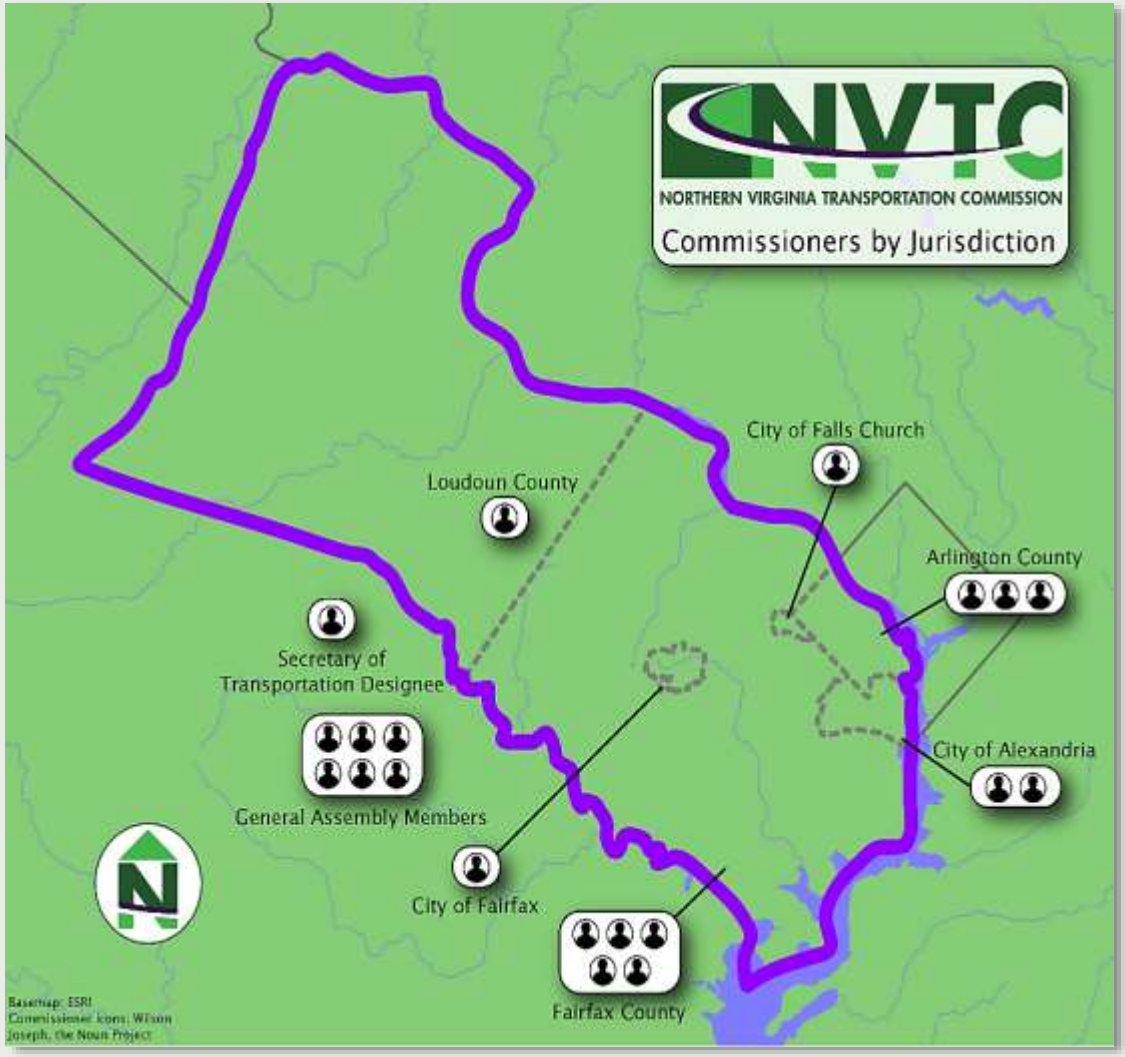
# The Value of Metrorail and Virginia Railway Express to the Commonwealth of Virginia

## 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

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# Why is Rail Transit Important to Virginia?

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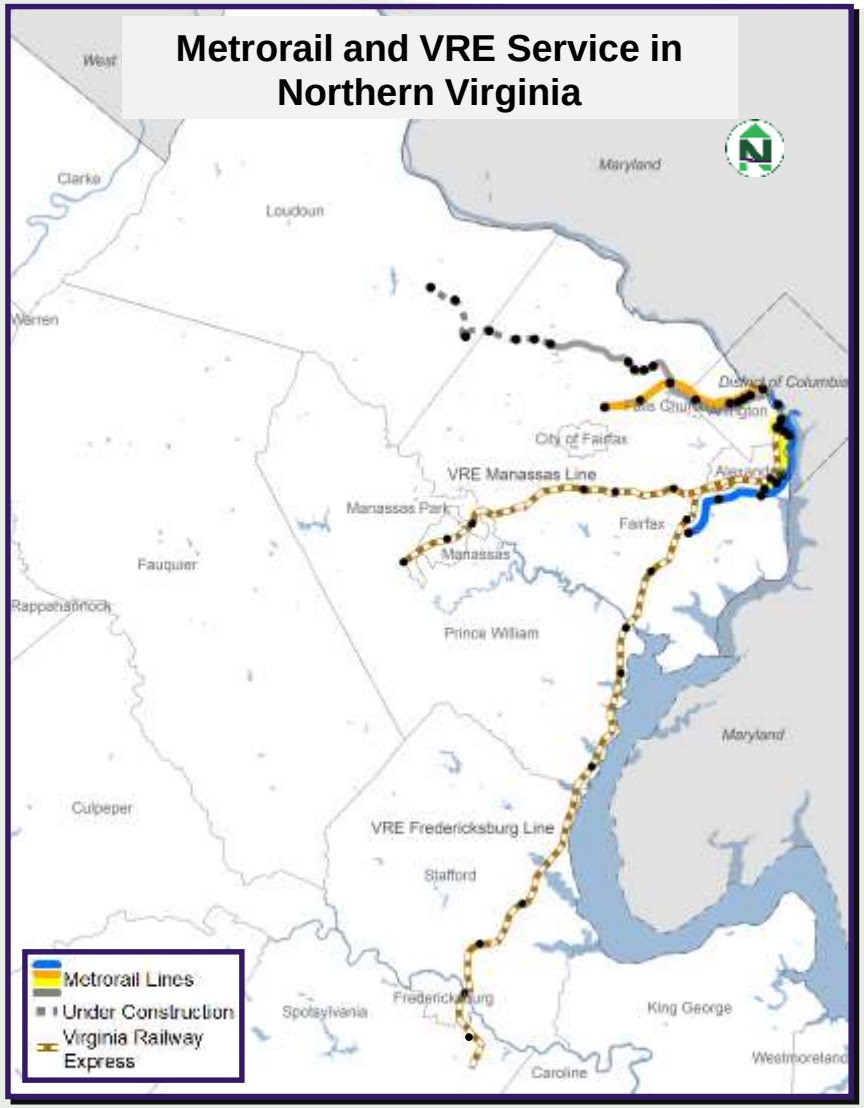


- ✓ Metrorail and VRE move 290,000 people per average weekday
- ✓ Approximately 80 directional miles of Metrorail and 25 stations in Virginia
- ✓ VRE has approximately 160 directional track miles and 17 stations in Virginia
- ✓ Regional Benefits - NVTC, WMATA, and MWCOG studies
  - $235B in property 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

