RVAMPO
Long-Range Transportation Plan 2025
Technical Report

January 2006

Roanoke Valley Area MPO Metropolitan Planning Organization

Roanoke Valley Alleghany Regional Commission

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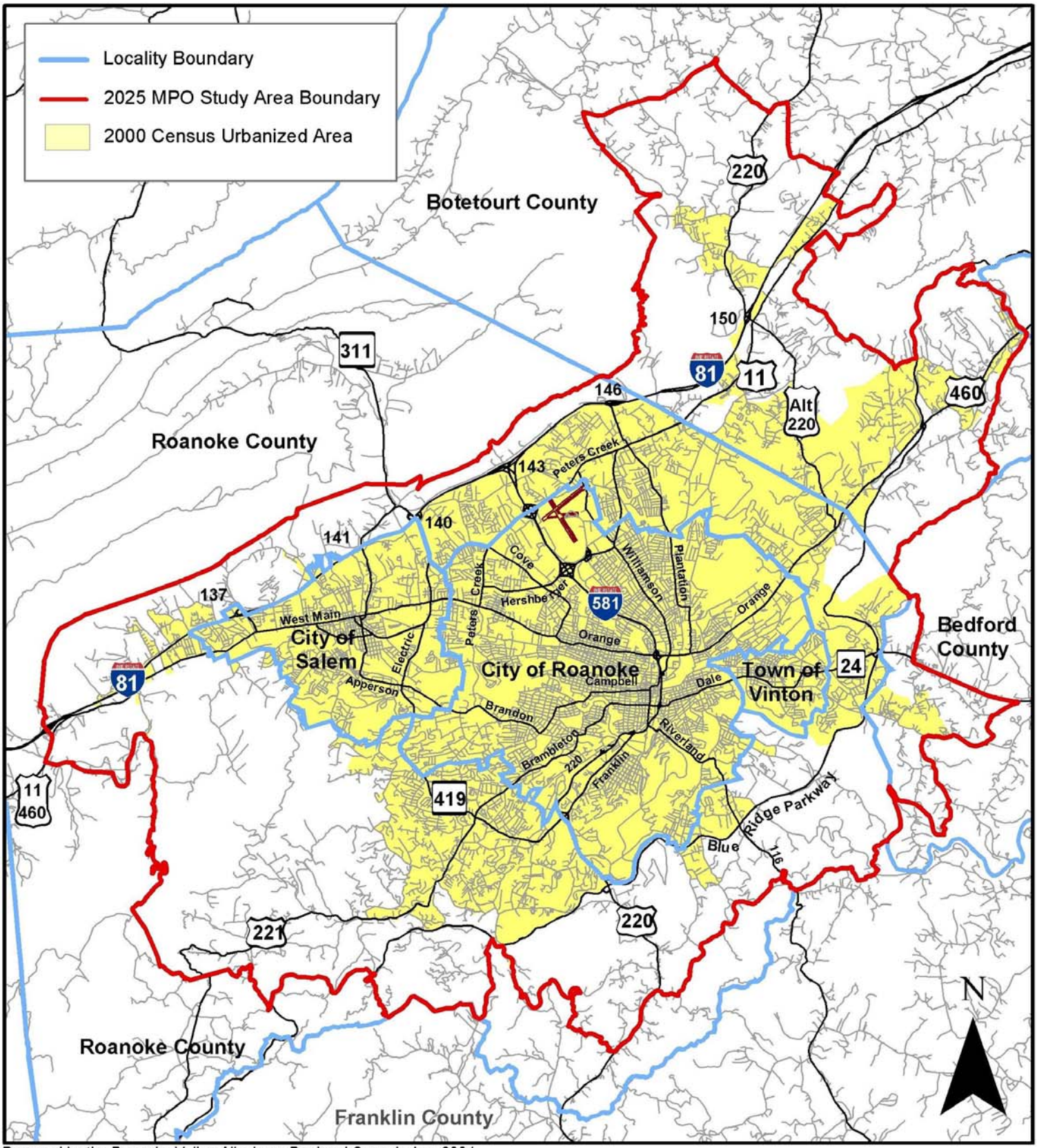
Roanoke Valley Alleghany Regional Commission

