

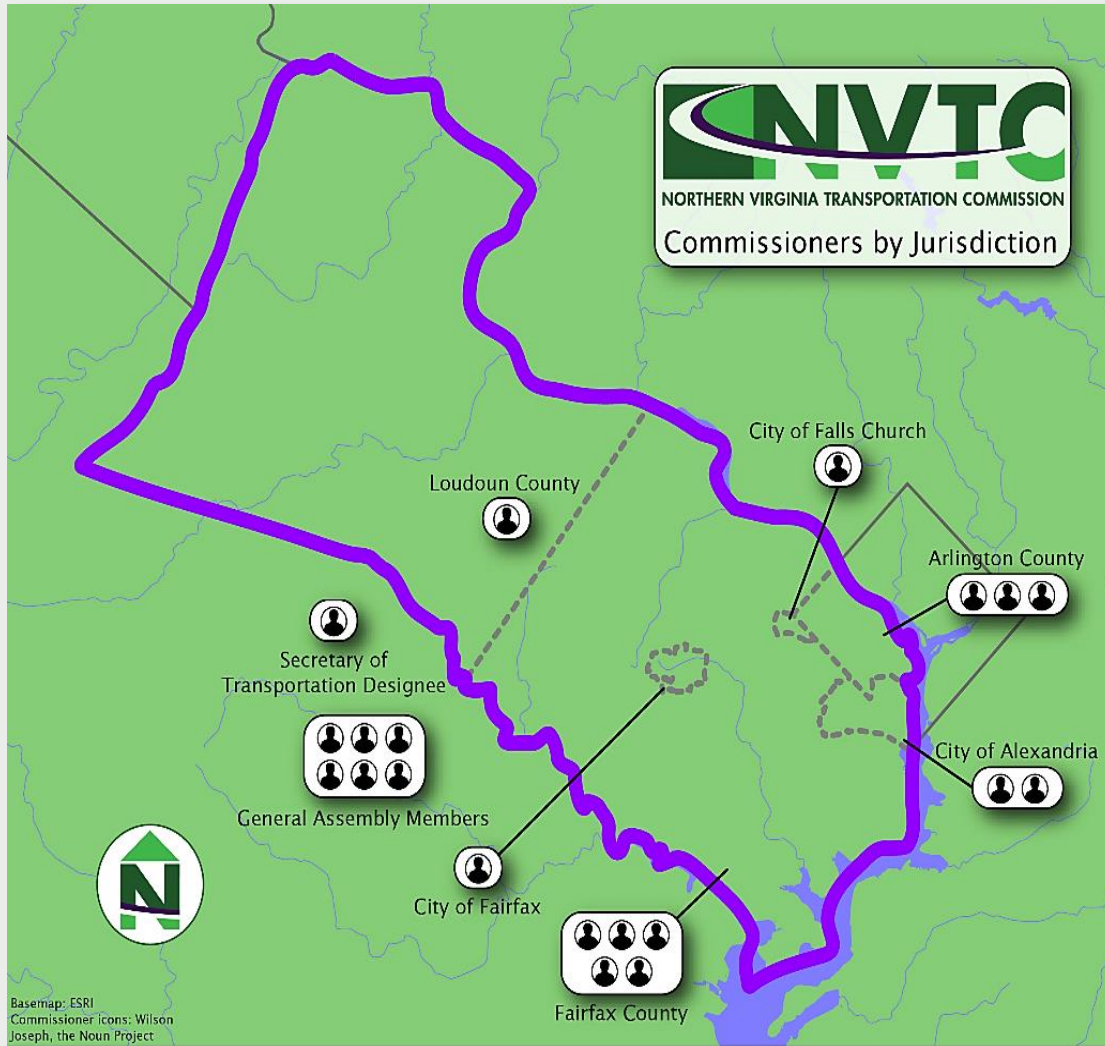
The Value of Metrorail and Virginia Railway Express to the Commonwealth of Virginia

**Overview and Findings
January 19, 2018**



NORTHERN VIRGINIA TRANSPORTATION COMMISSION

The Commission



NVTC Jurisdictions:

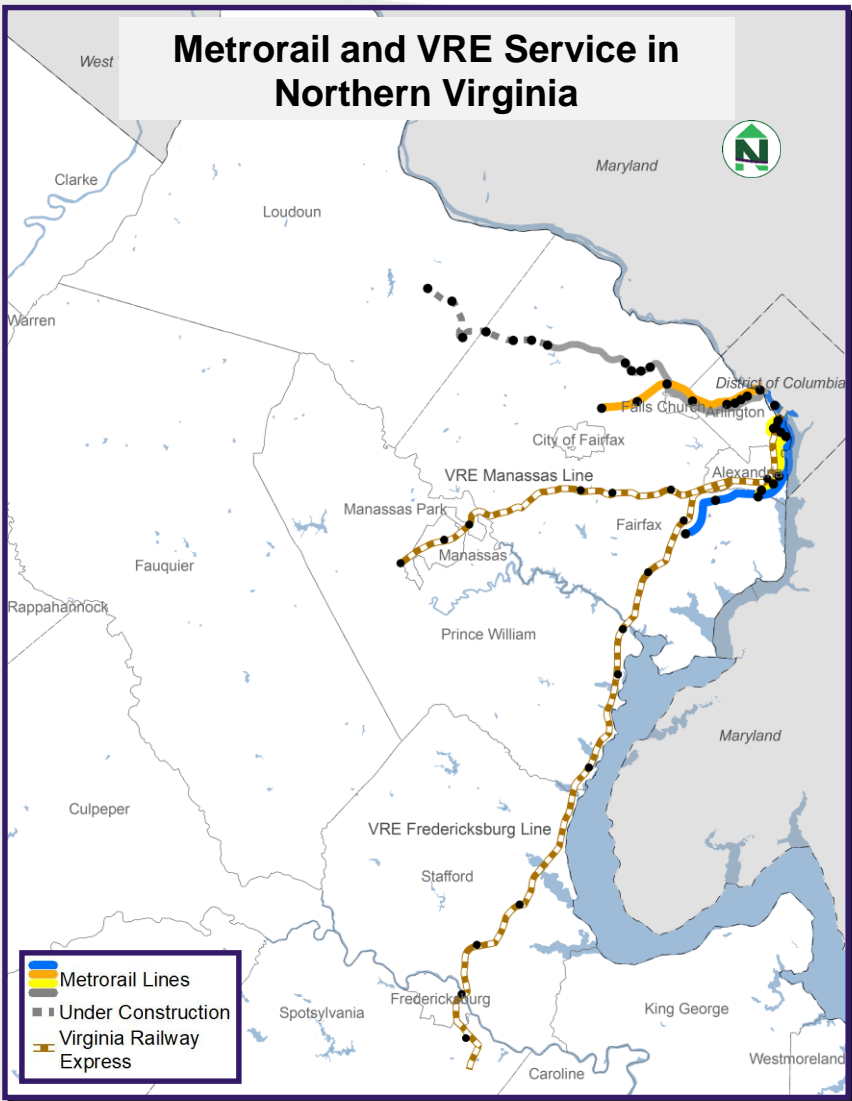
- Loudoun County
- Arlington County
- Fairfax County
- City of Alexandria
- City of Fairfax
- City of Falls Church

All of NVTC's jurisdictions are members of the Washington Metropolitan Area Transit Zone established by the WMATA Compact.

The Commission



Why is Rail Transit Important to Virginia?



- ✓ Metrorail and VRE move 290,000 people per average weekday
- ✓ Approximately 80 directional miles of Metrorail and 25 stations in Virginia
- ✓ VRE has approximately 160 directional track miles and 17 stations in Virginia
- ✓ Regional Benefits - NVTC, WMATA, and MWCOG studies
 - \$235B in property value within ½ mile
 - \$3.1B/year in property tax revenues

But how does rail transit in Northern Virginia benefit the Commonwealth as a whole?

Study Objectives and Methodology



Study Objective

- The goal of this effort was to evaluate the of Metrorail and VRE at the state level.

Technical Review Team

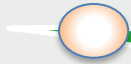
WMATA, TPB, FTA, GMU, and other nationally recognized transit experts.

How is this different than other studies?

- What distinguishes this study from earlier ones is that it is dynamic. Our approach focused on the level of activity that the regional transportation network could support.
- Looked beyond impacts on local generated revenues and focuses on state revenues.

Study Approach

(1) Determine the Existing Level of Roadway Congestion



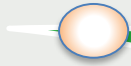
(2) Remove Metro & VRE from the Transportation Network in Virginia

(3) Redistribute Land Use Until Network Reaches Existing Roadway Congestion

(4) Estimate State Revenue Loses from Land Use Redistribution

Study Approach

(1) Determine the Existing Level of Roadway Congestion



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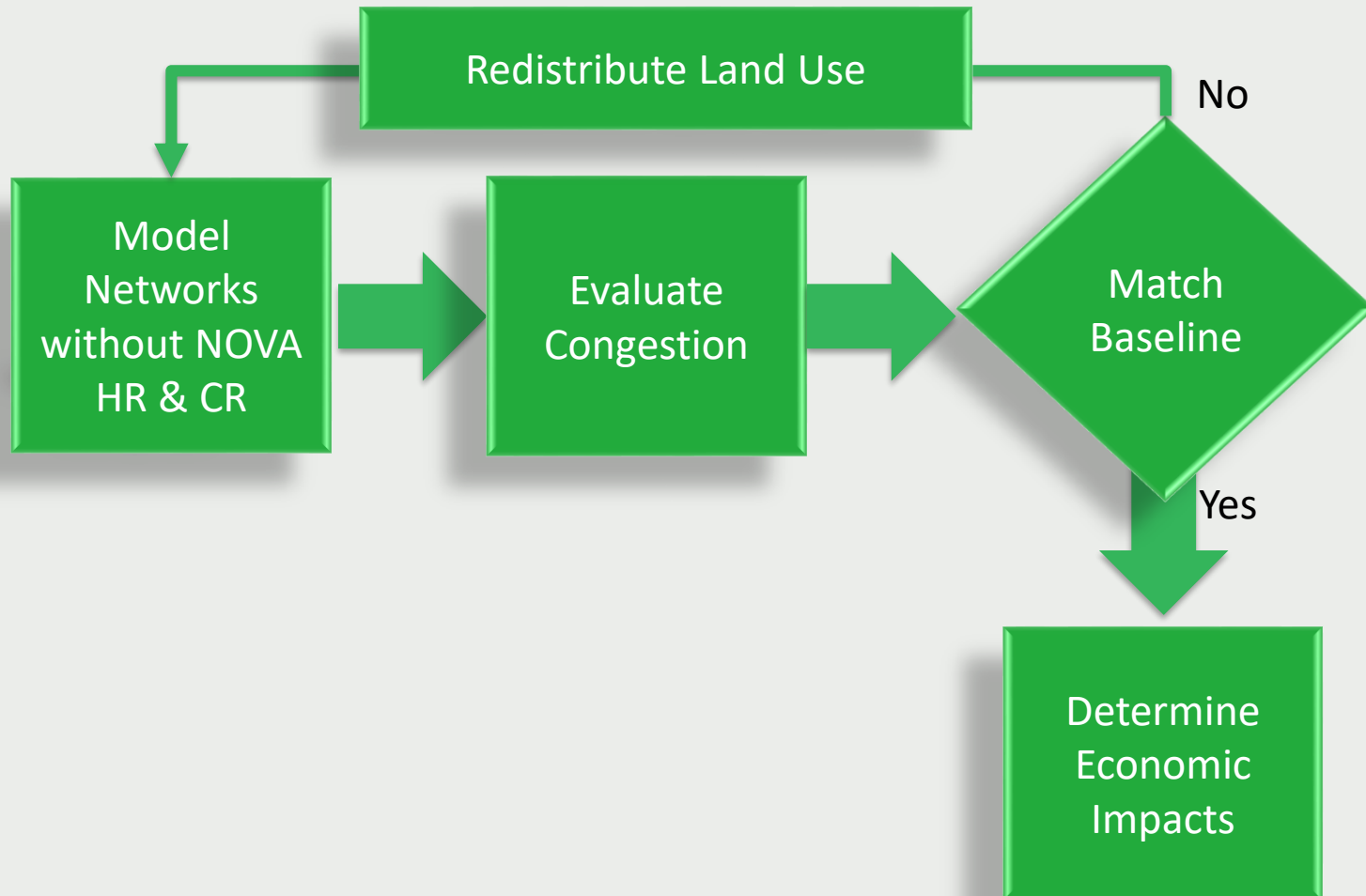
Modeling