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## Study Objective

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

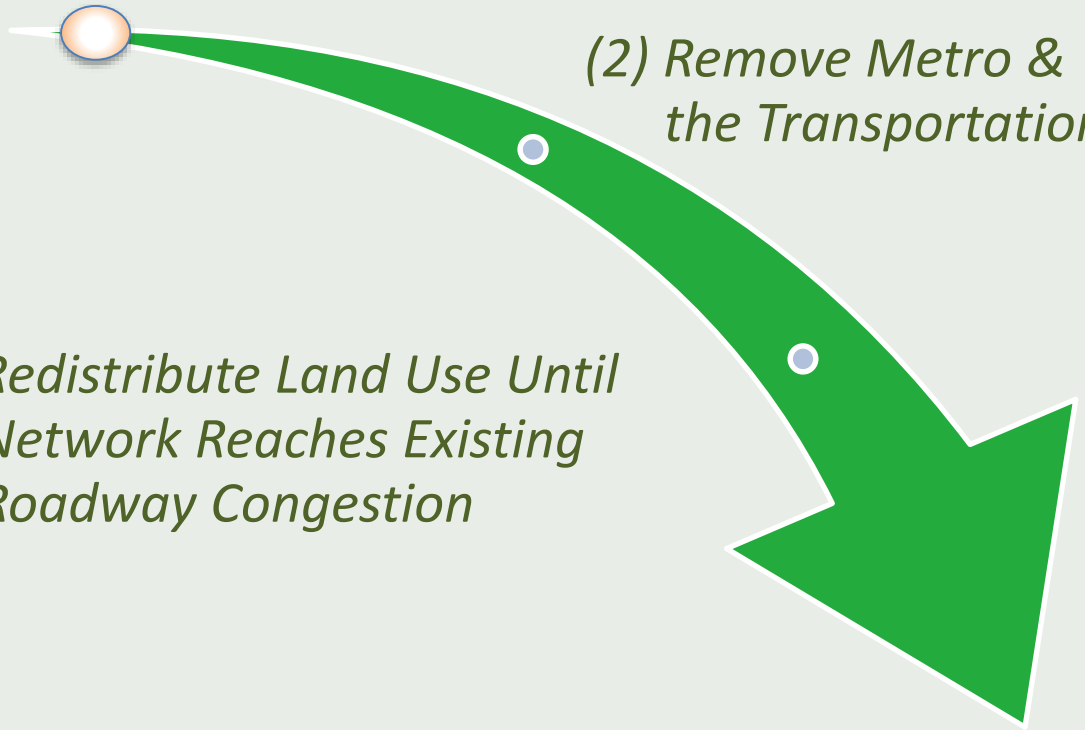
**Technical Review Team**

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

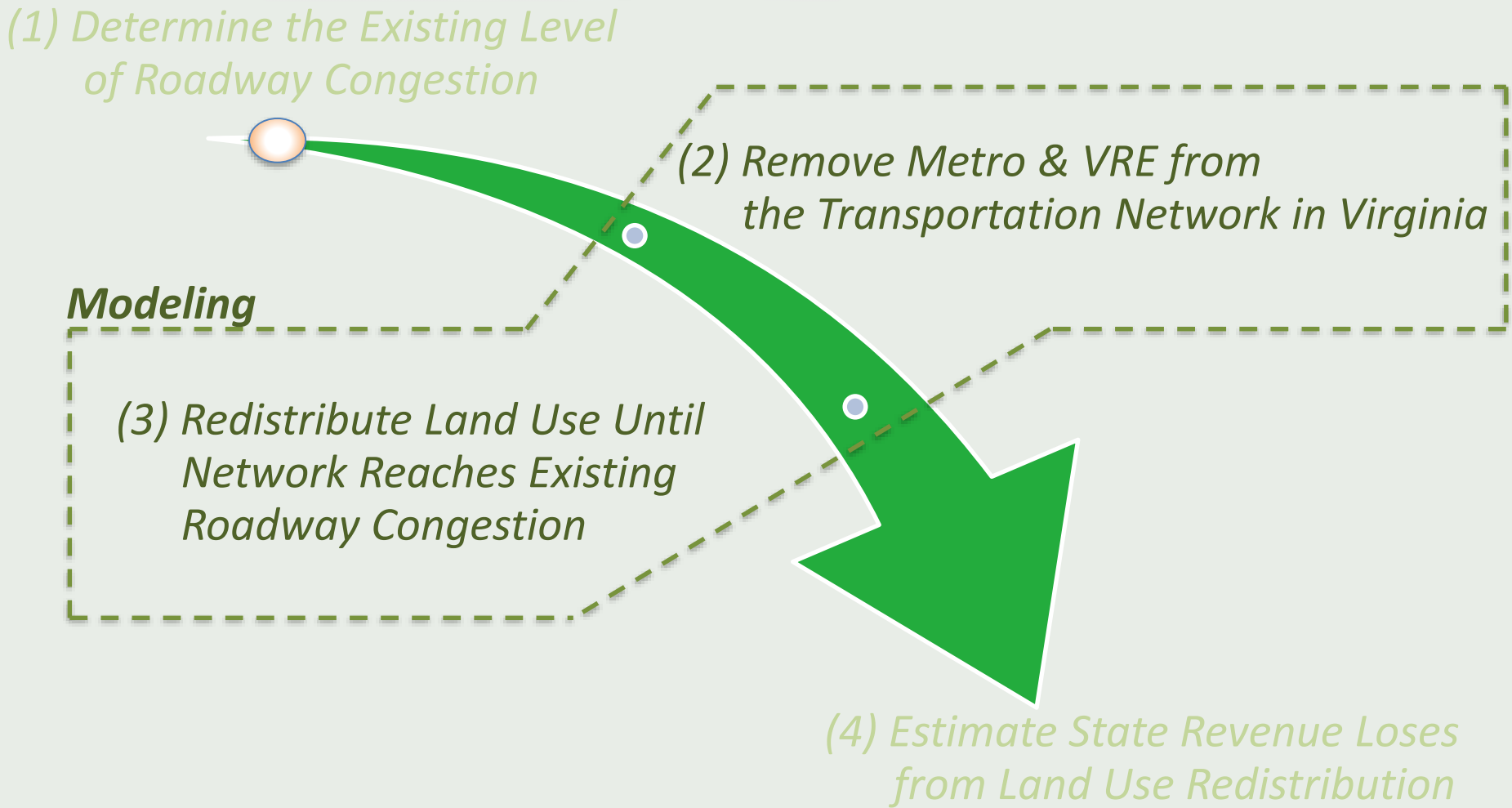
## How is this different than other studies?

- 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.

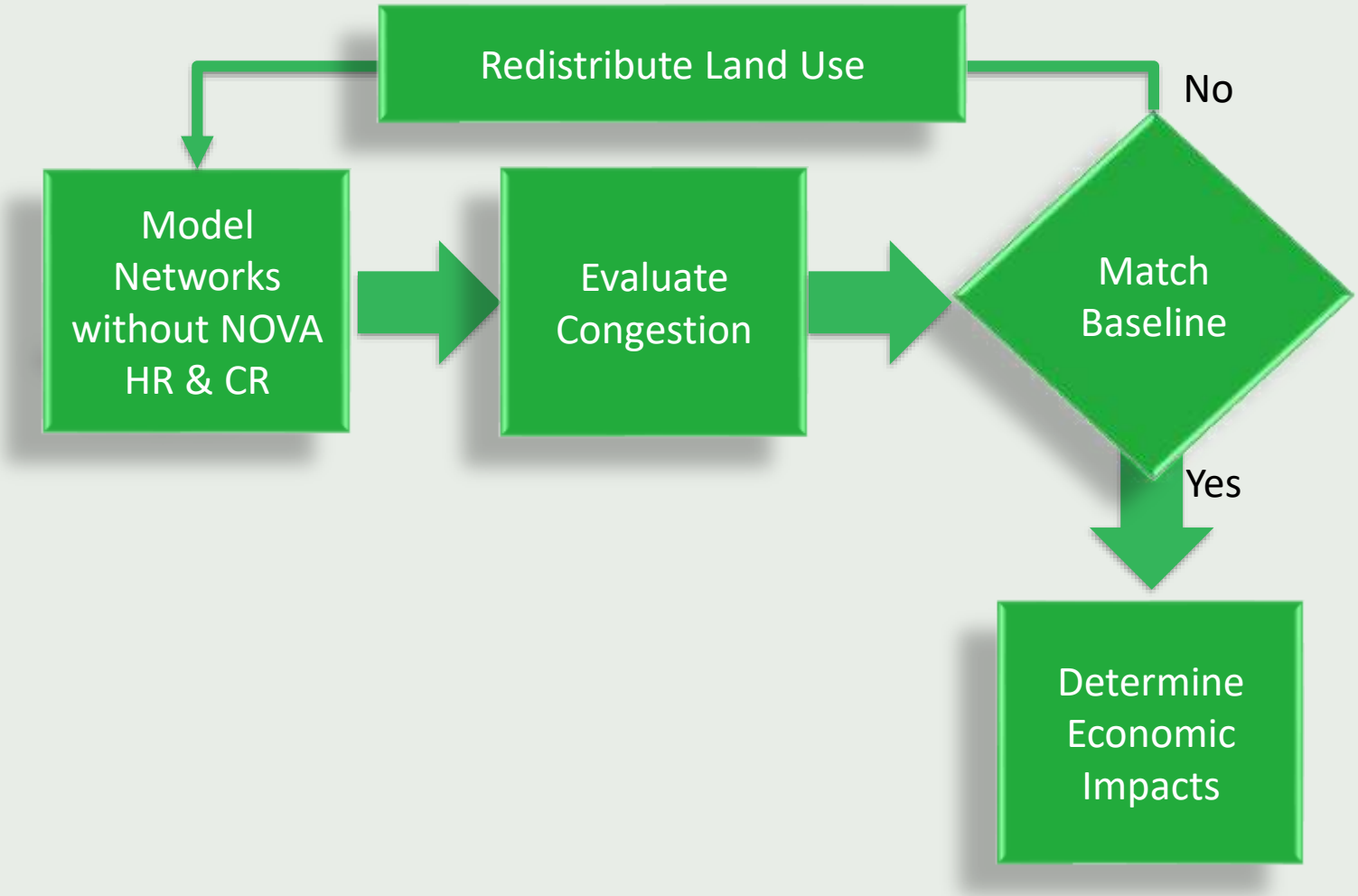
# Study Approach



# Study Approach



# Modeling Application



# Existing Level of Roadway Congestion

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## 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

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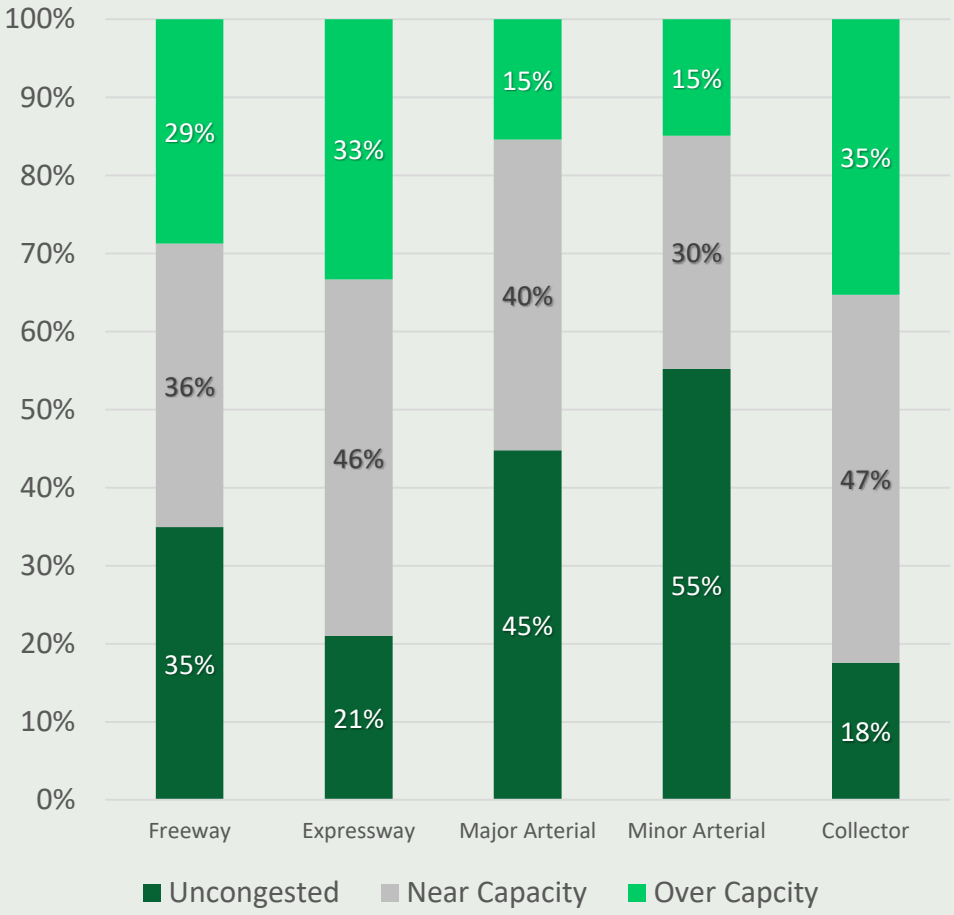
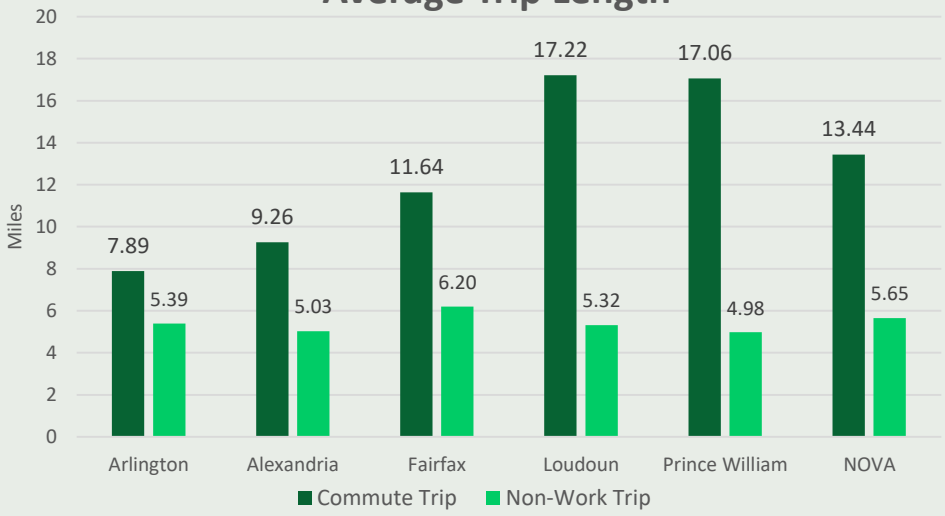
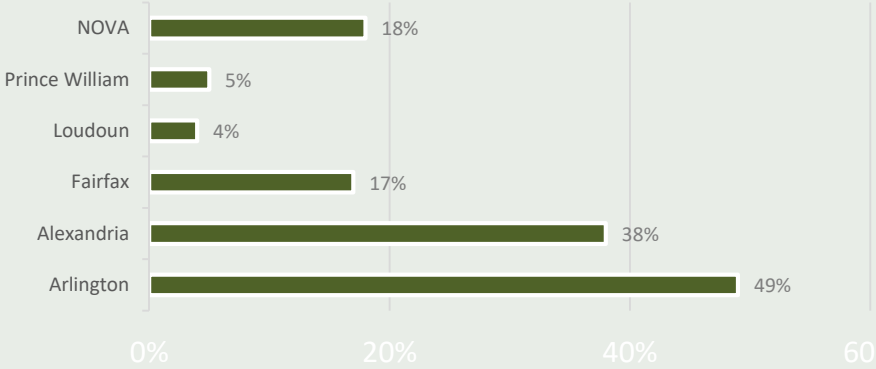
## Northern Virginia Morning Peak Period Lane Miles of Congestion