Roanoke Valley Area MPO Metropolitan Planning Organization

Roanoke Valley Area
Metropolitan Planning Organization (MPO)

2025 MPO Study Area Boundary



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Chapter 1

Introduction and Technical Report Organization

The *Roanoke Valley Area Metropolitan Planning Organization (RVAMPO) Long-Range Transportation Plan 2025 – Technical Report*, hereafter referred to, as the "Technical Report" is a supplemental document to the *Roanoke Valley Area Metropolitan (RVAMPO) Long-Range Transportation Plan 2025*, hereafter referred to as the "Long- Range Plan 2025."[1]

The primary goals of the Technical Report are:

1. To document the assumptions, data, processes and decisions that lead to development of the Long-Range Plan 2025; and,
2. To serve as a starting point for the next long-range transportation plan update by pointing to areas for improvement in the long-range planning process.

Beginning with Chapter 2, the heading of each chapter will contain a graphic similar to the boxes below.

Goal 1: Document Assumptions and Decisions

Goal 2: Serve as a starting point for the next long-range plan update

The box featured with bold text and bold lines indicates whether an individual chapter primarily addresses goal 1 or goal 2. However, each chapter contains elements that at least partially address each of the goals. Therefore, each chapter concludes with a list of recommendations for the next long-range plan update similar to the graphic below.[2] Staff may not be able to fully address all such suggestions in the next long-range plan update; however, the list can still serve as a useful guide during the process.

Recommendations for Next Long-Range Plan Update

- Use a scenario planning process to generate multiple sets of population, housing and employment projections depending on the scenario employed.
- Test data projections for conformity to adopted comprehensive plans, economic development plans and similar documents.

[1] The RVAMPO Long-Range Transportation Plan 2025 was adopted by the RVAMPO policy board on February 26, 2004. The Technical Report is not the long-range transportation plan for the RVAMPO region; rather, it is a technical supplement for interested parties and stakeholders.

[2] The recommendations in the example are hypothetical, please refer to individual chapters for specific recommendations.

The remainder of the Technical Document is divided into the following chapters:

Chapter 2 – Transportation Planning Data: This chapter documents the data sources, assumptions and methods used to summarize and project population, employment, household, vehicle availability and other data useful in the transportation planning process. Although this chapter primarily addresses "Goal 1 – Document Assumptions and Decisions," it concludes with a substantial list of recommendations to improve the quality and applicability of the data in the next long-range plan update. This chapter is particularly useful to stakeholders who are interested in the data and assumptions that went into the planning process before any analysis was performed.

Chapter 3 – Travel Demand Model: This chapter documents the computerized "4-step Travel Demand Model" that was used to generate a list of deficiencies and recommendations to address the deficiencies. The 4-step model uses data developed in Chapter 2, as well as, additional traffic volume and other data to estimate future traffic volumes using 4 primary sub-models:

- Trip Generation
- Trip Distribution
- Mode Choice
- Traffic Assignment

This process is what is traditionally referred to as the "technical process." This should not be confused with project selection, which is the subject of Chapter 5. This chapter primarily addresses "Goal 1," and is useful to stakeholders who seek a more detailed explanation of the travel demand model and its maintenance, calibration and validation.

Chapter 4 – Public Involvement: This chapter documents the public consultation process that was used at various stages throughout the long-range transportation plan development. The public involvement process employed a variety of techniques and greatly assisted the transportation technical committee (TTC) and the RVAMPO Policy Board in the development of the "Vision Statement" and the "Goals and Objectives" of the Long-Range Plan 2025. The public involvement process played a role in the project selection process that is explained in greater detail in Chapter 5. Although this chapter documents the public involvement process used in the Long-Range Plan 2025, its primary importance is "Goal 2," to serve as a starting point for a more improved public involvement process in the next long-range plan update. This chapter is useful to stakeholders who are interested in public participation in both quantitative and qualitative aspects.