(3) Redistribute Land Use Until Network Reaches Existing Roadway Congestion



(4) Estimate State Revenue Loses from Land Use Redistribution

Modeling Application



Existing Level of Roadway Congestion



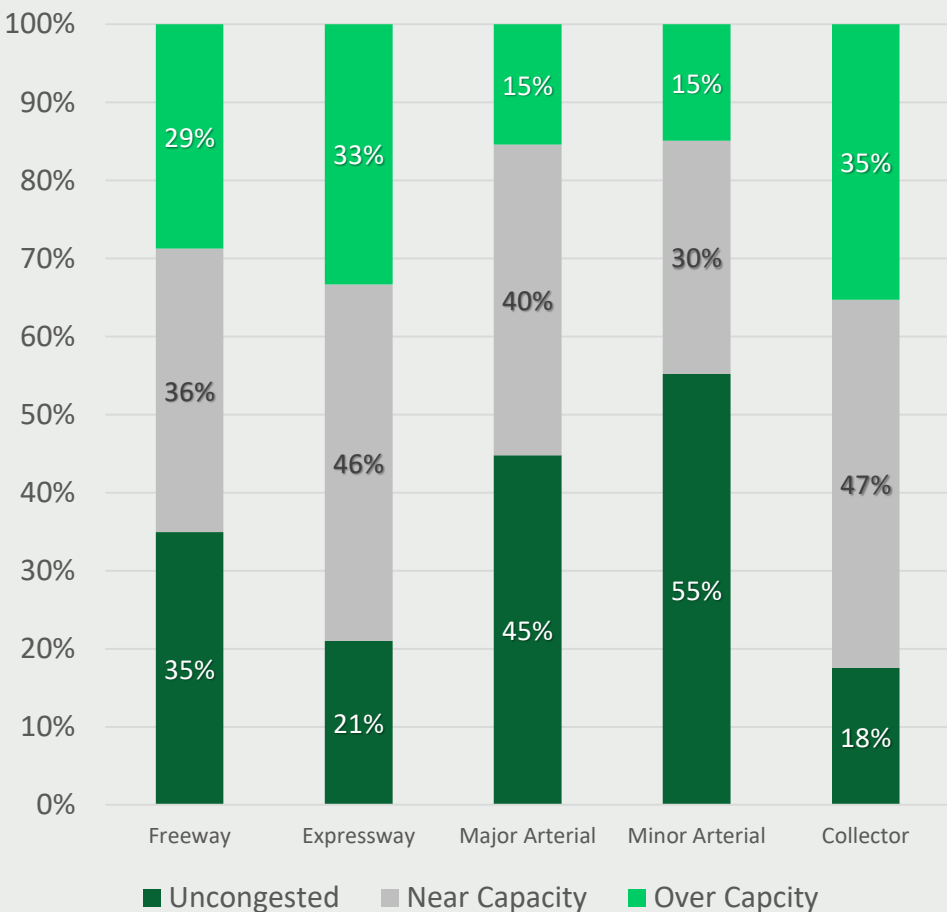
Measures of Effectiveness (MOEs)

Measure	Primary	Secondary
Service Supplied (Mobility)	HBW Average Trip Length	Job Accessibility
Service Consumed	Peak Period Congested Lane Miles	HBW Mode Share

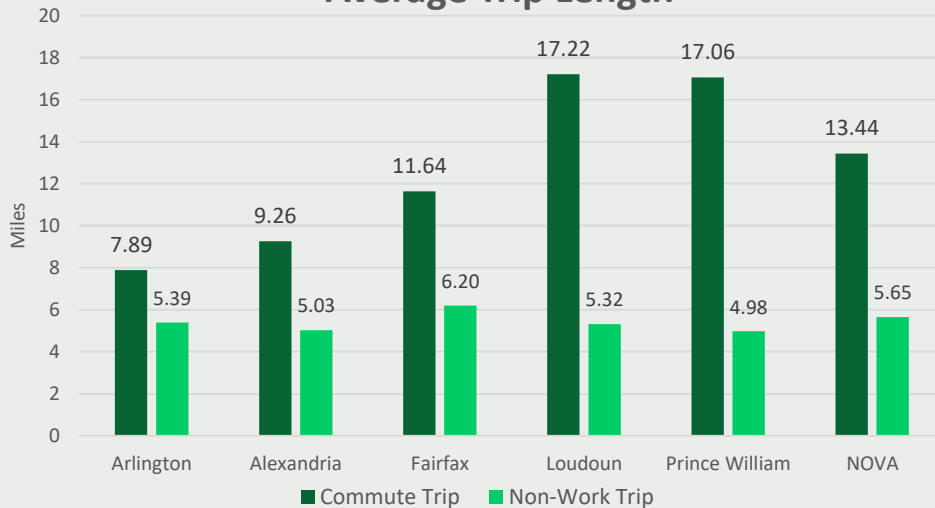
Congestion Analytics



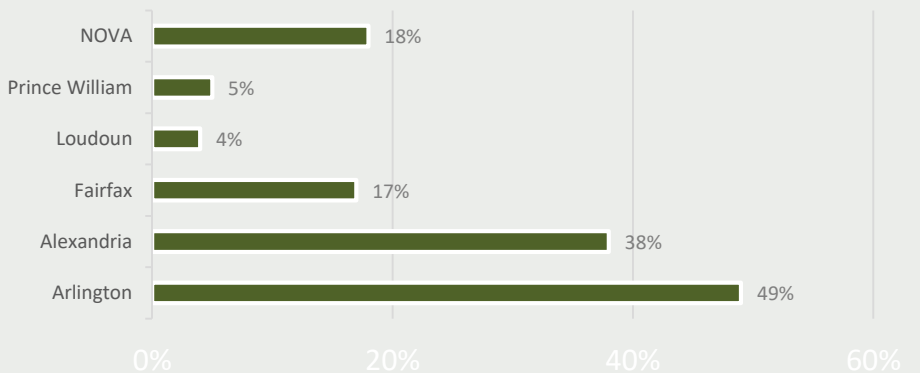
Northern Virginia Morning Peak Period Lane Miles of Congestion