## Average Trip Length




## HBW Transit Mode Share



# Percent of Lane Miles by Level of Service

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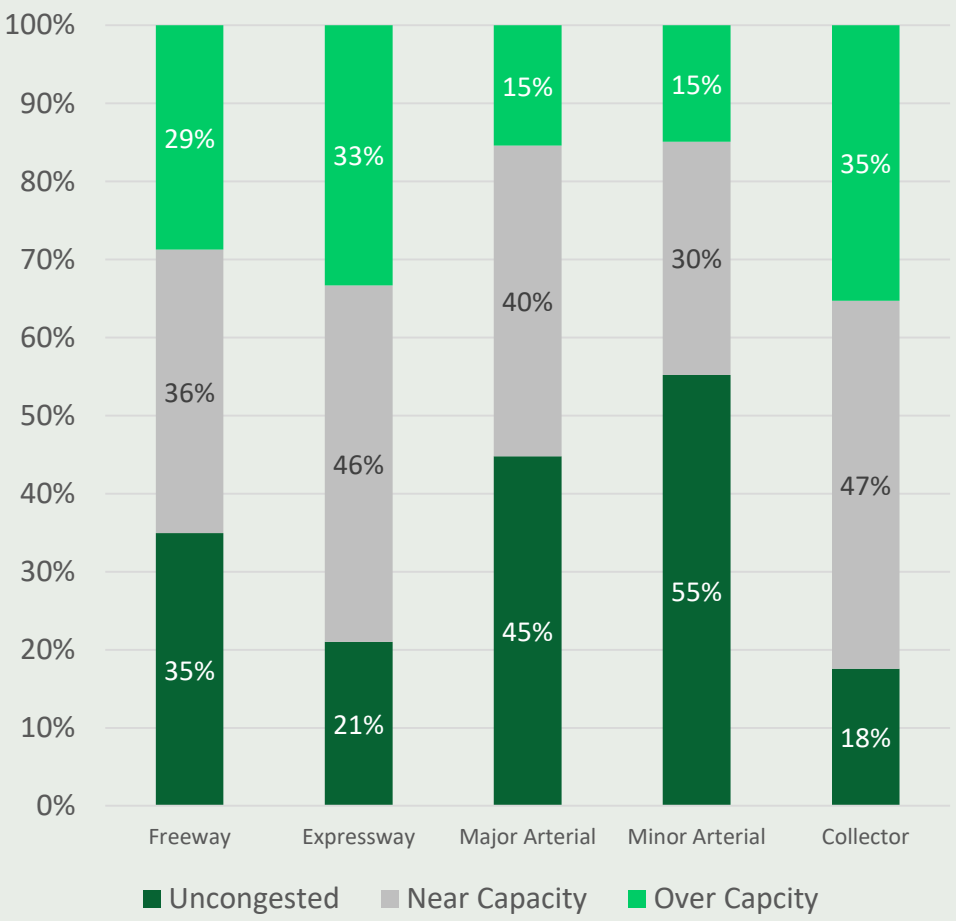
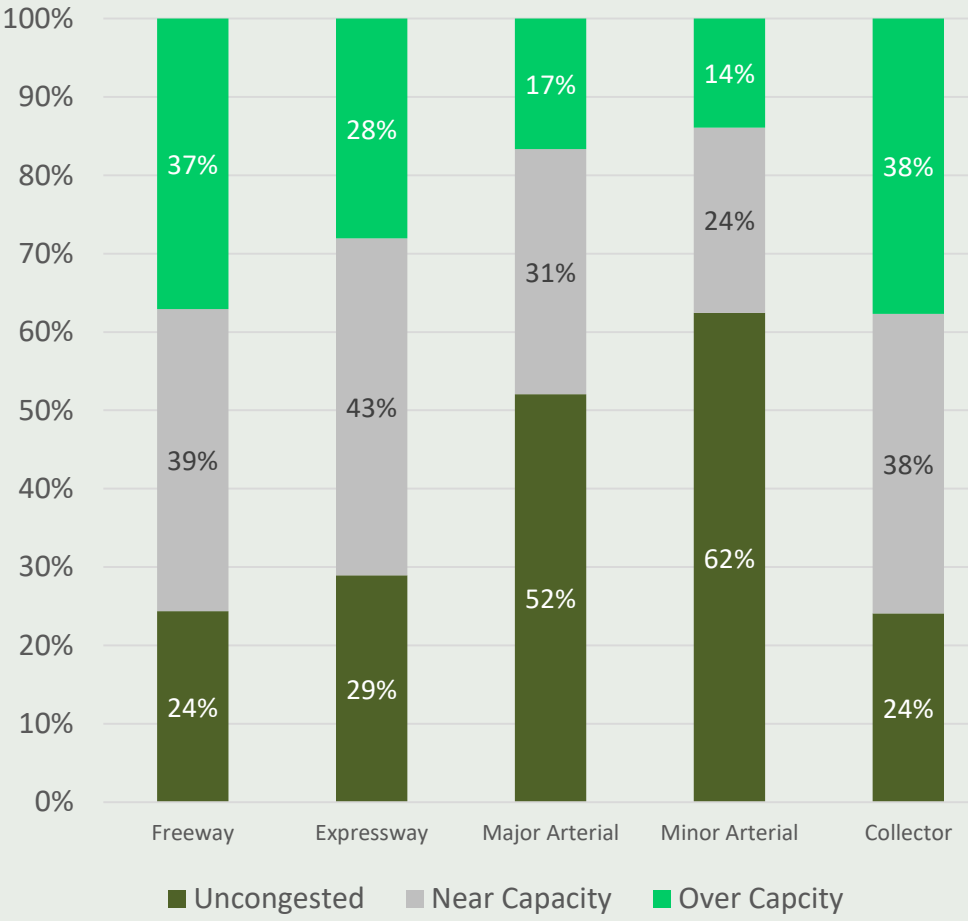
## Northern Virginia Morning Peak Period Lane Miles of Congestion



