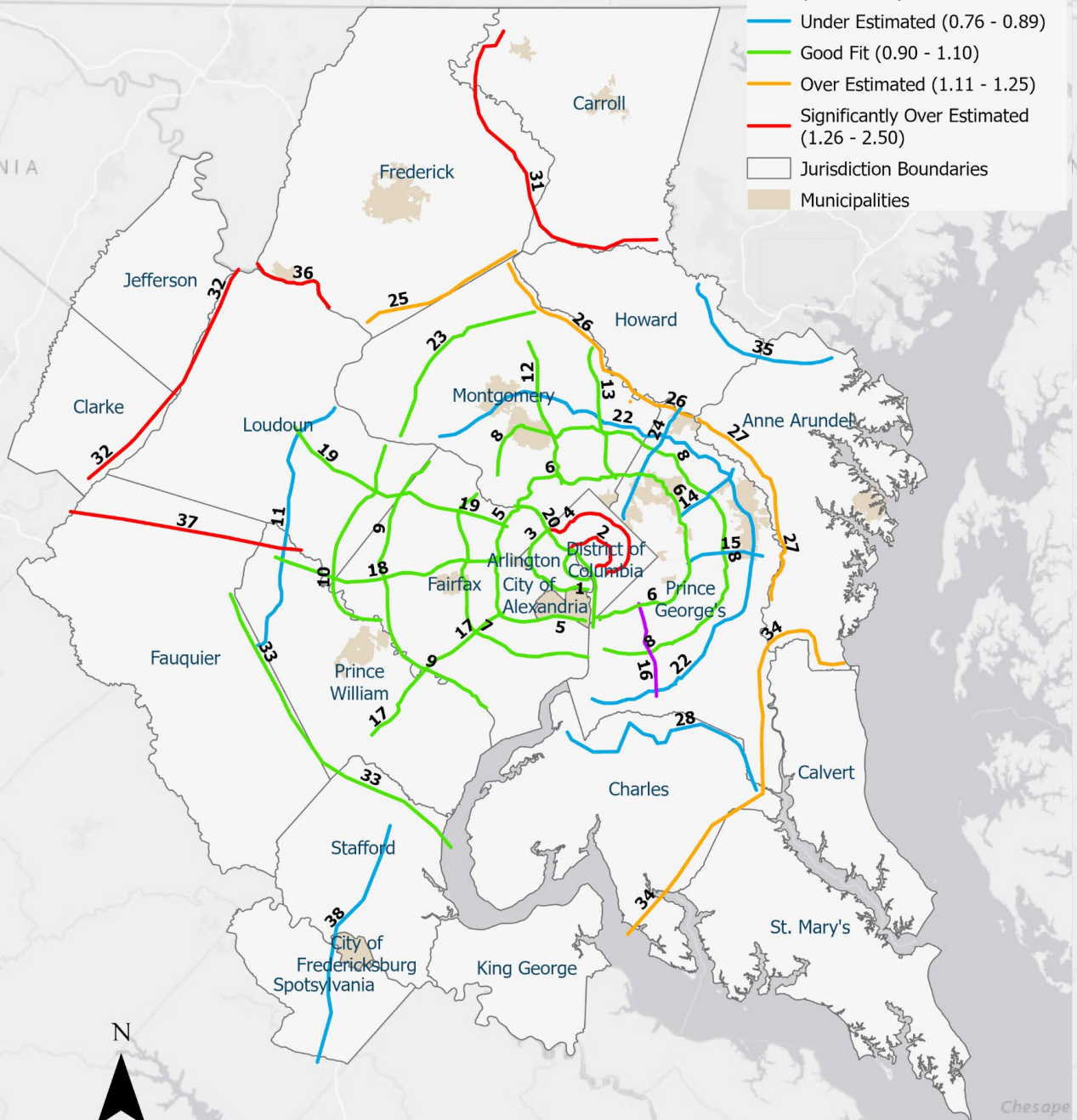
Gen2 TPB V 2.4

- Significantly Under Estimated (0.01 - 0.75)
- Under Estimated (0.76 - 0.89)
- Good Fit (0.90 - 1.10)
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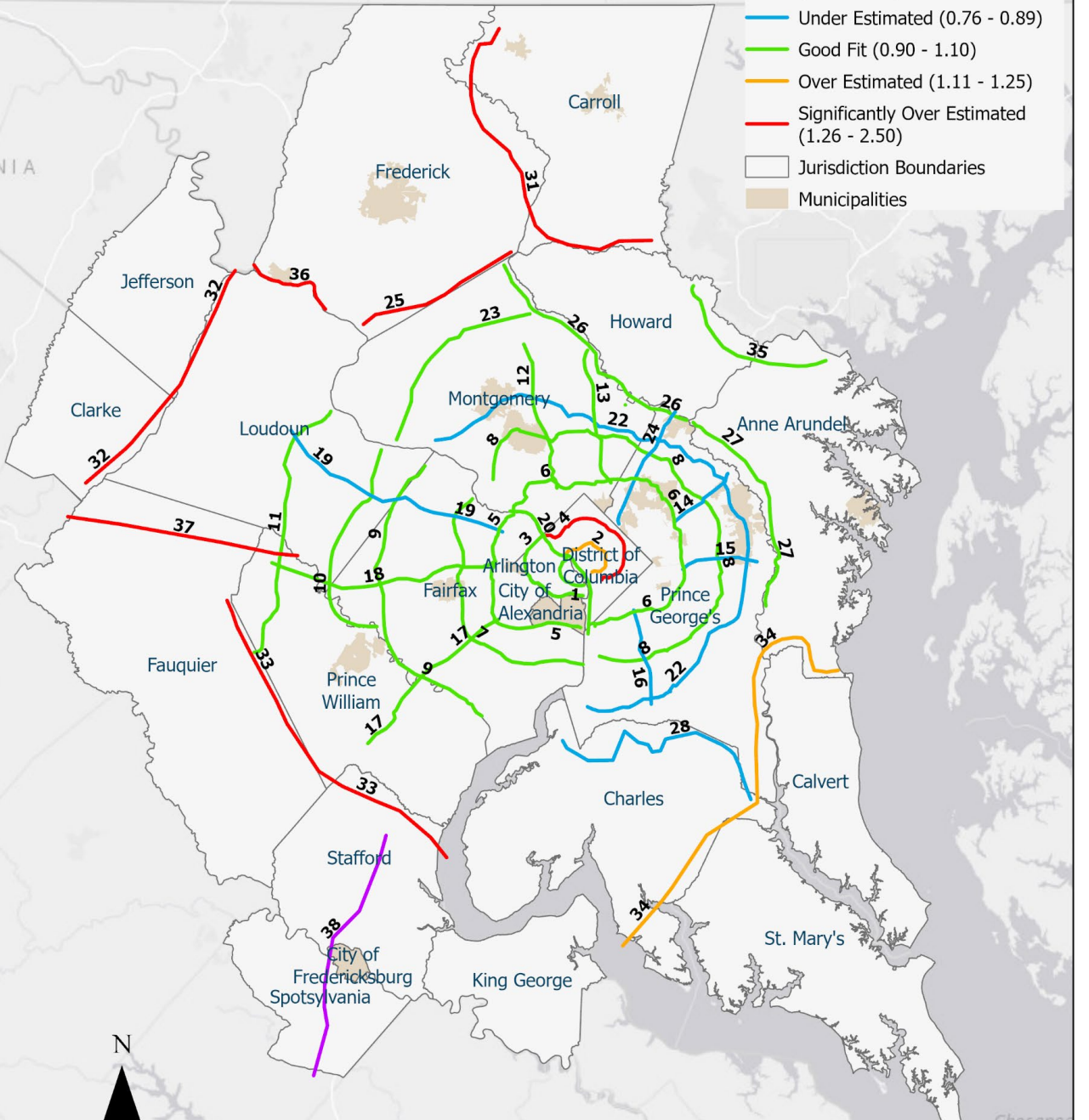
VMT by Jurisdiction Comparison to Gen2.4 (2018)

Jurisdiction Name	Observed VMT	Gen3 VMT	Gen3 Ratio	Model 2.4 VMT	Model 2.4 Ratio
District of Columbia	8,410,547	9,042,395	1.08	8,160,131	0.97
Montgomery County	20,844,658	20,341,077	0.98	20,794,264	1.00
Prince George's County	25,320,822	22,609,785	0.89	22,659,440	0.89
Arlington County	4,115,600	4,141,095	1.01	4,109,213	1.00
City of Alexandria	1,851,663	2,280,679	1.23	2,140,651	1.16
Fairfax County	28,284,350	26,655,371	0.94	28,111,767	0.99
Loudoun County	7,342,782	7,719,474	1.05	7,449,609	1.01
Prince William County	10,300,396	9,359,783	0.91	10,162,646	0.99
Frederick County	8,391,370	7,856,855	0.94	9,066,690	1.08
Howard County	11,526,986	11,185,767	0.97	11,426,554	0.99
Anne Arundel County	16,518,082	15,434,307	0.93	16,058,595	0.97
Charles County	3,426,164	3,087,776	0.90	3,237,059	0.94
Carrol County	3,408,904	4,146,367	1.22	4,381,657	1.29
Calvert County	2,019,452	1,461,690	0.72	1,652,935	0.82
St. Mary's County	2,367,534	1,888,796	0.80	2,134,629	0.90
King George County	932,207	655,858	0.70	835,845	0.90
City of Fredericksburg	990,749	815,089	0.82	894,269	0.90
Stafford County	4,358,421	3,570,595	0.82	4,716,562	1.08
Spotsylvania County	3,774,287	2,345,573	0.62	2,376,420	0.63
Fauquier County	3,686,566	3,180,533	0.86	3,802,460	1.03
Clarke County	827,733	1,027,238	1.24	1,082,114	1.31
Jefferson County	1,069,310	1,380,178	1.29	1,505,290	1.41
Total	**169,768,582**	**160,186,281**	**0.94**	**166,758,800**	**0.98**