Average Trip Length

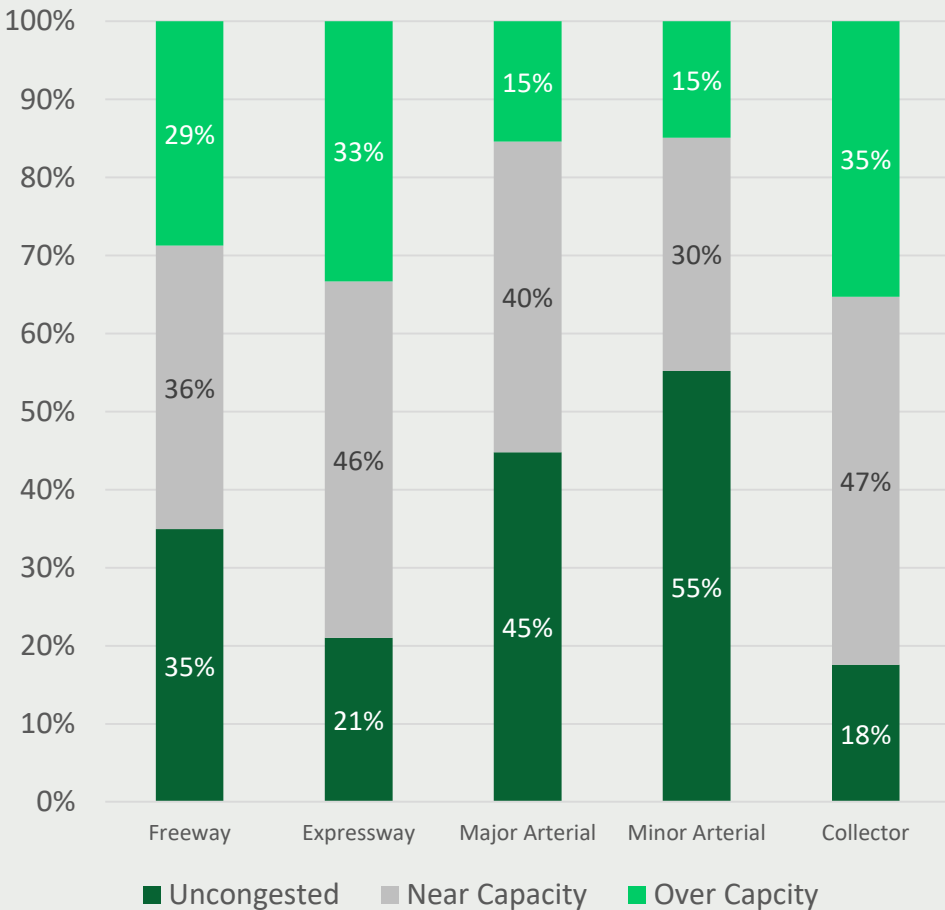


HBW Transit Mode Share

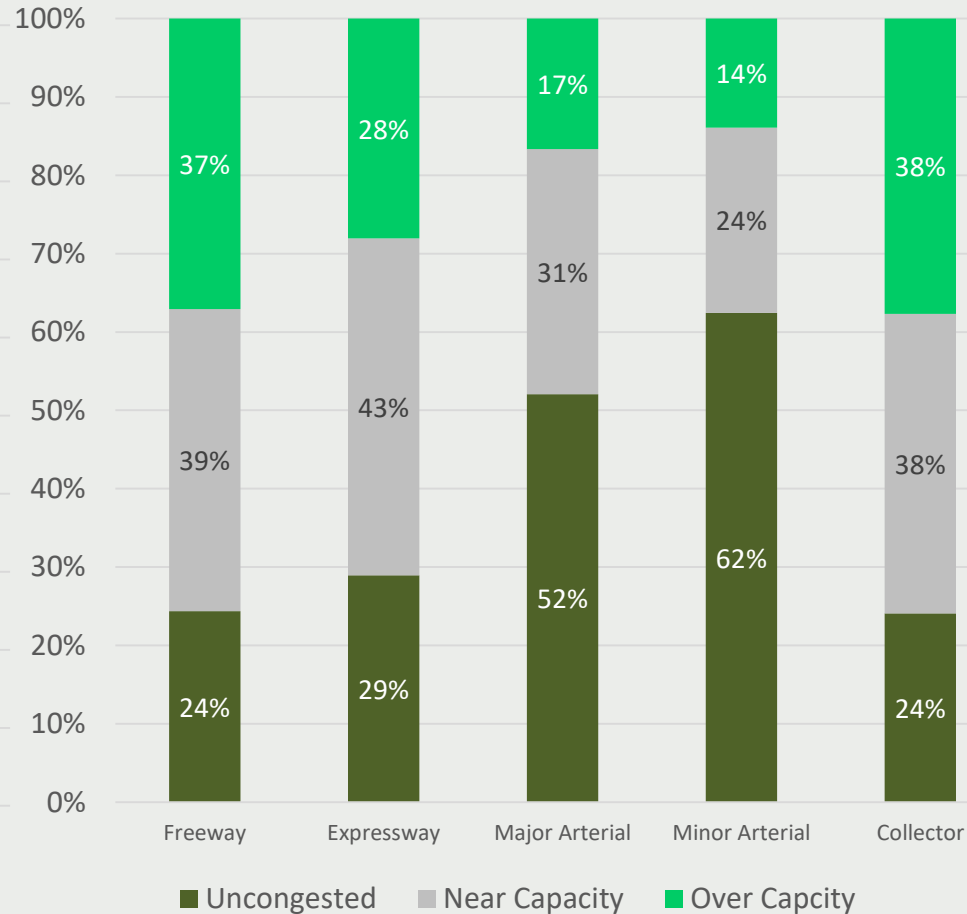


Percent of Lane Miles by Level of Service

Northern Virginia Morning Peak Period Lane Miles of Congestion

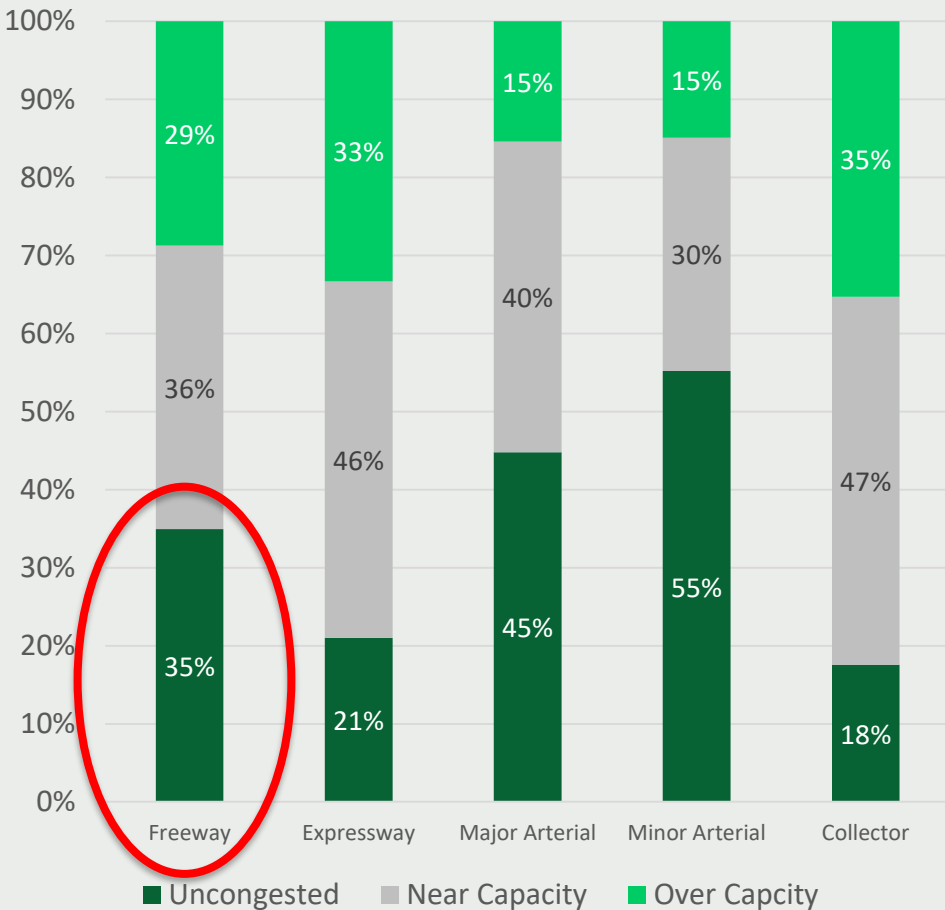


Metropolitan Area Morning Peak Period Lane Miles of Congestion

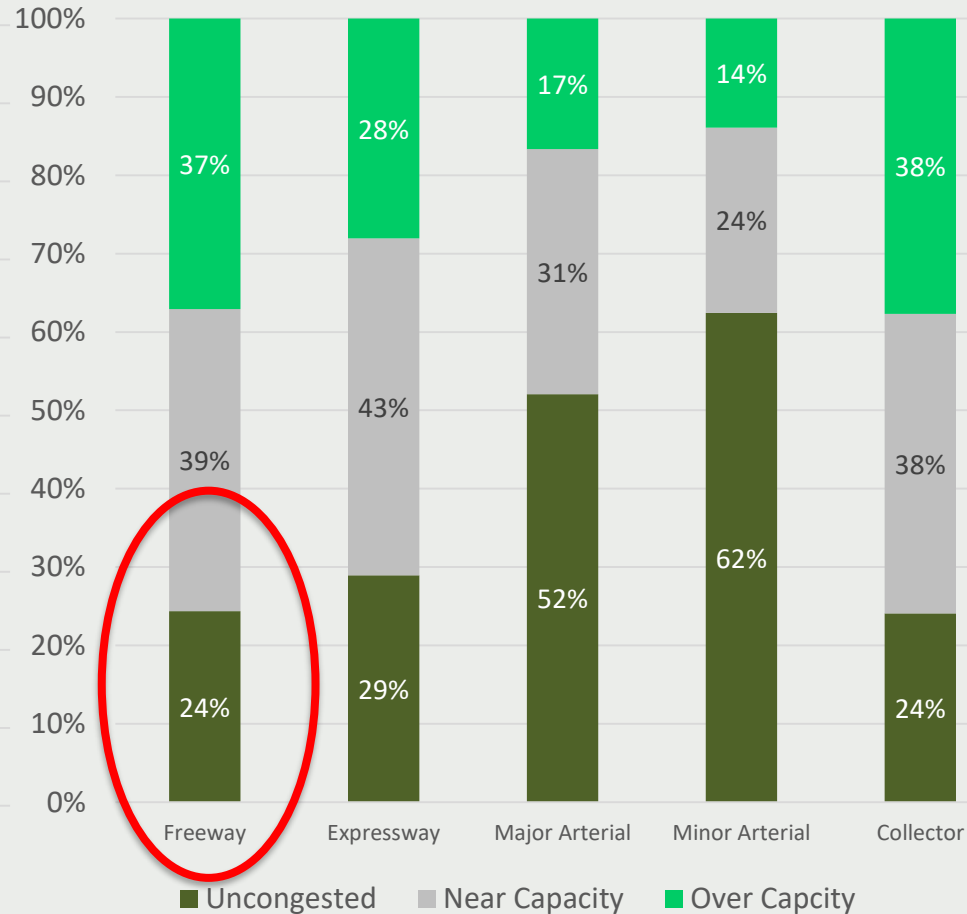


Percent of Lane Miles by Level of Service

Northern Virginia Morning Peak Period
Lane Miles of Congestion



Metropolitan Area Morning Peak Period
Lane Miles of Congestion

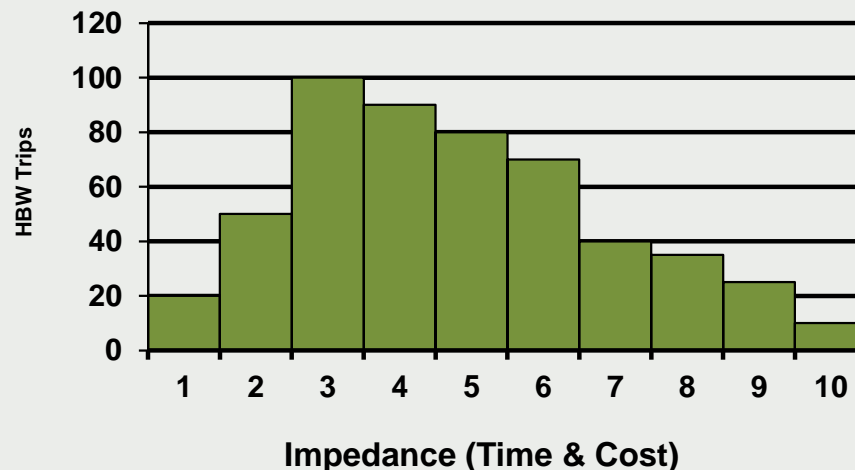


Mobility Measure

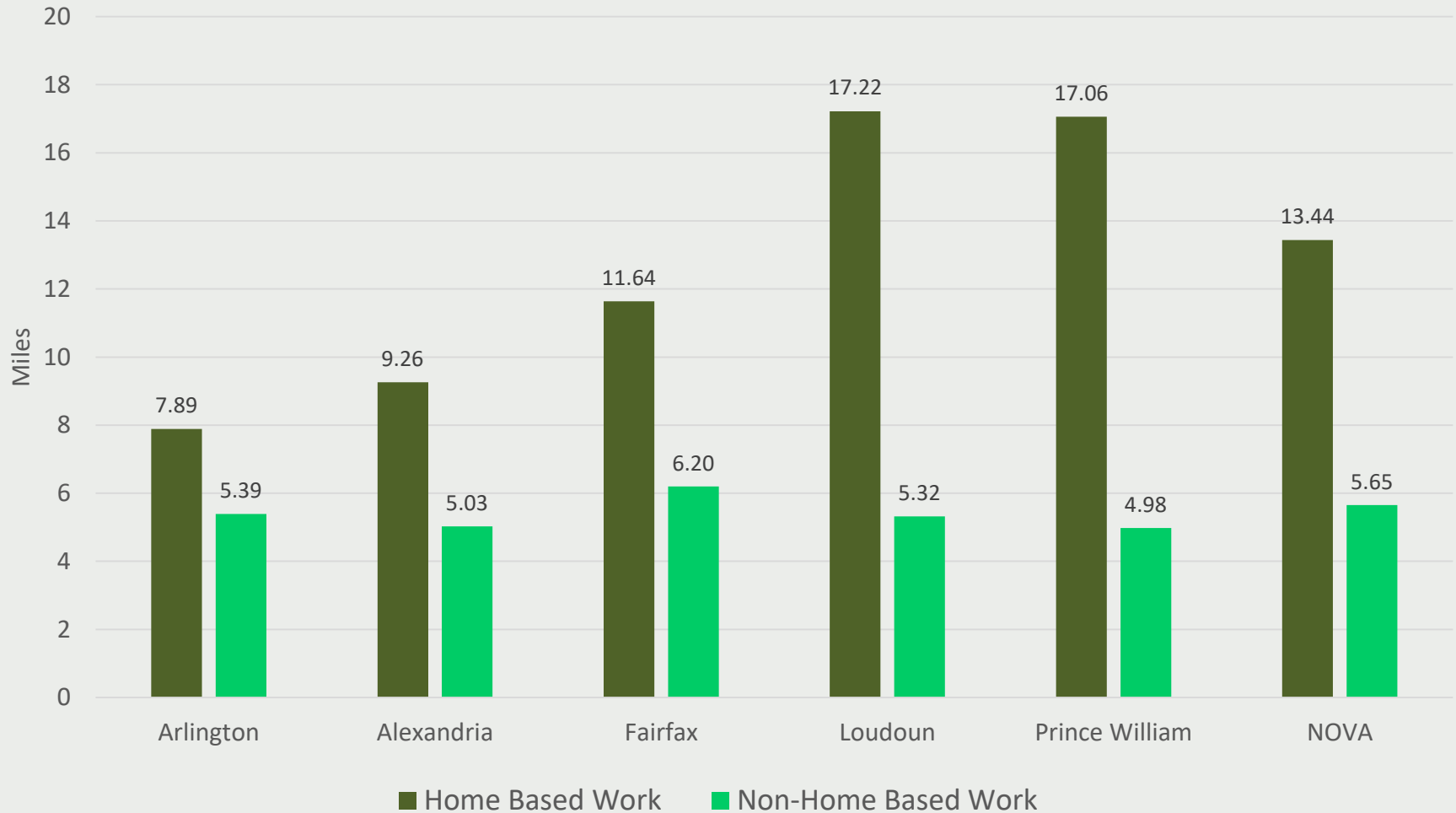
- Gravity Model
- Travel time budget
- Average HBW trip time 30 minutes
- Time constant
- Length changes
- Measures impact from congestion

$$\text{Trips}_{ij} = P_i \times \frac{A_j \times FF_{ij} \times K_{ij}}{\sum(A_j \times FF_{ij} \times K_{ij})}$$