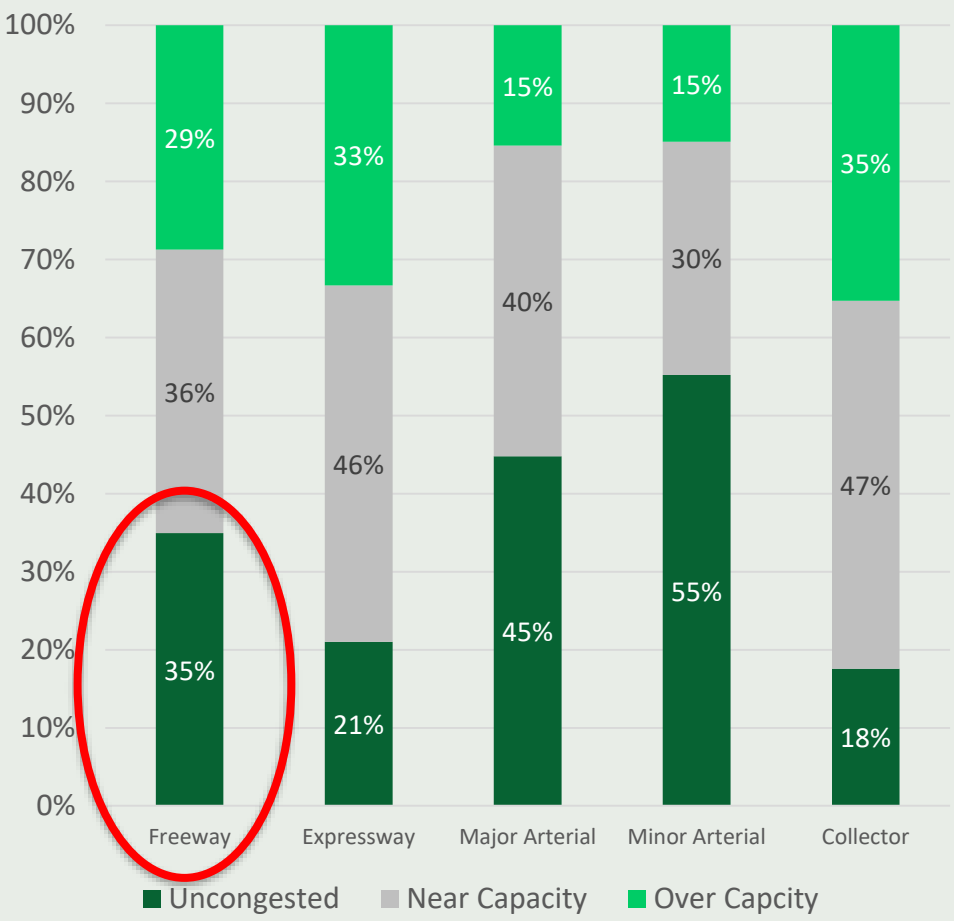

## Metropolitian Area Morning Peak Period Lane Miles of Congestion



# Percent of Lane Miles by Level of Service

NORTHERN VIRGINIA TRANSPORTATION COMMISSION

## Northern Virginia Morning Peak Period Lane Miles of Congestion

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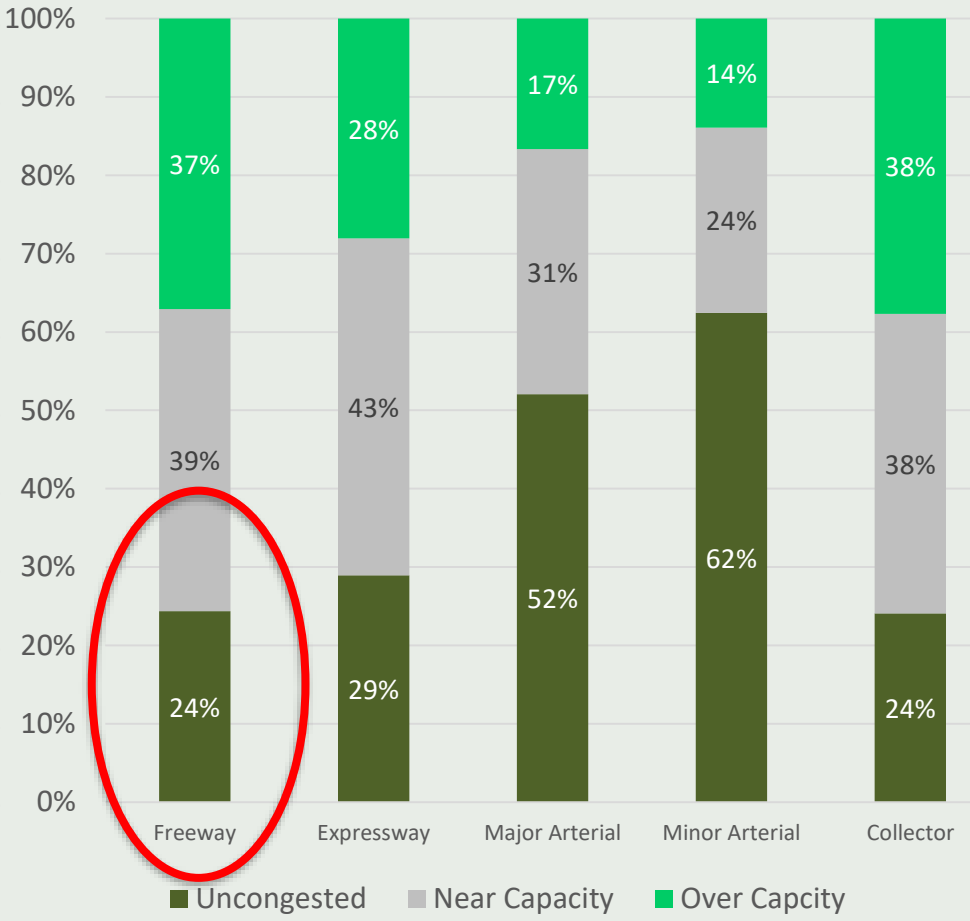
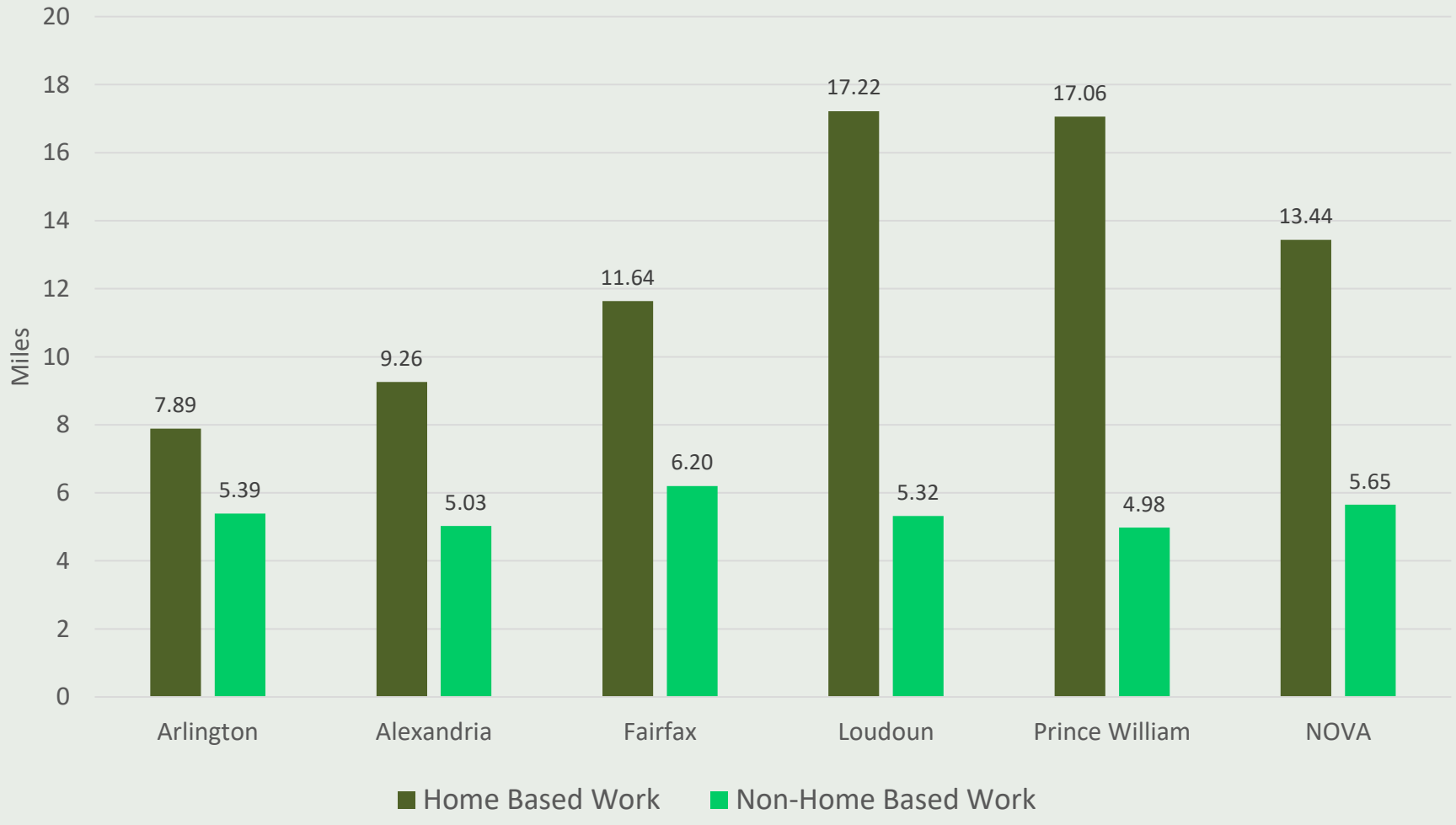


# Mobility Measure

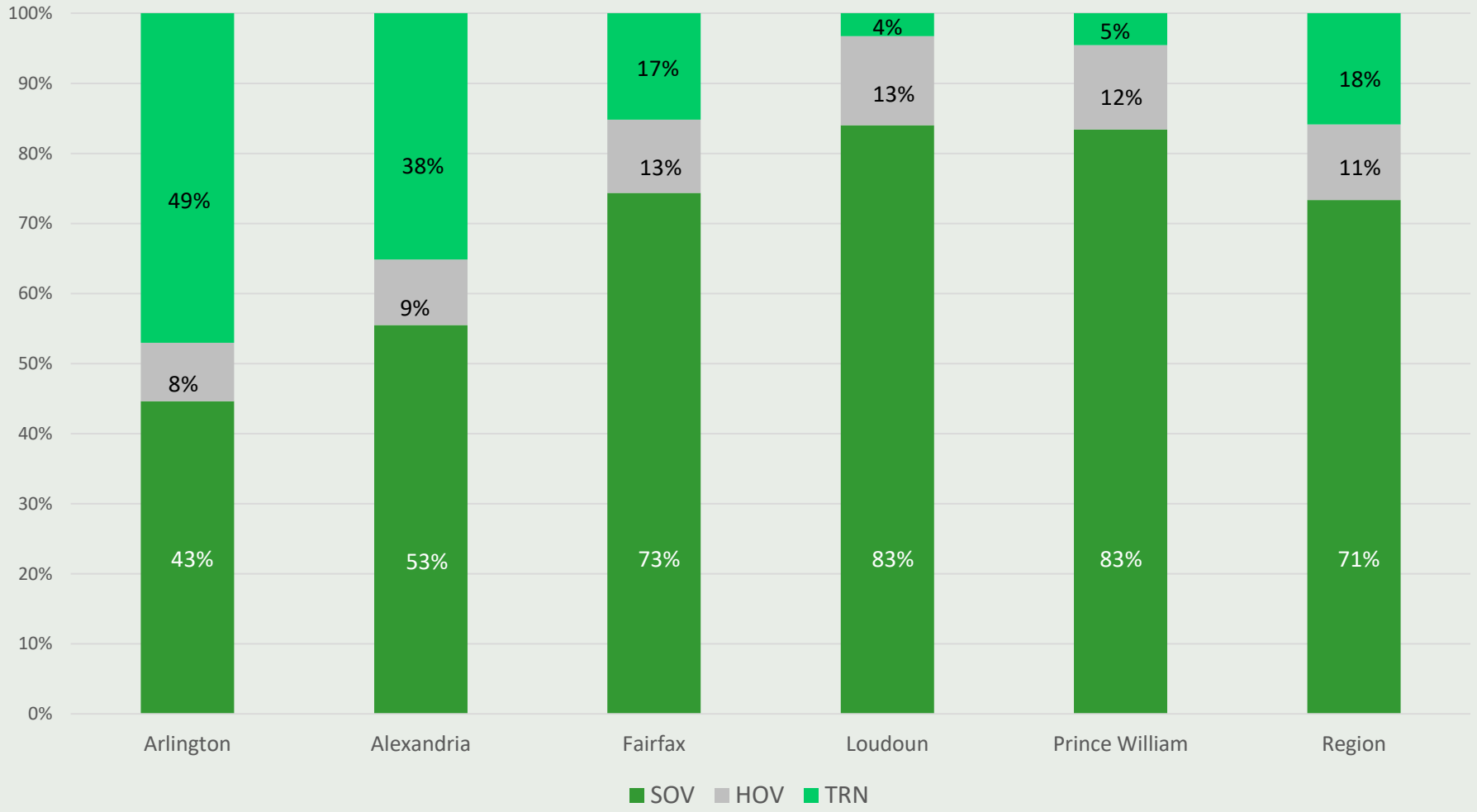
- Gravity Model
- Travel time budget
- Average HBW trip time 30 minutes
- Time constant
- Length changes
- Measures impact from congestion

$$Trips_{ij} = P_i \times \frac{A_j \times FF_{ij} \times K_{ij}}{\Sigma(A_j \times FF_{ij} \times K_{ij})}$$