Chapter 5 – Project Evaluation and Selection: This chapter describes how technical recommendations, public involvement, local government involvement, and a financial projection of available funds to 2025 were used to select the projects that comprise the "Financially Constrained List of Projects" in the Long-Range Plan 2025. This chapter addresses both Goals 1 and 2. This chapter is useful for stakeholders who are interested in how the technical process is weighed against community and other concerns to arrive at a final list of projects. This chapter describes the "lynchpin" of the planning process that leads to the development of the long-range plan.

Chapter 6 – Bicycle Planning Methodologies: Funds for bicycle facilities were included in the "Financially Constrained List" of the Long-Range Plan 2025. In addition, a new statewide policy states that bicycle accommodations will be considered in the development of all highway projects. Nevertheless, financial decisions must still be made in the application of constrained list funds to specific bicycle improvements. This chapter documents two technical models, which allow planners to evaluate potential bicycle improvements: The Bicycle Compatibility Index (BCI) and the Bicycle Level of Service (BLOS). These models allow local governments to evaluate a range of accommodations in funding and project level decisions. This chapter primarily addresses Goal 2 and is useful for stakeholders who are interested in a more technical look at bicycle planning.

Chapter 7 – Public Transportation and Rideshare: For small to medium sized urban areas like the Roanoke Valley, the technical transportation planning process does not take adequate account of the potential of public transportation and ridesharing. However, public transit ridership and commuters signing up for RIDE Solutions, the regional rideshare agency, have been on the increase over the last several years. This represents an opportunity to view public transportation providers and RIDE Solutions as implementation arms of many of the "Goals and Objectives" that are included in the Long-Range Plan 2025. Public Transportation and RIDE Solutions have the advantage that programs and marketing campaigns can be implemented continuously and over short, medium and long terms. Public Transportation and RIDE Solutions also have a beneficial effect on regional air-quality. This is especially important since the Roanoke Valley Area is a participant in the Environmental Protection Agency's Early Action Compact/ Early Action Plan program for the 8-hour Ozone Standard. This chapter primarily focuses on Goal 2. This chapter is useful for stakeholders who are interested in immediately addressing transportation and while keeping focused on overall long-term goals.

Chapter 8 – Freight Planning: The transportation planning process tends to focus on individual and passenger travel. Increasingly, freight and goods transportation is increasingly important to the overall transportation system and economy. The RVAMPO, Roanoke Valley-Alleghany Regional Commission (RVARC) and Wilbur Smith Associates teamed up to produce the Roanoke Valley-Alleghany Regional Freight Study in 2003. This report offers various strategies for incorporating freight transportation into the transportation planning process. Freight strategies have the potential to have a great influence on the transportation land-use connection. The timing of the study did not allow for many of its recommendations to make it into the planning process for the Long-Range Plan 2025; however, freight concepts are relevant to Goal 2 by serving as a starting point for the next long range transportation plan update. This chapter is useful to stakeholders who are interested in transportation/ land use connection with regards to goods movement.

Chapter 9 – Environmental Justice: Environmental Justice (EJ) is a term that advances the concept that low-income, minority or other disadvantaged segments of the community should not bear undue burdens or be denied proportional benefits of transportation or other public works projects. Clearly, EJ concerns are present throughout the entire project delivery process: planning, preliminary engineering, right-of-way, and construction. The purpose of incorporating EJ into the planning process is to serve as a filter in the decision making process concerning

projects which are in the planning stage but have not moved on to preliminary engineering, right-of-way or construction. An EJ framework will serve as another framework in the project evaluation and selection process detailed in Chapter 5. This chapter addresses Goal 2 because there is much effort in developing, testing and implementing frameworks that address EJ concerns in the planning process. Current progress consists of developing an EJ Index of the RVAMPO area with relation to income, minority, limited English proficiency, and disability. This chapter details the methodology that was used to develop the RVAMPO EJ data profiles. It should be noted that development of the EJ profiles was completed after the RVAMPO Long-Range Plan 2025 was adopted as such these profiles will serve as a springboard to the next long-range plan update This chapter is useful to stakeholders that are interested in community equity issues that extend beyond the public involvement process detailed in Chapter 4. Integration of EJ frameworks in the planning process will be a major activity of the next long-range transportation plan update.