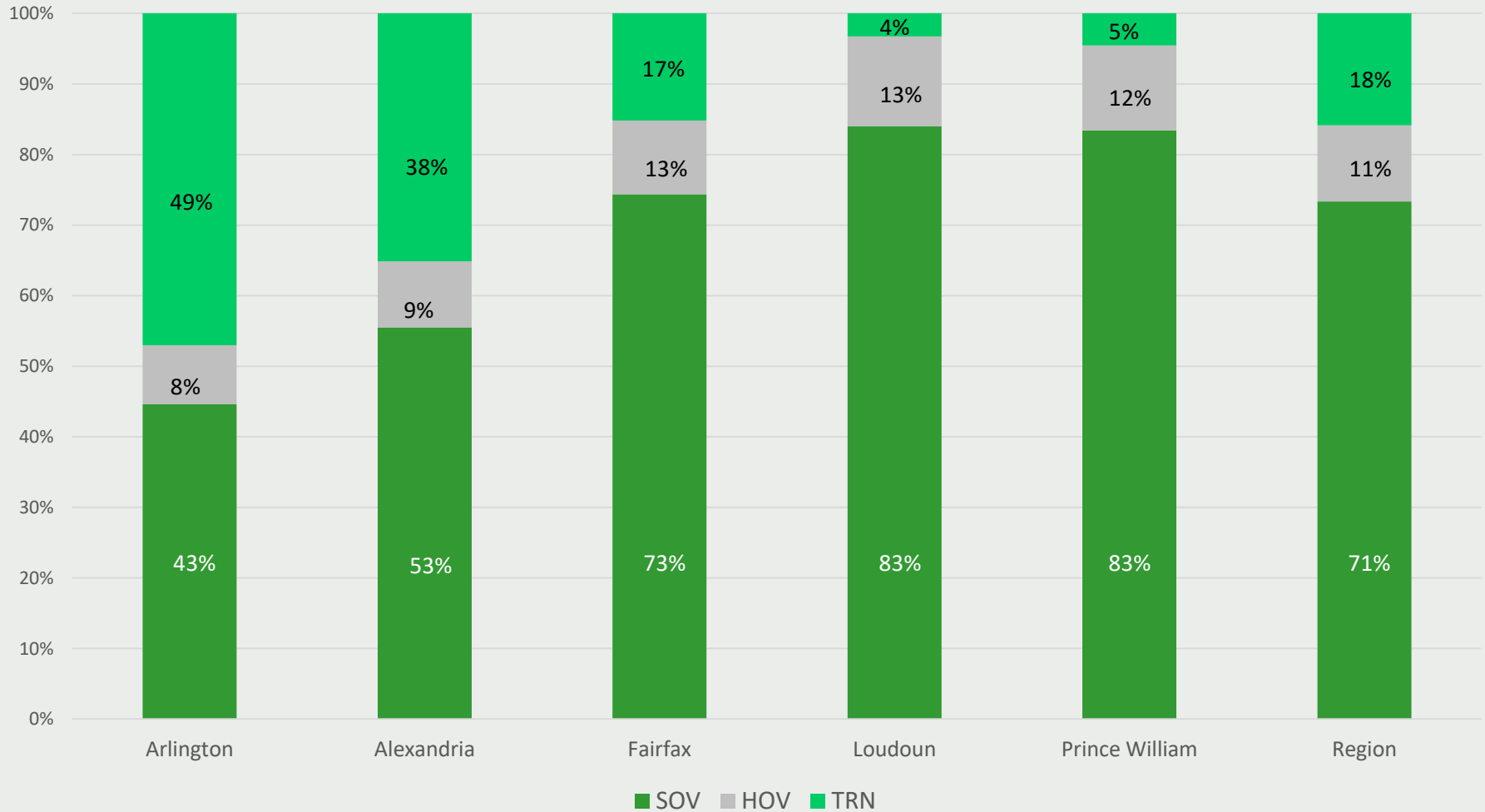
Travel Time Distribution



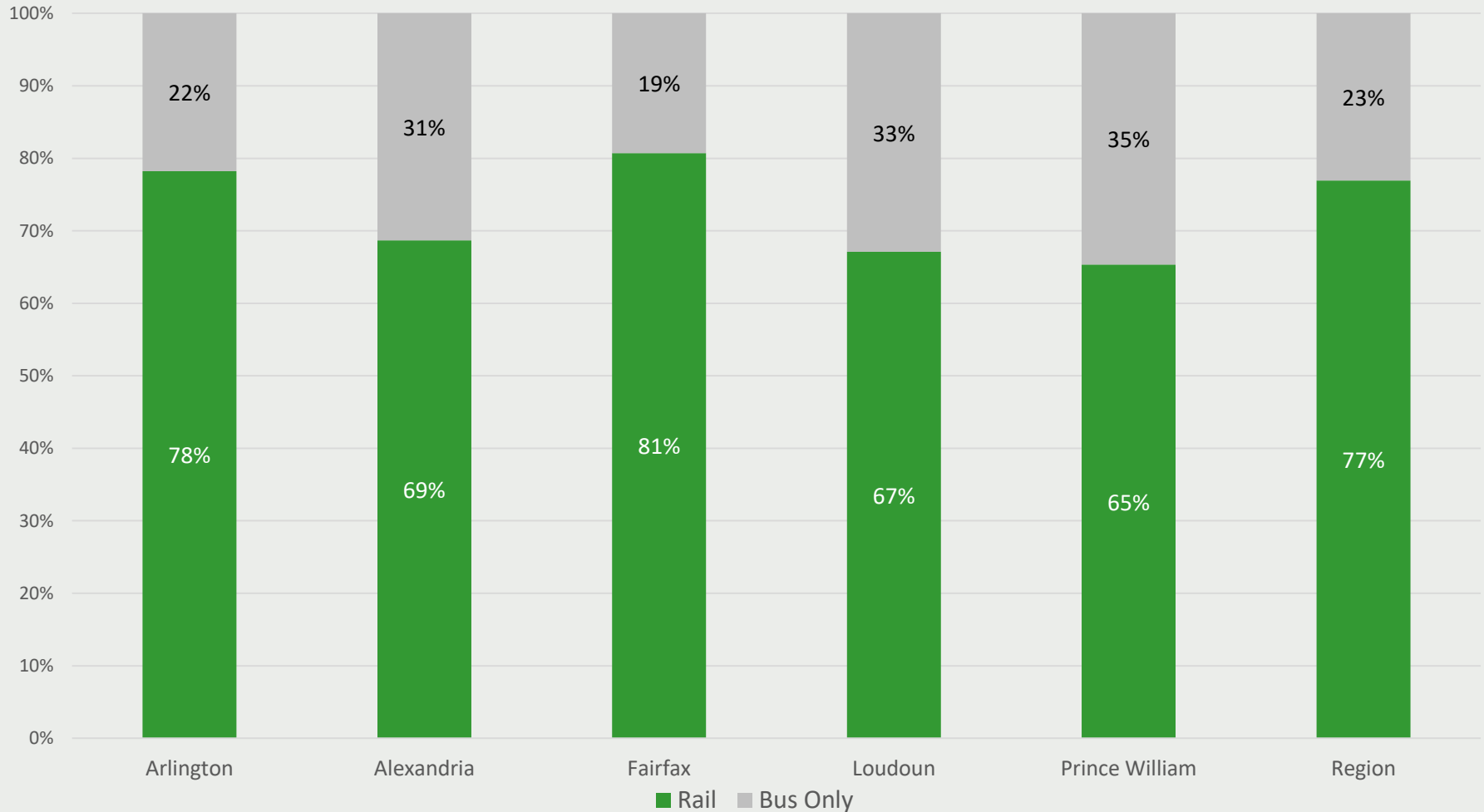
Existing Trip Length



Existing HBW Mode Share



Existing HBW Transit Mode Share



Modeling



- Iterative process
- Total of 14 model runs
 - Baseline
 - Existing land use, with no rail in Northern Virginia
 - Existing rail mode share reduction with no rail in Northern Virginia
 - Match average HBW trip length
- Redistributed households and jobs to jurisdictions outside of Northern Virginia in MWCOG region
- Redistribution was based on future land use plans
- Households were located in areas of similar income levels
- Abbreviated model process
- Full model with equilibrium assignment

Household Reductions

- Productions
 - TAZ level
 - Proportionally reduced based on the WMATA passenger survey