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Bus Loadings

Mode Name	Model Boardings	2018 Observed Boardings	Gen3 Ratio	Gen2/Ver. 2.4 Ratio
Metrobus Total	345,496	360,000	0.96	
Other Bus in WMATA Area	202,978	141,390	1.44	
Other Bus not in WMATA Area	71,718	74,252	0.97	
All Bus	**659,585**	**575,642**	**1.08**	**1.09**

Rail Loadings

Operator Name	Model	2018 Observed Station Entries	Gen3 Ratio	Gen2/Ver. 2.4 Ratio
Metrorail	643,801	641,227	1.00	1.01
VRE	15,203	18,332	0.83	0.64
MARC	41,417	38,795	1.07	0.86
Total commuter rail	**56,620**	**56,580**	**0.99**	**0.76**

Metrorail Station Boardings

Metrorail Station Boarding Comparison
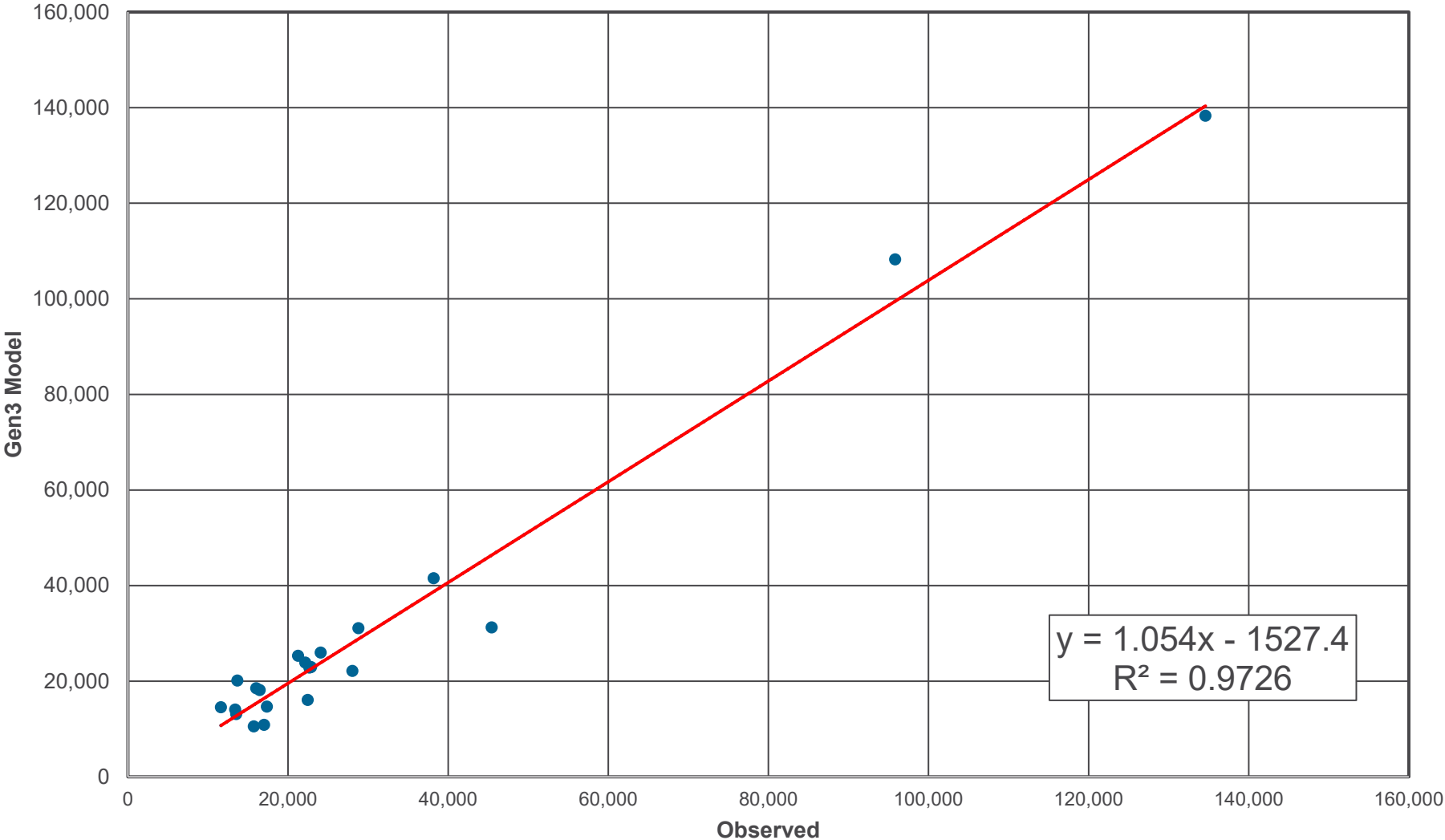
Next steps

Next steps

- Finalize calibration and validation (end of May target)

- Finalize draft calibration and validation documentation (mid-June target)

- COG staff to review draft user's guide and RSG to respond to comments (end of June target)

- Deliver final models and documentation (end of July target)

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