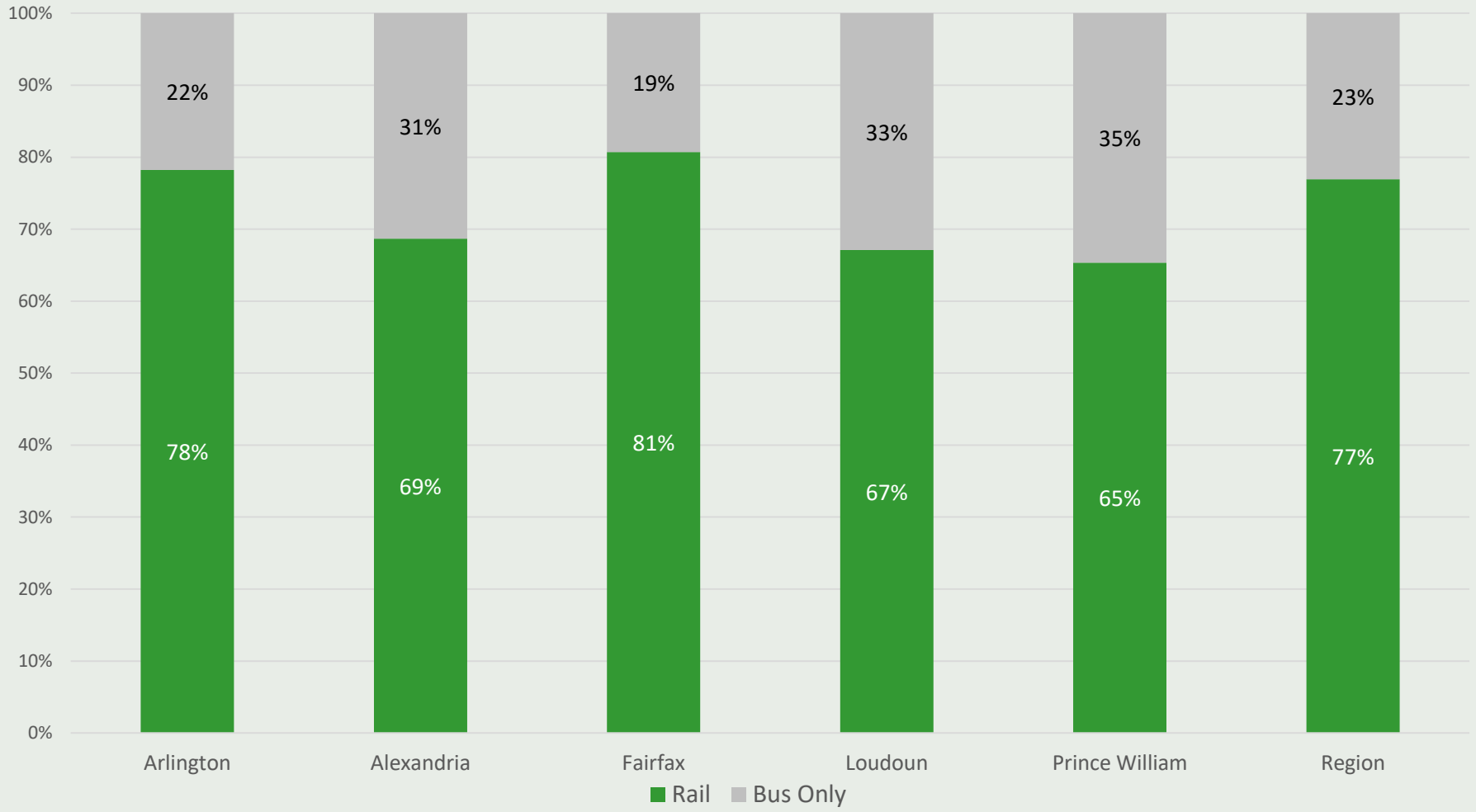
# Existing Trip Length



# Existing HBW Mode Share



# Existing HBW Transit Mode Share



# Modeling

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- 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

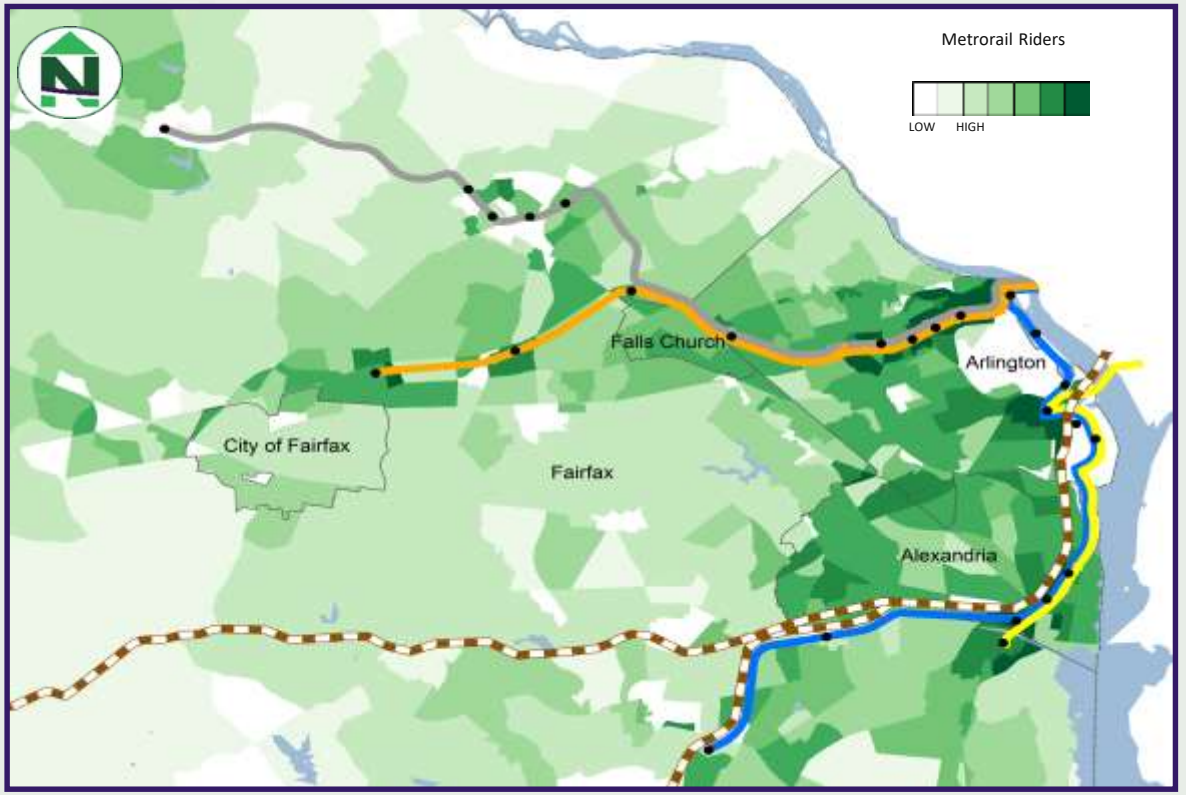
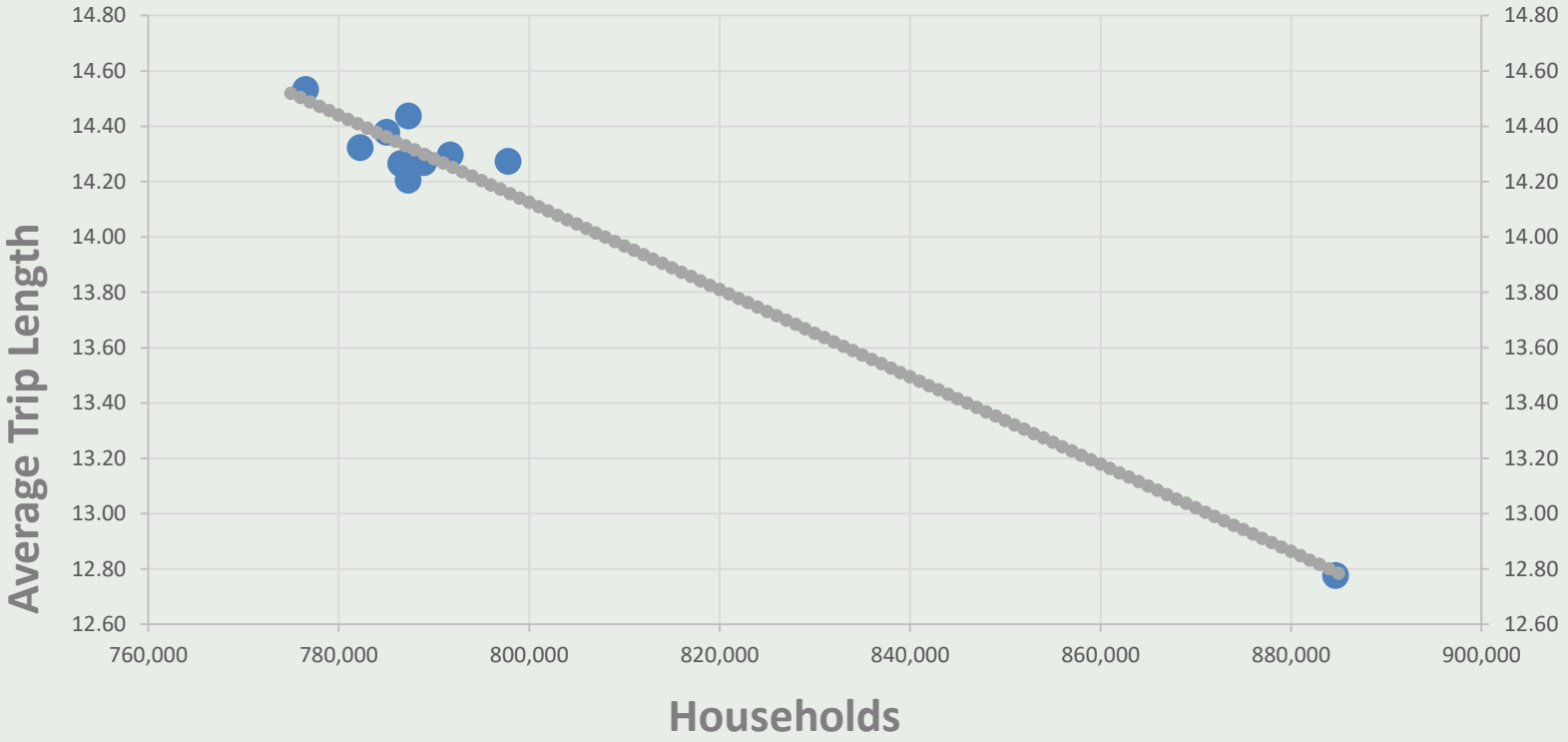



*Figure 3 Source: NVTC and WMATA 2016 Metrorail Survey*
*Ridership weighted by population per traffic analysis zone*

# 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

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| 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

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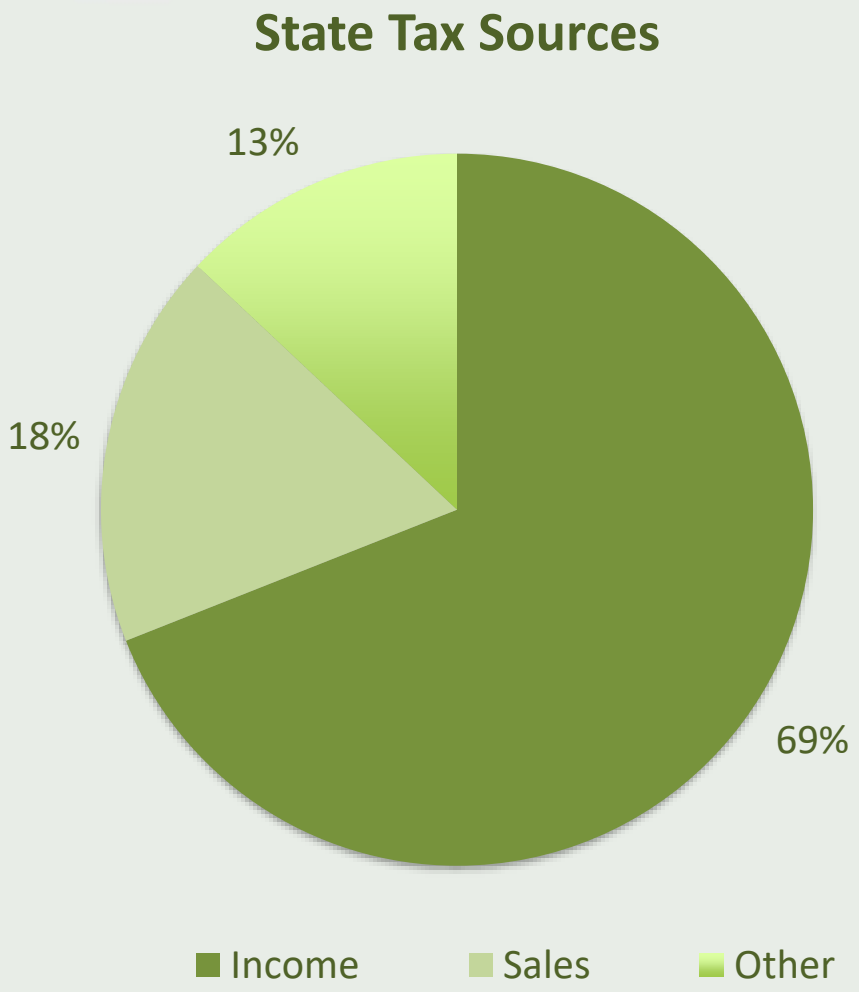
- Attractions
  - TAZ level
  - Proportionally reduced based on the WMATA passenger survey
  - Applied areas around Metro stations
  - Employment was a function of household productions
    - Office employment used NCHRP 365
    - Retail employment used V2.3 trip attraction
  - Balanced to production