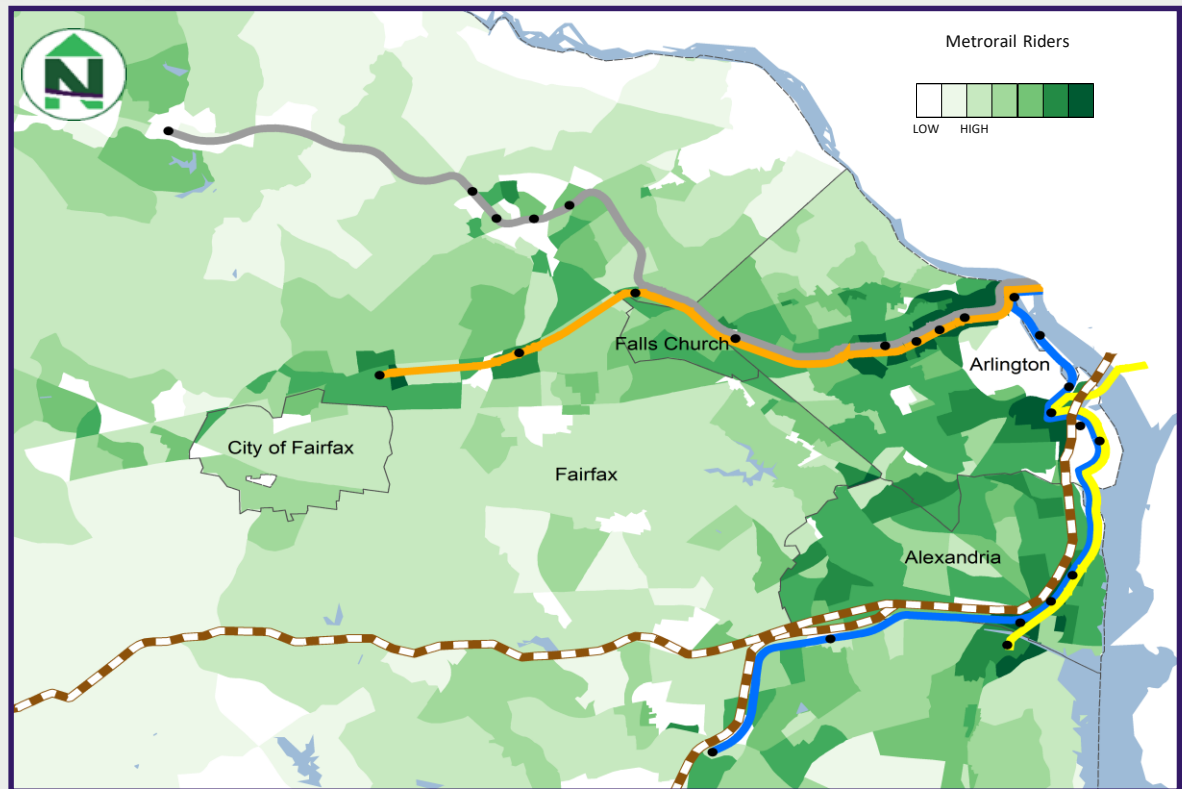
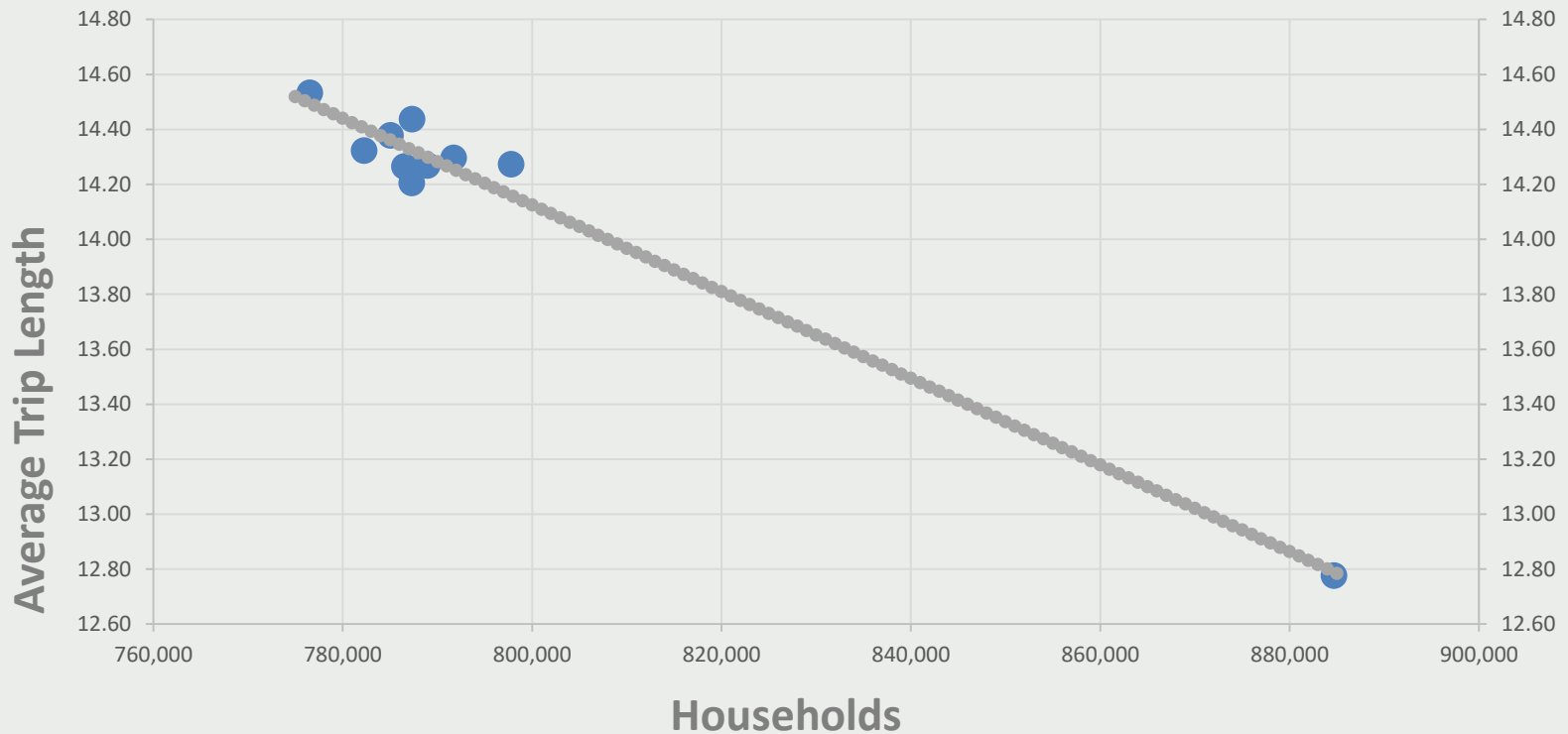


Figure 3 Source: NVTC and WMATA 2016 Metrorail Survey
Ridership weighted by population per traffic analysis zone

Household Reductions



The regression analysis helped to guide the reduction of households in Northern Virginia. It was applied to the abbreviated model runs.

Household Reductions



Jurisdiction	Percent Households Reduced	Percent of Households Reduced to Total Households in the Jurisdiction
Arlington	30%	25%
Alexandria	15%	15%
Fairfax	45%	10%
Loudoun	5%	1%
Prince William	5%	5%

Jobs Reductions



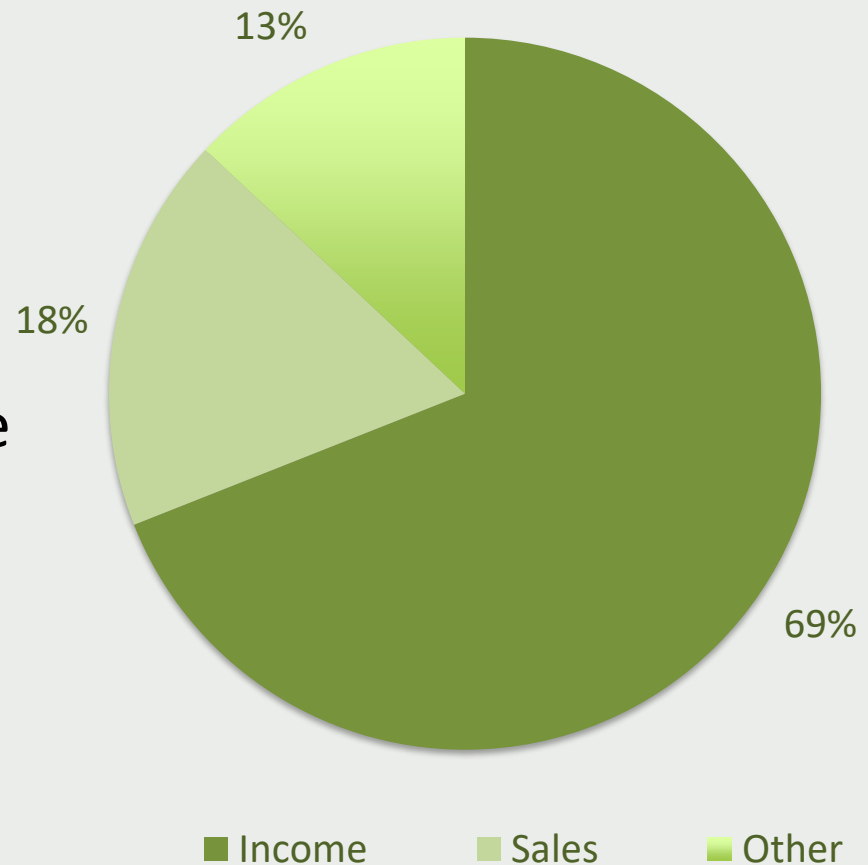
- Attractions
 - TAZ level
 - Proportionally reduced based on the WMATA passenger survey
 - Applied areas around Metro stations
 - Employment was a function of household productions
 - Office employment used NCHRP 365
 - Retail employment used V2.3 trip attraction
 - Balanced to production

Economic Impacts

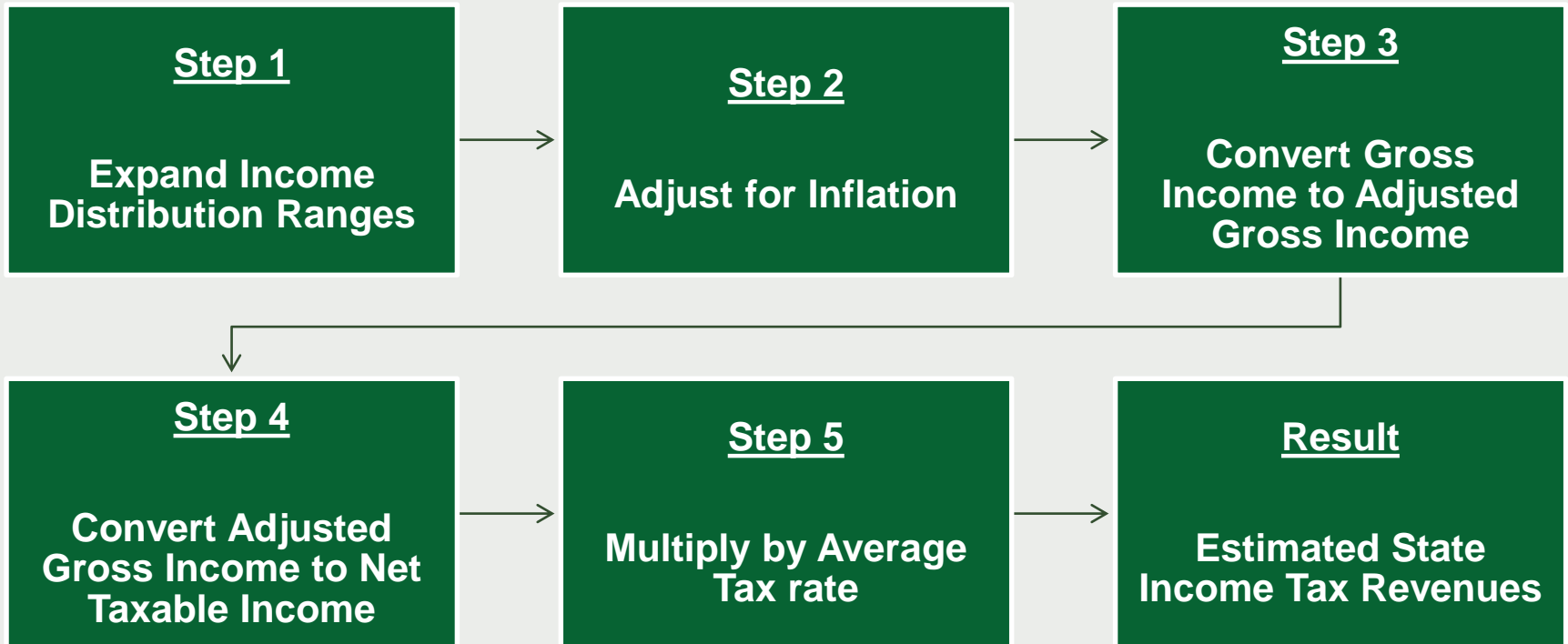


- Focus was impacts to the Commonwealth
- Approximately 90% of the revenue is income and sales taxes
- Calculated the loss in income and sales taxes from redistribution of households and jobs
- Calculations were at the TAZ level

State Tax Sources



Income Tax Calculations



Income Tax Calculations



Household Income provided by the 2009 5-Year American Community Survey

Model Income Quartiles (\$2007)	ACS Income Ranges (\$2009)	Midpoint
< \$50,000	Less than \$10,000	\$5,000
	\$10,000 to \$14,999	\$12,500
	\$15,000 to \$24,999	\$20,000
	\$25,000 to \$34,999	\$30,000
	\$35,000 to \$49,999	\$42,500
\$50,000 - \$99,999	\$50,000 to \$74,999	\$62,500
	\$75,000 to \$99,999	\$87,500
\$100,000 - \$149,000	\$100,000 to \$149,999	\$125,000
> \$150,000	\$150,000 to \$199,999	\$175,000
	\$200,000 or more	\$400,000