# 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



# Income Tax Calculations

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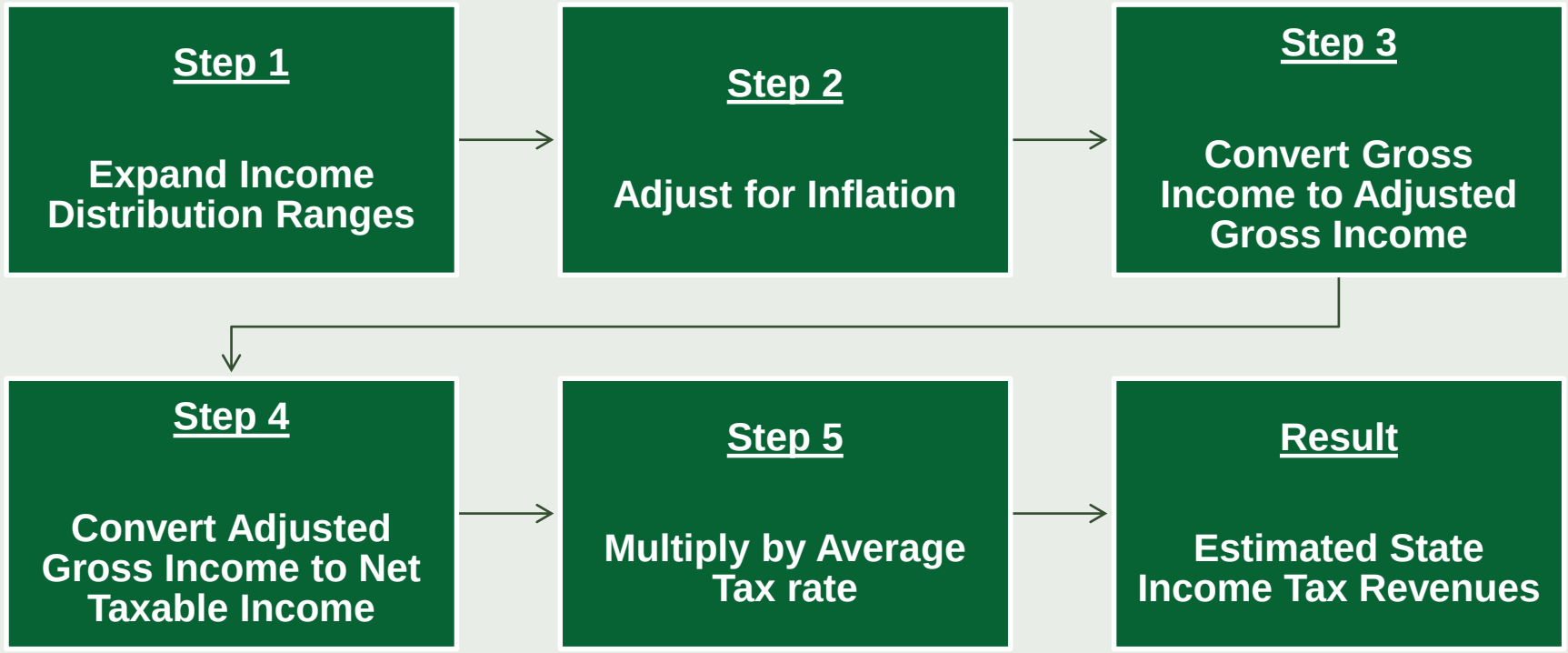

# Income Tax Calculations

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**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 |

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| | **$200,000 or more** | **$400,000** |

# Income Tax Calculations

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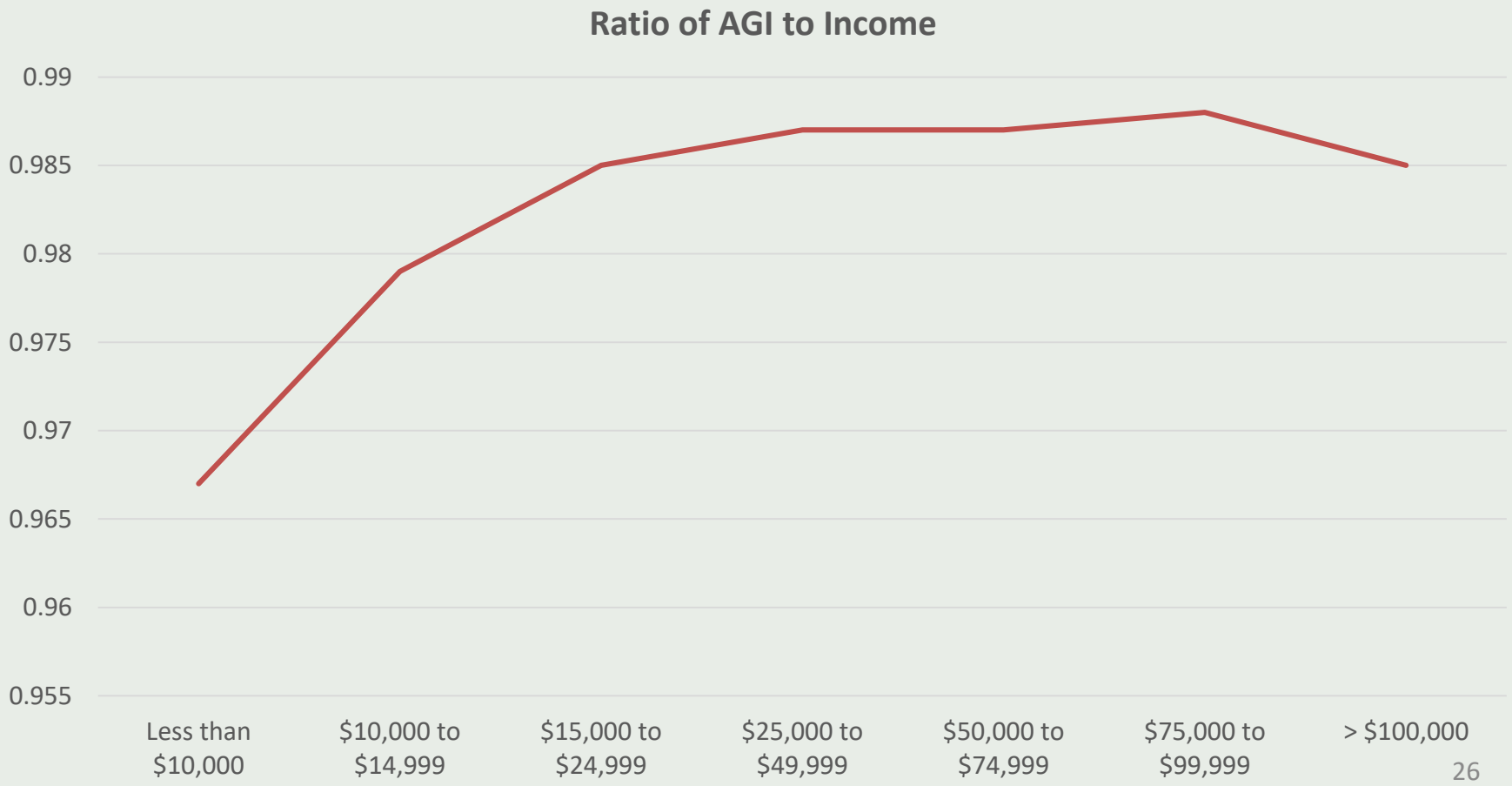
## Gross Income compared to Adjusted Gross Income