Income Tax Calculations



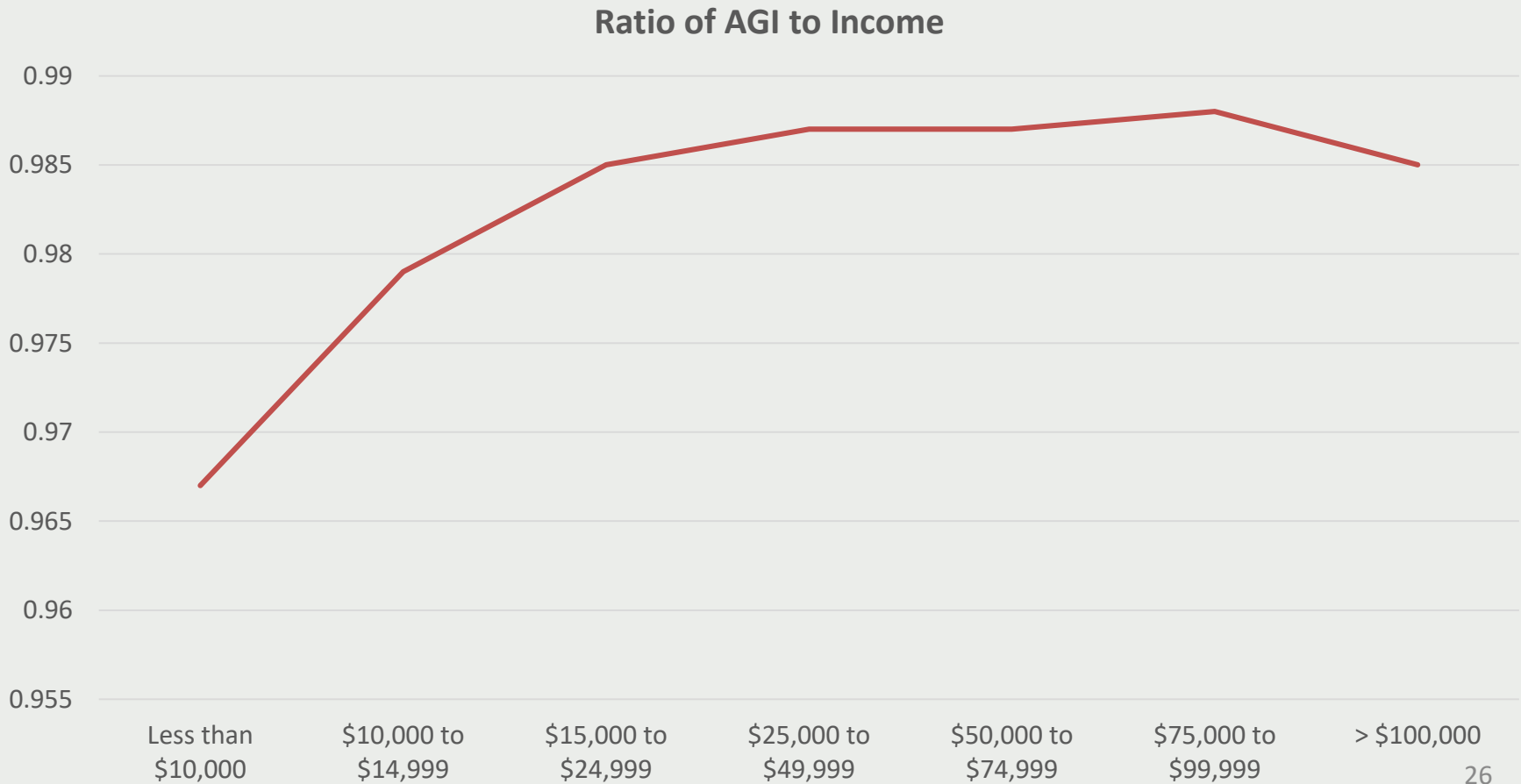
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Income Tax Calculations



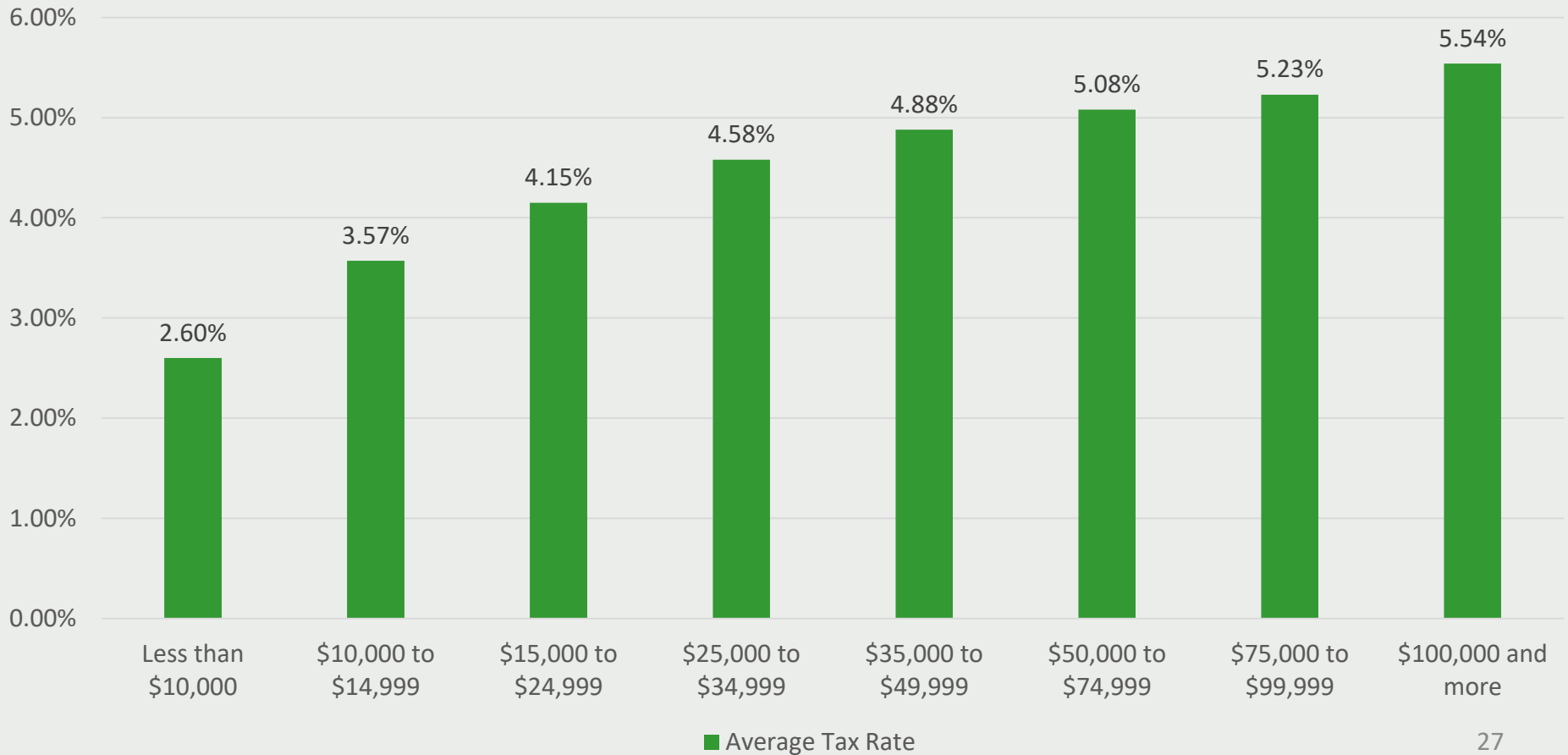
Gross Income compared to Adjusted Gross Income