# Income Tax Calculations

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

# Sales Tax Calculations

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**Step 1**

Calculate Retail Jobs by Jursidiction

**Step 2**

Estimate Sales Tax Yield by Jurisdiction

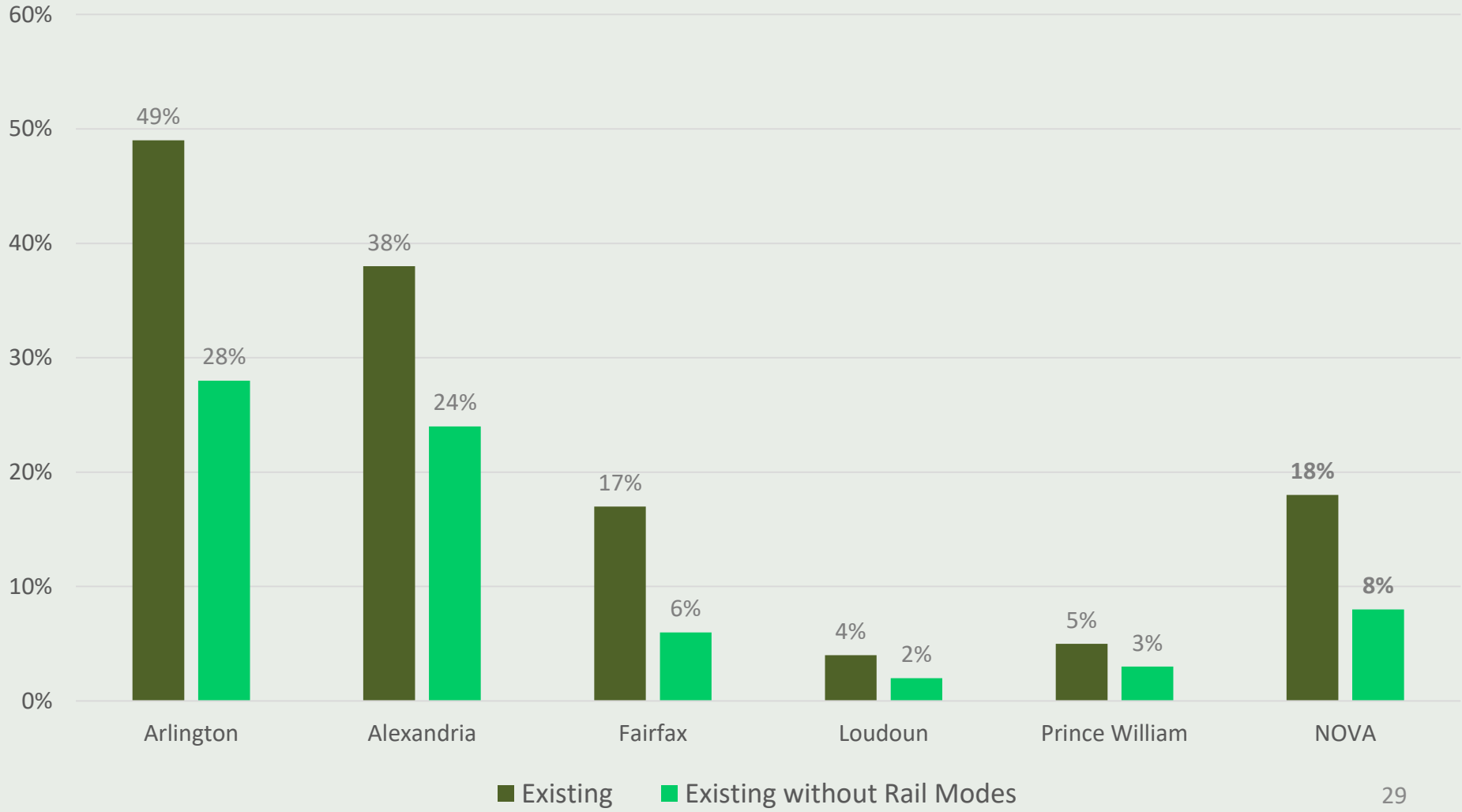
**Step 3**

Establish Ratios of Retail Jobs to Sales Tax Yield

**Step 4**

Estimate State Sales Tax (General Fund) Revenues

# Findings HBW Mode Share Impacts



# Redistributing Land Use

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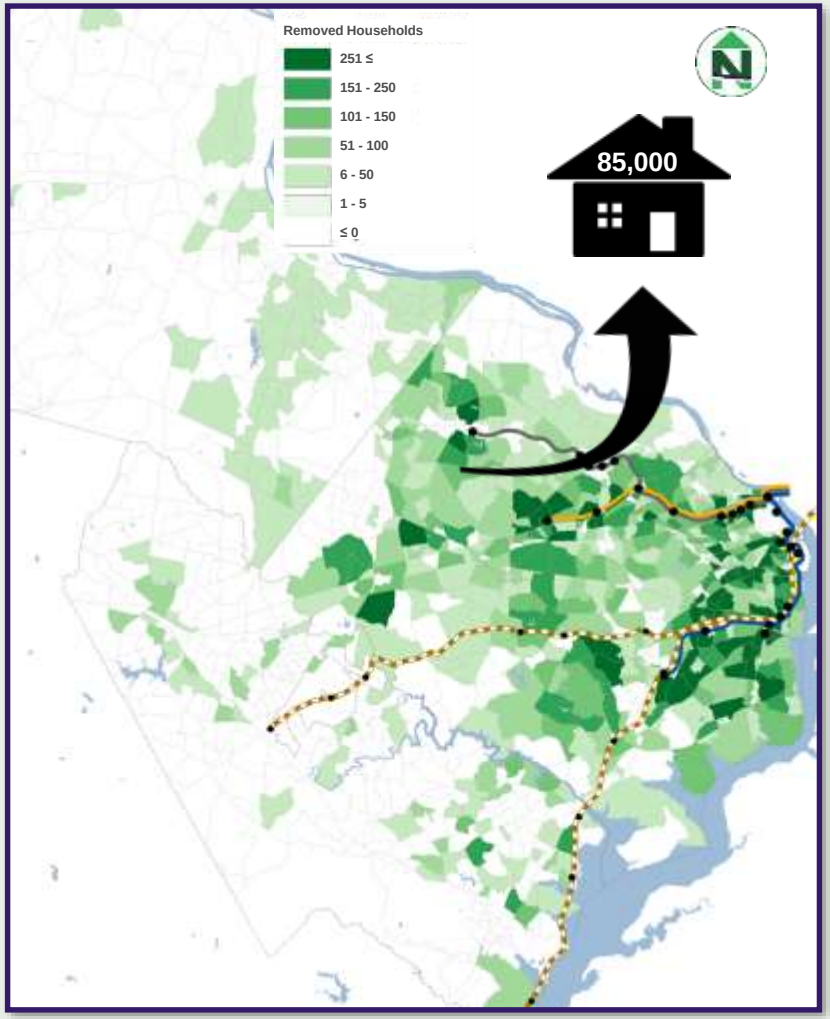
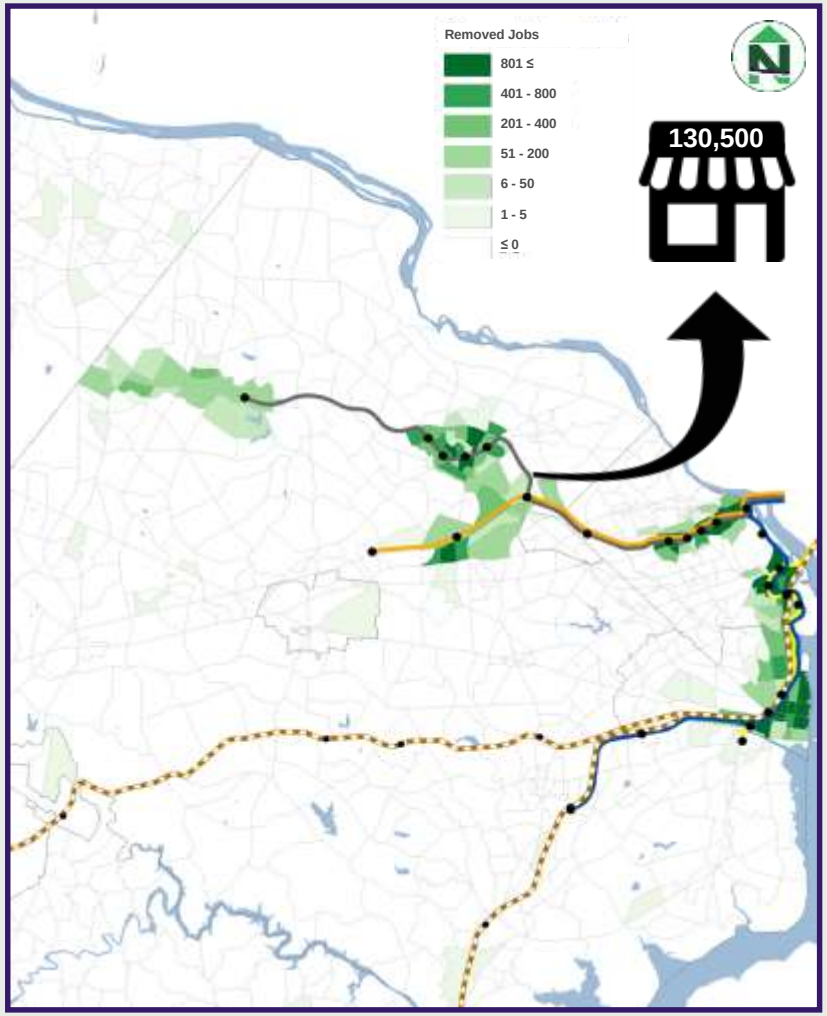
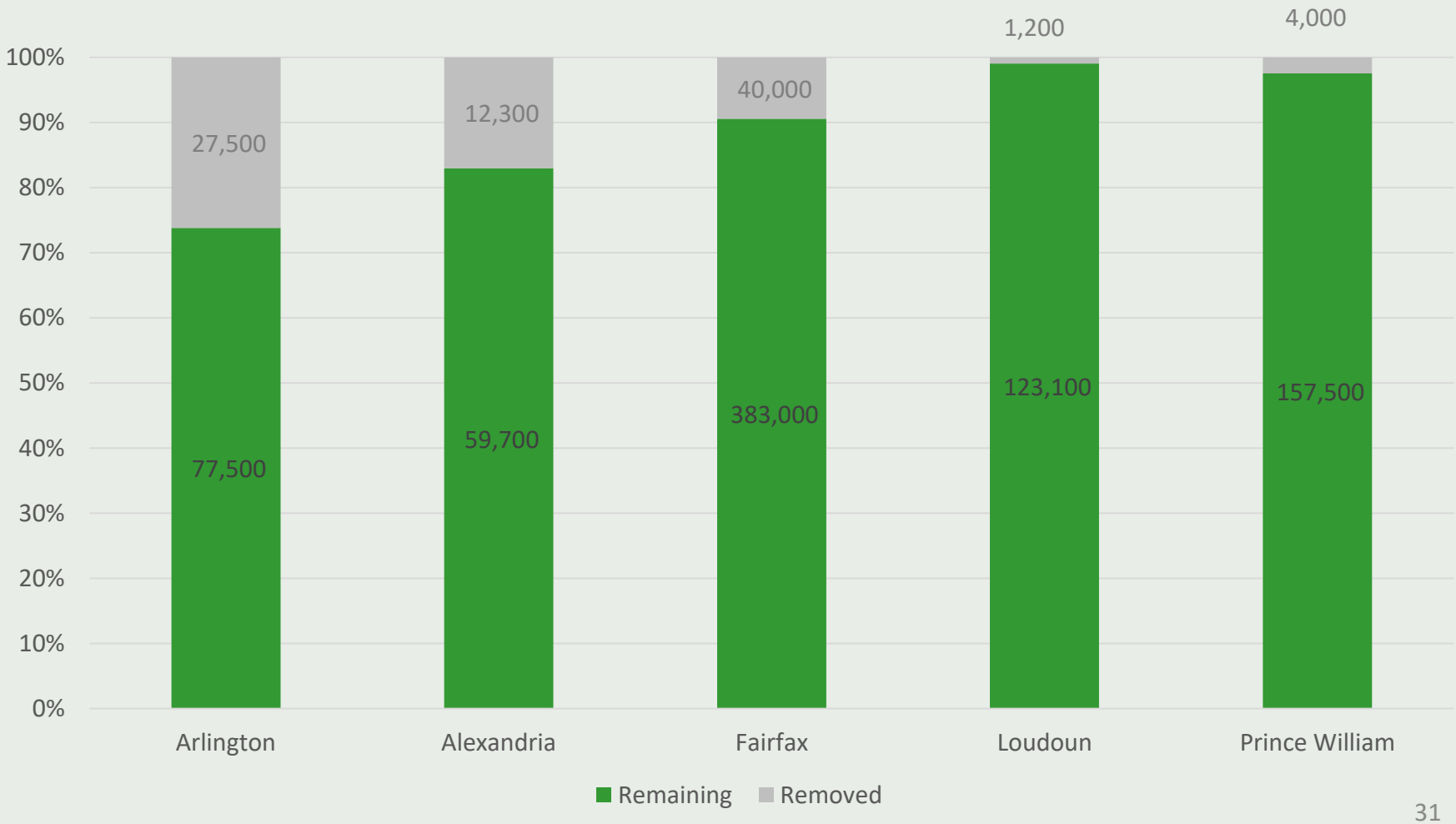
## Households Redistributed



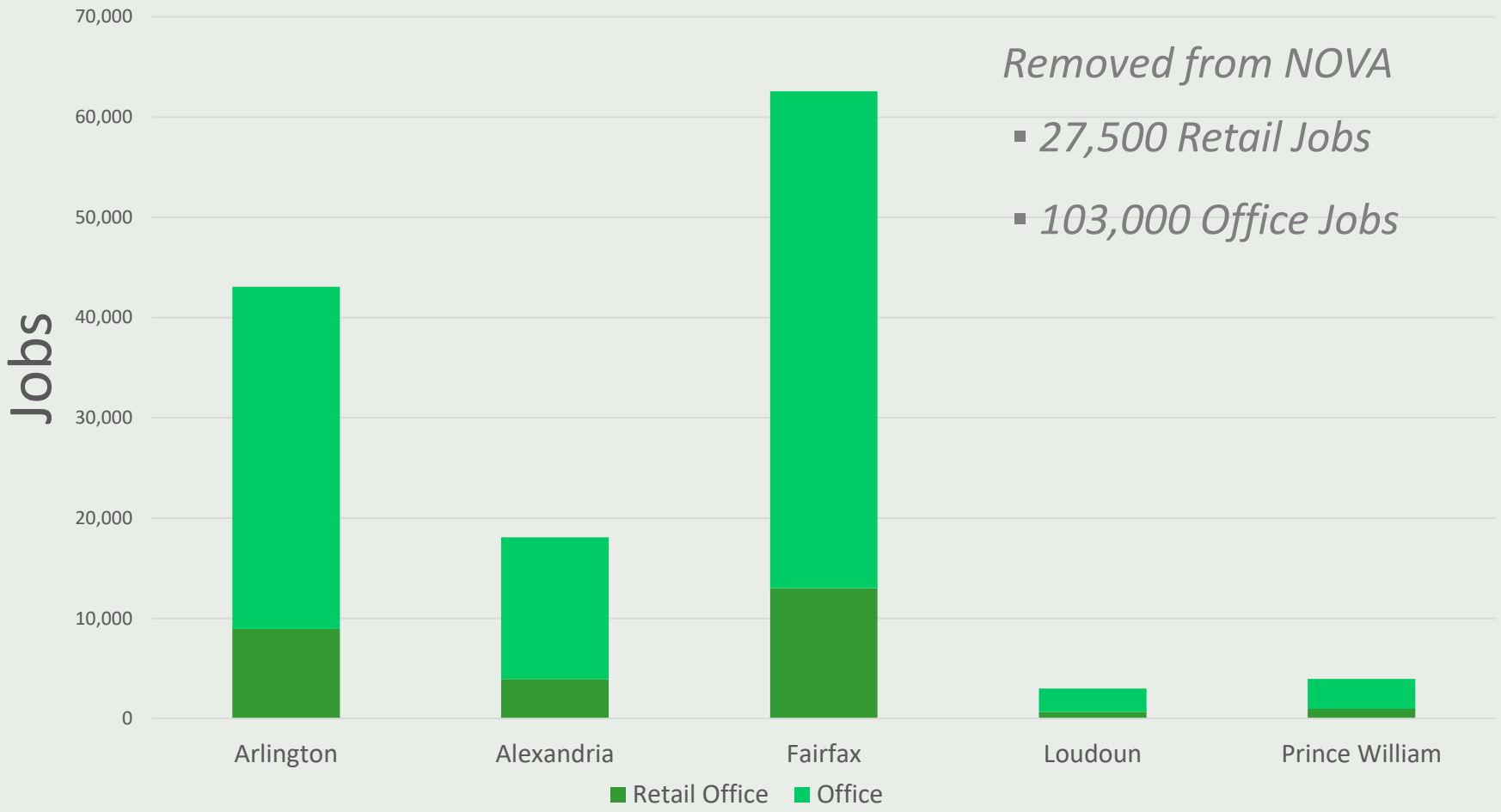

## Jobs Redistributed



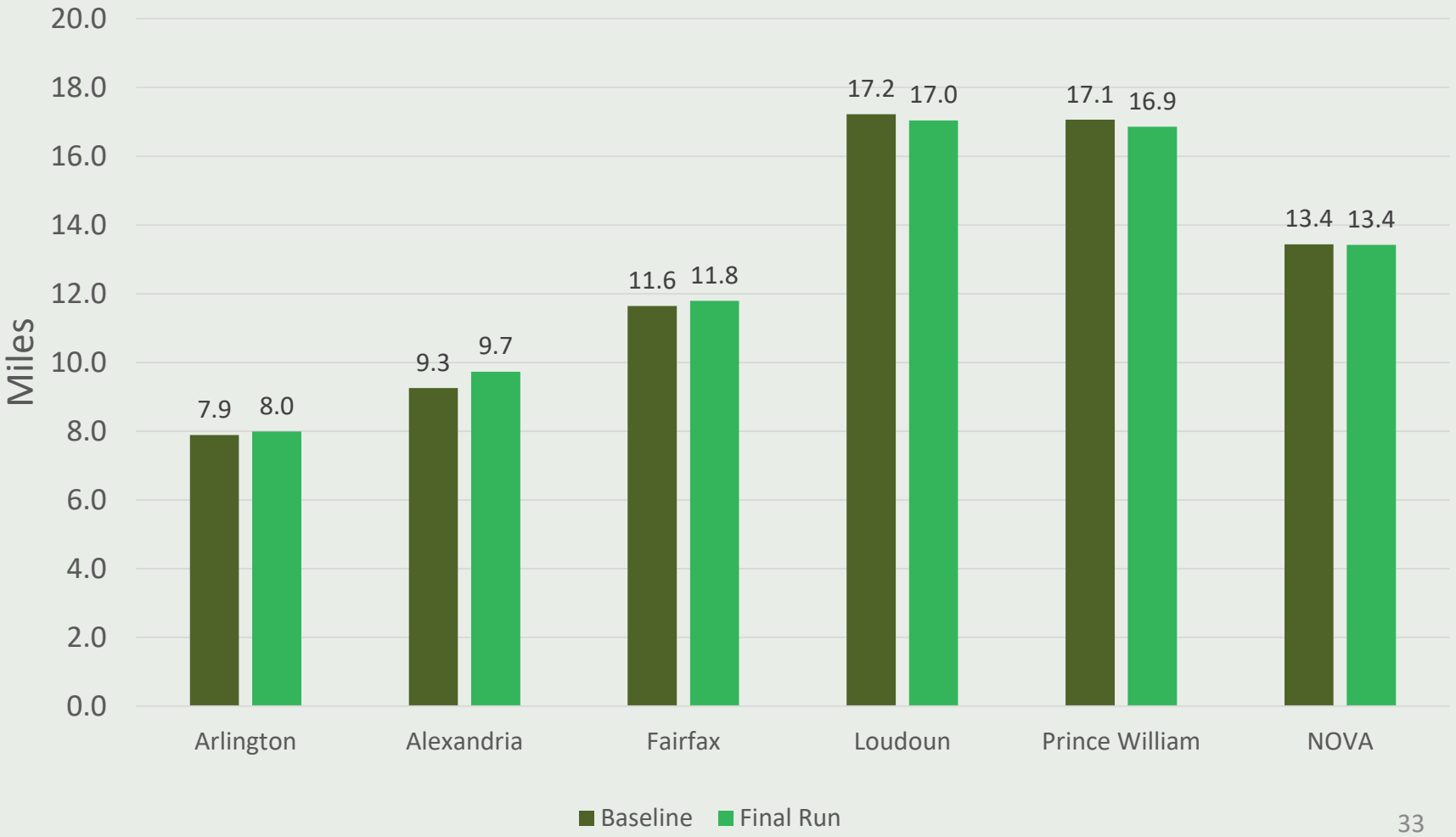
# Household Reductions



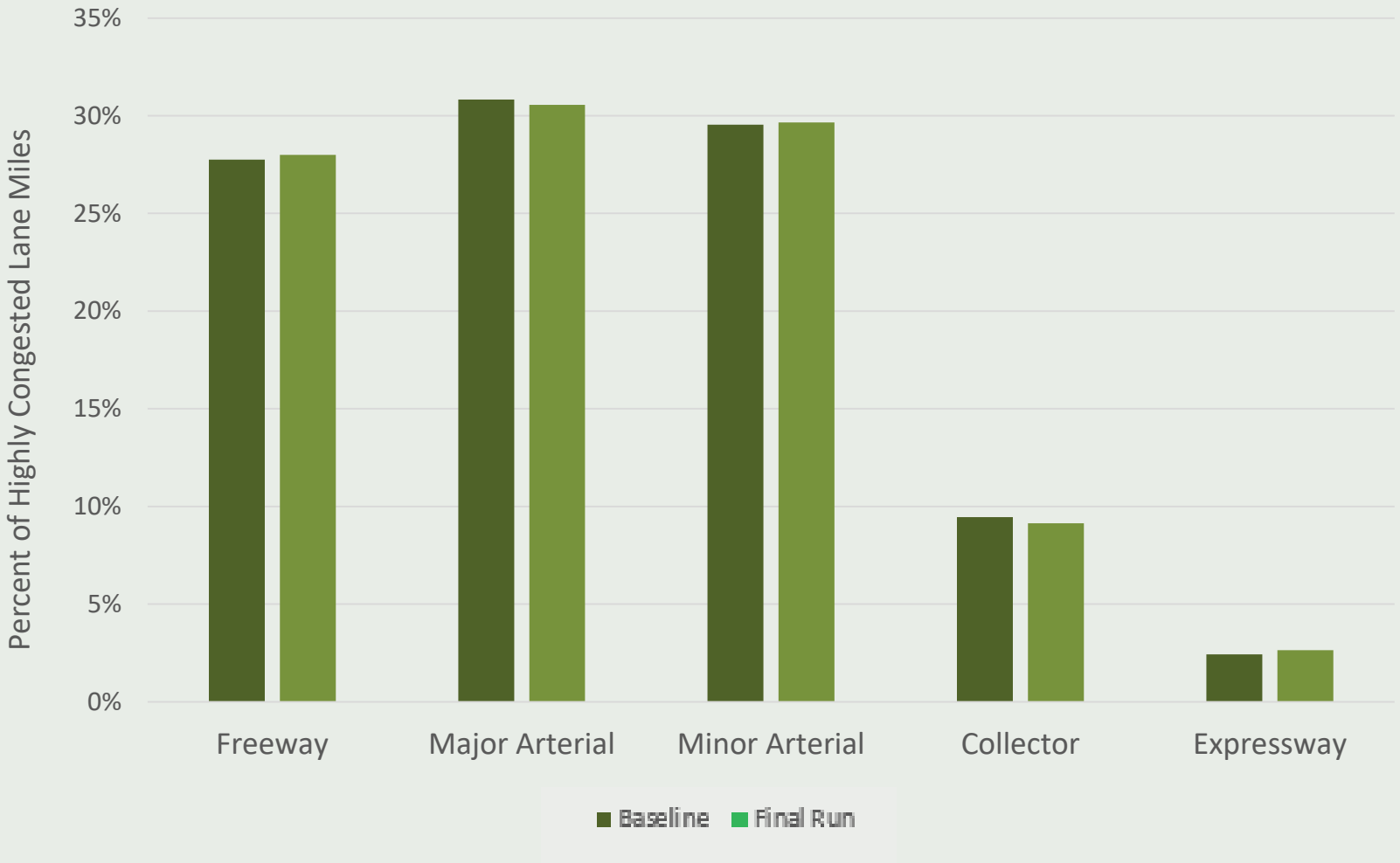
# Job Reductions



# HBW Trip Average Length



# Percent Distribution by Facility Type of Highly Congested Lane Miles



# Report Findings: Revenues, Riders, and Cost Savings

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**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**

# Value of Metrorail and VRE to the Commonwealth of Virginia

NORTHERN VIRGINIA TRANSPORTATION COMMISSION

## This report can be found at

## www.novatransit.org

## Northern Virginia Transportation Commission


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