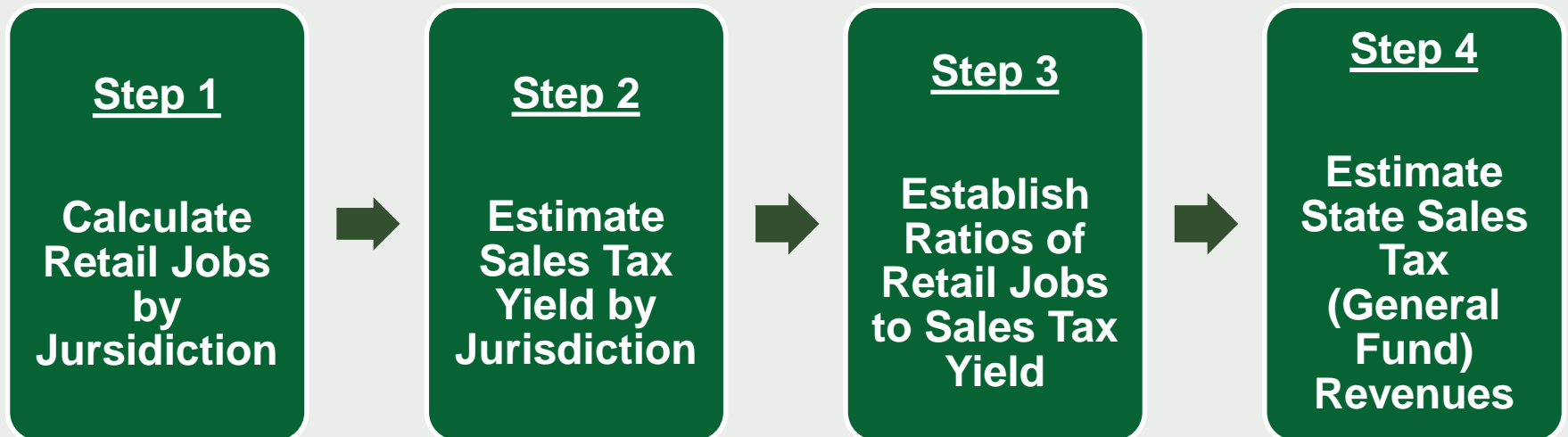
Income Tax Calculations



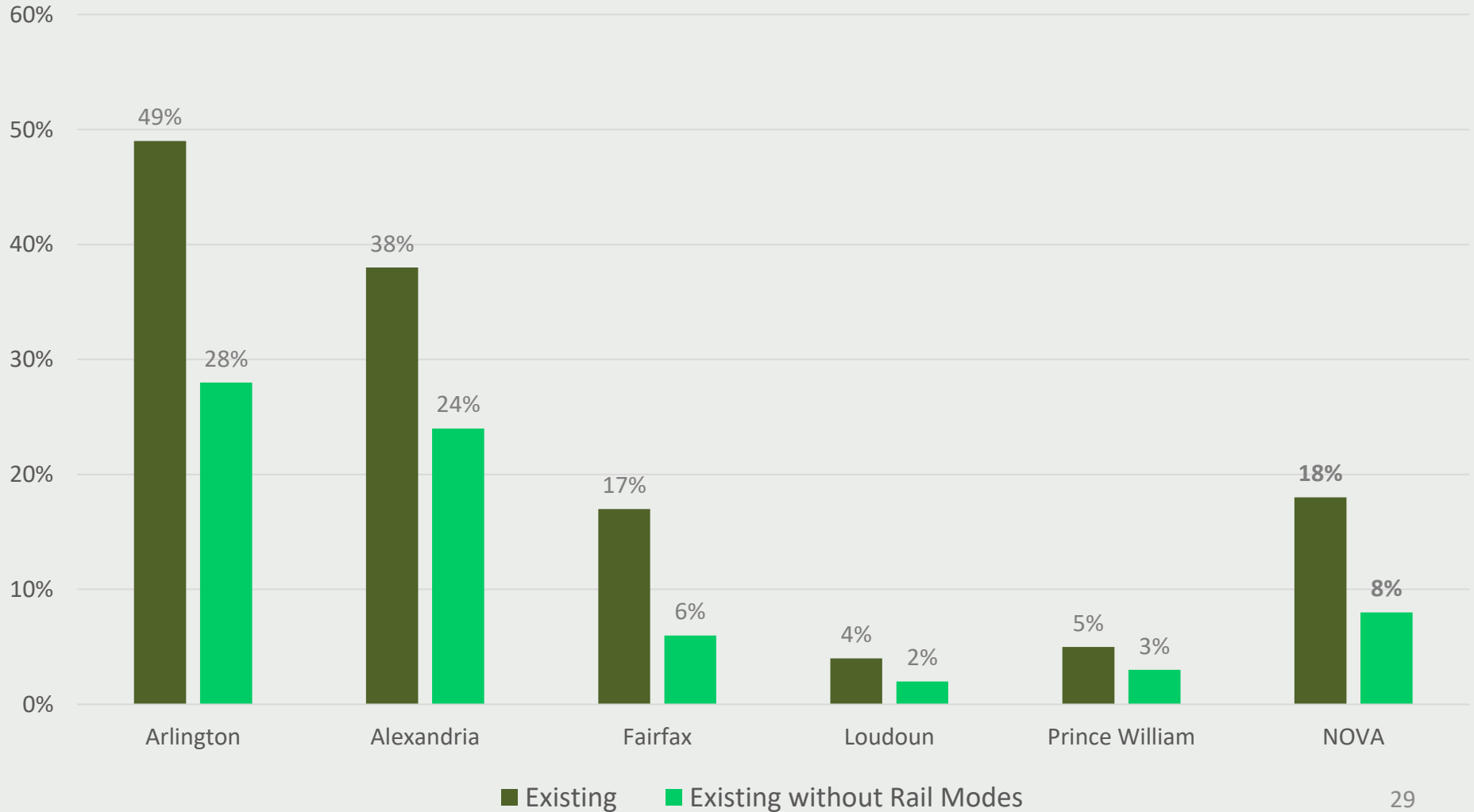
Adjusted Gross Income, Taxable Income, and Total Tax Liability by Income Class.



Sales Tax Calculations

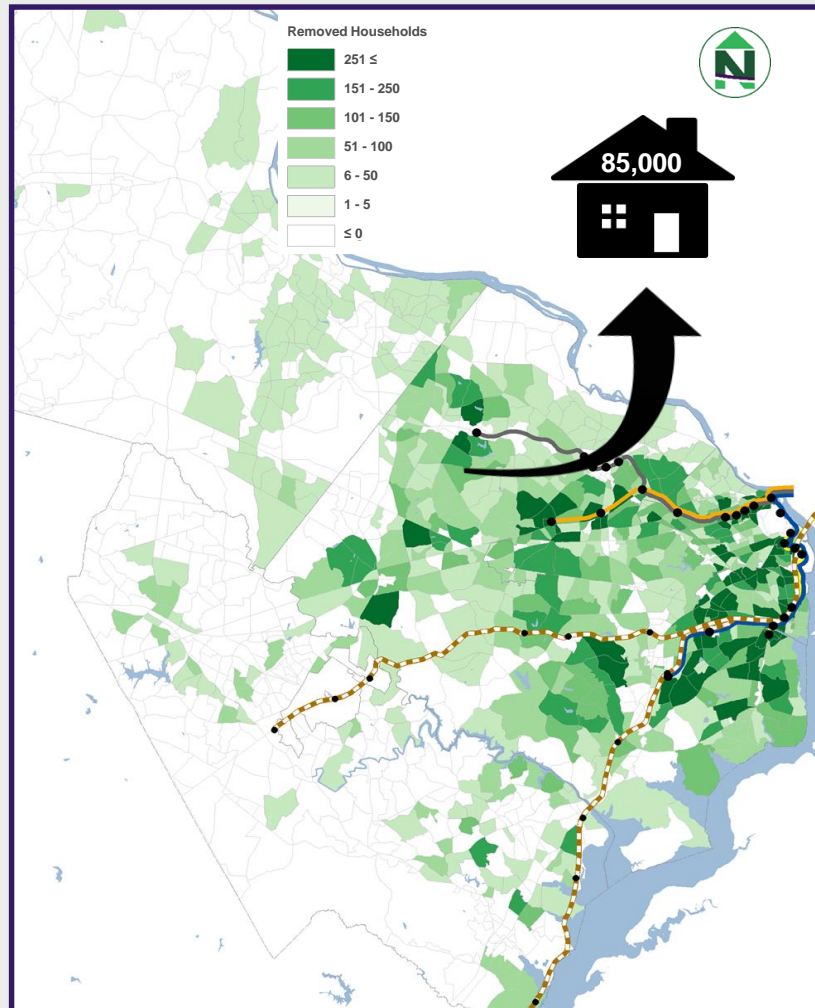


Findings HBW Mode Share Impacts

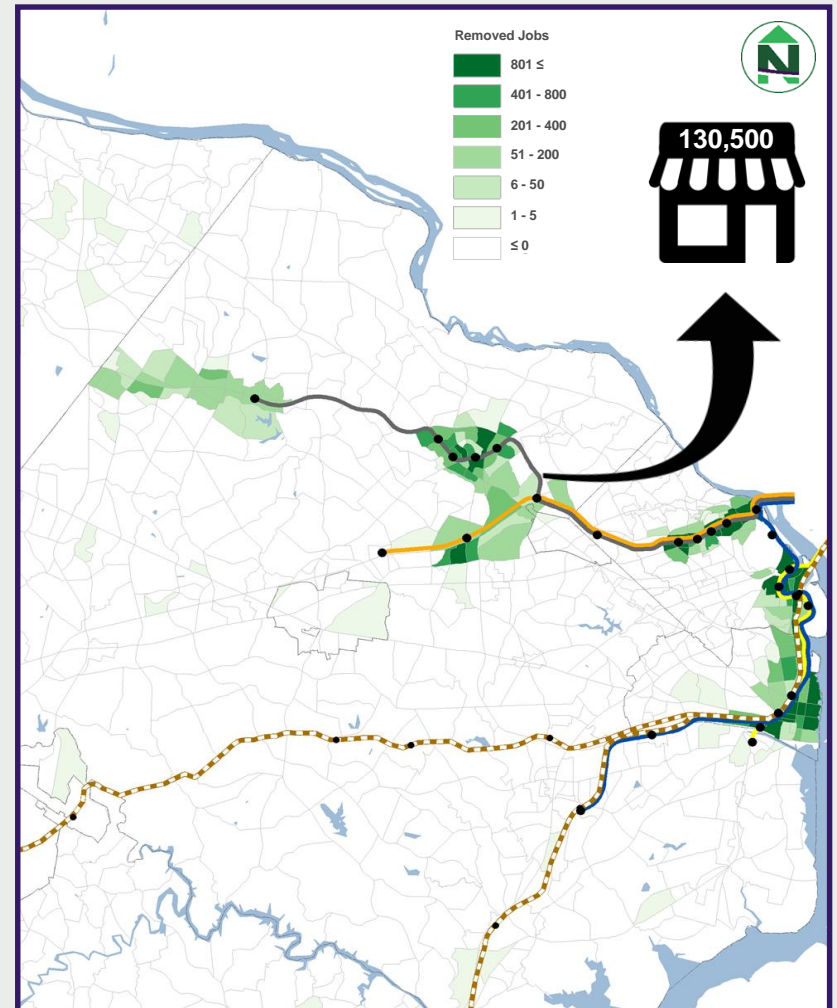


Redistributing Land Use

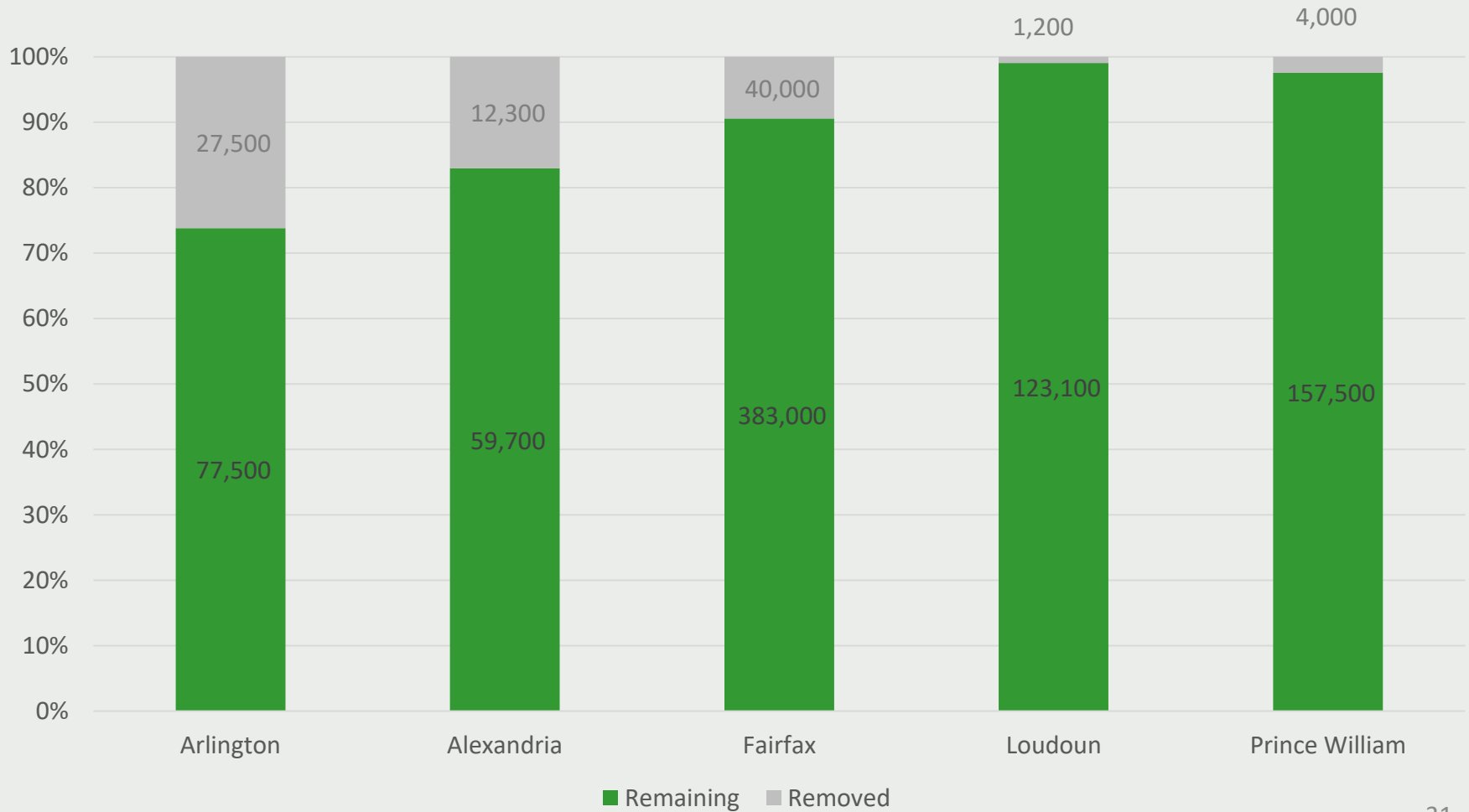
Households Redistributed



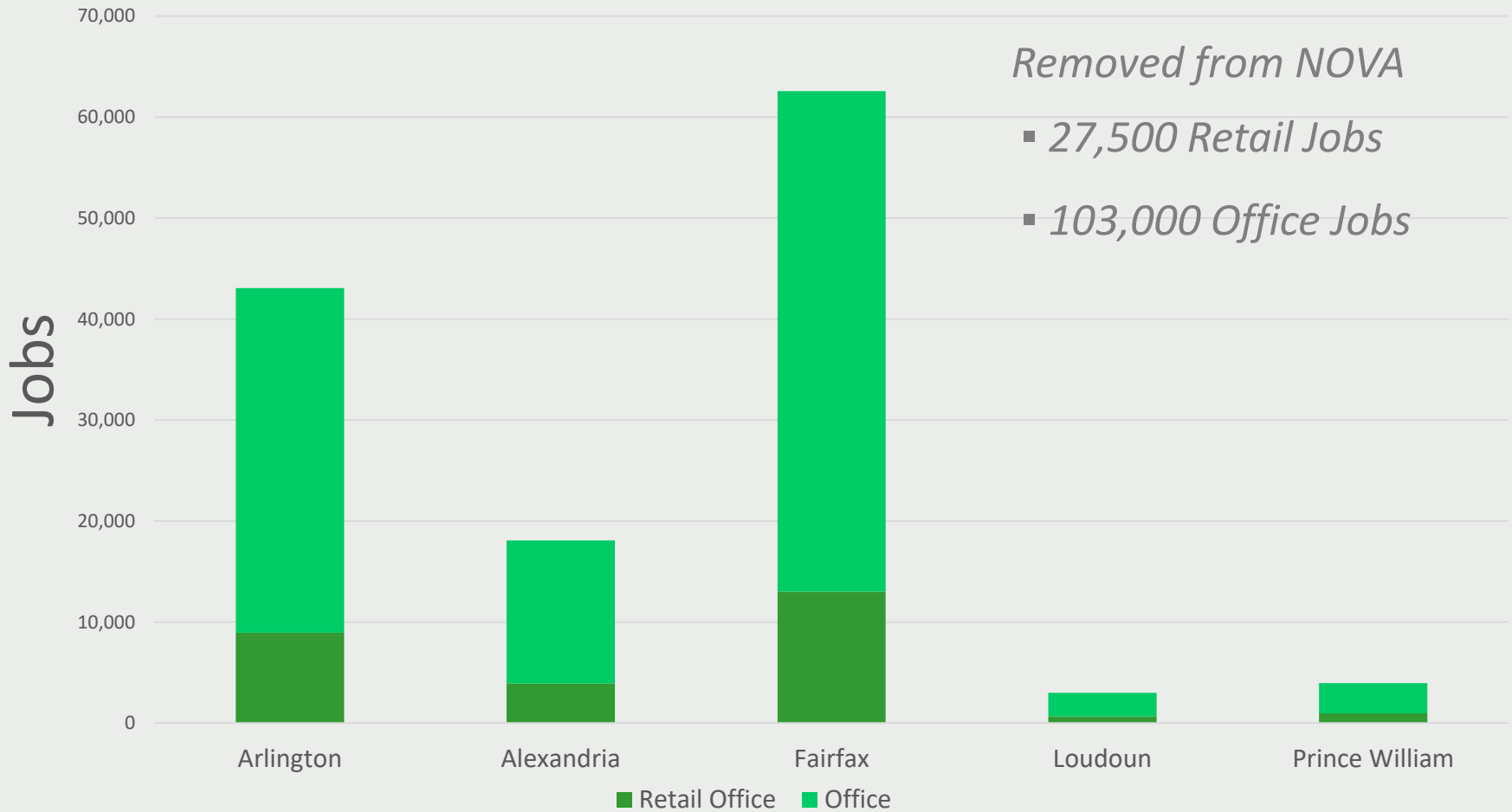
Jobs Redistributed



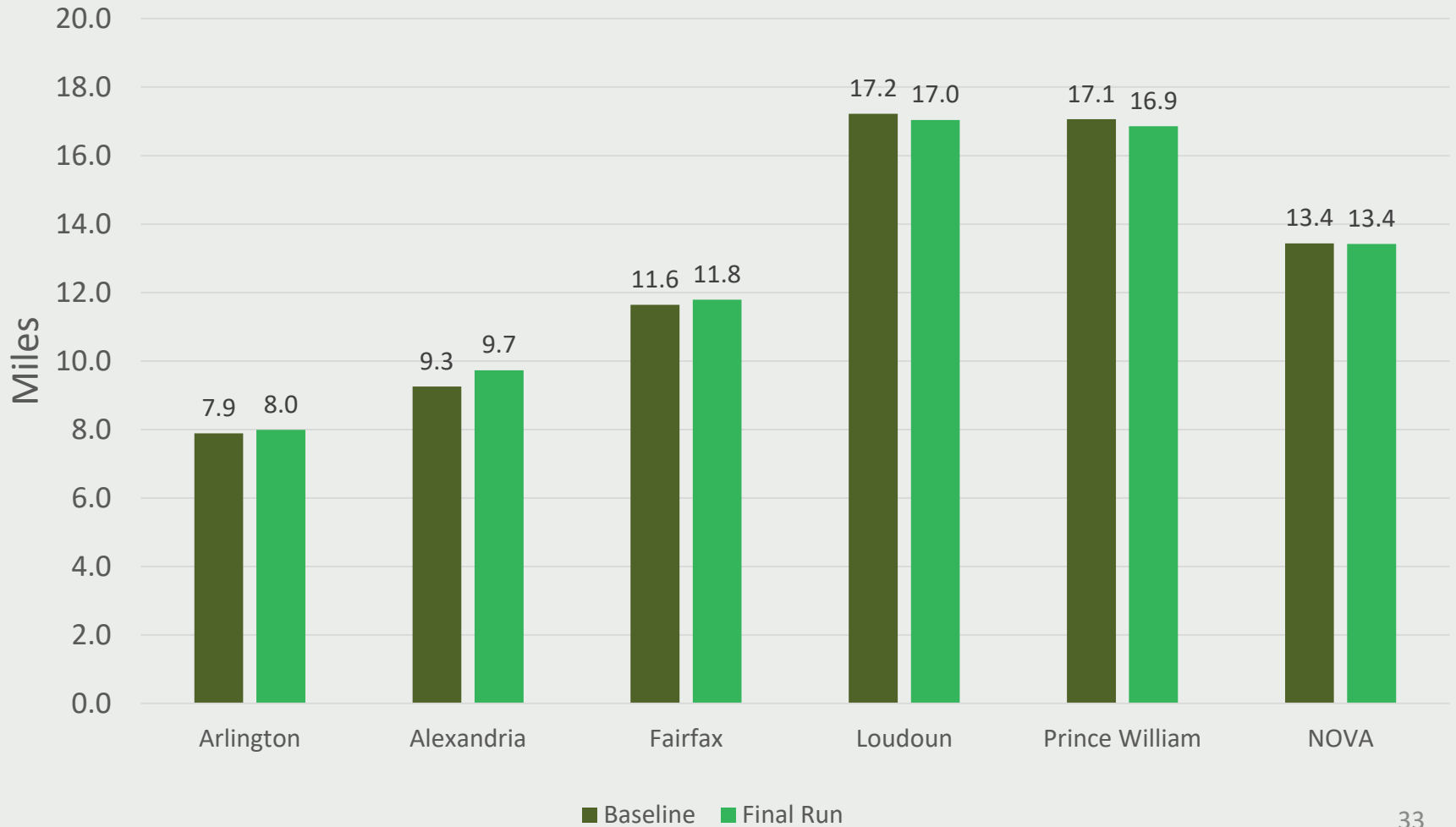
Household Reductions



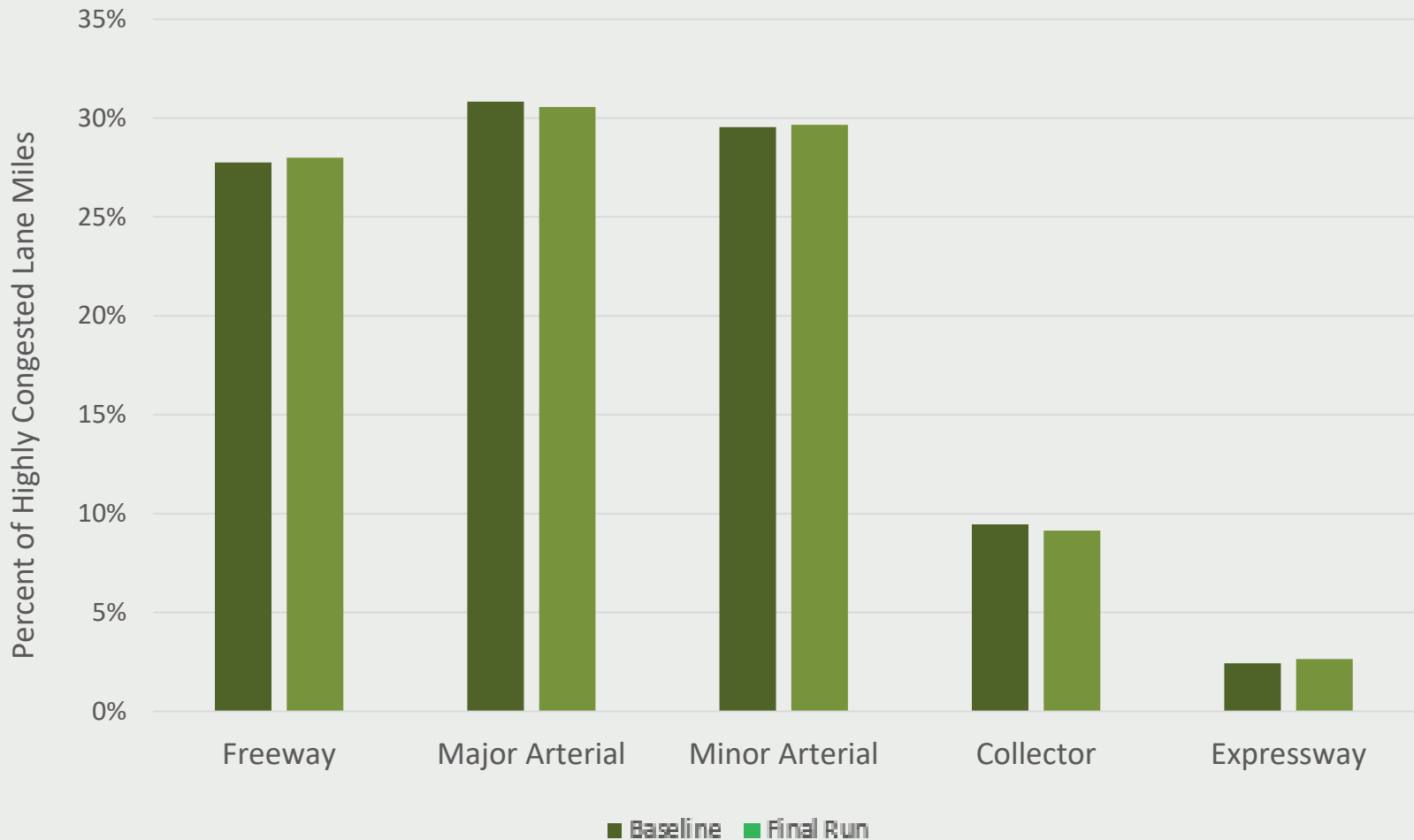
Job Reductions



HBW Trip Average Length



Percent Distribution by Facility Type of Highly Congested Lane Miles



Report Findings: Revenues, Riders, and Cost Savings



More than
\$600M



in sales and income tax revenue sent to the state's general fund generated by the additional households and jobs that rail supports

250%
ROI

received by the Commonwealth from the \$170 million it provided to Metro and VRE

130K



additional daily transit trips in Northern Virginia

56,500

lane miles of congestion saved



This report can be found at

www.novatransit.org

Northern Virginia Transportation Commission

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