Chapter 10 – Epilogue: The intent of this chapter is to summarize trends and activities that primarily serve to improve the long-range planning process for the next long-range plan update, but were not adequately addressed in the previous chapters. The primary focus of this chapter will be the potential of safety conscious planning and scenario planning to improve the planning process.

Chapter 2

Transportation Planning Data

Goal 1: Document Assumptions and Decisions

Goal 2: Serve as a starting point for the next long-range plan update

Overview

Transportation planning data for the Roanoke Metropolitan Planning Area is a special tabulation of socioeconomic information intended to aid transportation planners in planning and designing responsive and needed transportation services and facilities in the community. Transportation planning and design agencies use this data in the four-step Transportation Planning Process to assess the impact of changes in the transportation system on present demand. This process is of great importance in Roanoke Valley's development and evaluation of urban transportation plans and policies.

Transportation planning data serves many other related transportation and regional planning purposes. The data provides dependable background information for large sub-area studies, public transportation and facilities plans, transportation demand analysis, and land use and rezoning studies. Historical comparisons of transportation planning data provide an indicator of the ongoing health of the region's socioeconomic assets.

Background

Under the direction of the Roanoke Valley Area Metropolitan Planning Organization (MPO), the staff of the Roanoke Valley-Alleghany Regional Commission compiles the transportation planning data. Transportation planning data for prior years can be found in the Data Maintenance Reports (DMR) for the Roanoke Urban Study Area. Methodologies for the preparation of the DMR were published in fiscal years 1972, 1977 and 1998. It seems clear that previous attempts to compile DMRs were timed to coincide with the publication of the 1970 and 1980 census figures for the region. The availability of the Census data greatly simplifies the data collection process and, with continual maintenance, provides the most reliable source of data for modeling the Roanoke urban area transportation system.

Data is obtained from the US Census Bureau's Census Transportation Planning Package (CTPP). Historically, this product is released four to six years after each decennial census. For example, the 1990 CTPP was released in 1996.

The Census Transportation Planning Package

The CTPP is a special set of tabulations designed primarily for transportation planners, policy analysts and engineers. It is developed by the Bureau of the Census using decennial census data, and provides detailed population, housing, worker, and commuter characteristics for a number of geographic levels. The CTPP data is compiled by place of work and by place of residence.

The urban element of the CTPP contains selected information at the Traffic Analysis Zone (TAZ) level. The urban element is especially designed to assist MPOs in carrying out their planning responsibilities. In 1999, Commission staff participated in the US Census Bureau's "TAZ-Up" program to better define TAZ boundaries based on Census block boundaries.

The 2000 TAZ boundaries and data should fix many errors that existed in prior data sets; however, these boundaries were not used for the 2000 update of the Long Range Transportation Plan. The new 2000 boundaries (and data) were not yet available at the time of the plan update.

Traffic Analysis Zones (TAZ)

As previously mentioned, information collected for the Transportation planning data is published at the Traffic Analysis Zone (TAZ) level. TAZs are geographic units representing sizable portions of the region, which impact, or in some cases are predicted to impact, the transportation networks. For this reason, TAZs in more heavily developed areas and rapid growth areas tend to be smaller than those in outlying zones. Ideally, TAZs have distinct geographic boundaries with relatively few access points to the region's overall transportation network. Ideal boundaries often include limited access highways, railroad lines, water boundaries and ridgelines. Because the impact of different types of trips (e.g. home to work, home to shopping, etc.) may be assessed, TAZs should be of fairly homogeneous land use. Of course, no urban area follows these ideal criteria. Therefore, a good deal of judgment is involved in determining appropriate TAZ boundaries. Two additional principles should be observed in delineated TAZ boundaries. First, TAZ boundaries should coincide with jurisdictional boundaries. Second, in order to compare previously developed Transportation Planning Data, adjusting TAZ boundaries should be avoided, if possible. This does not preclude the subdivision of existing zones, a natural process of individual zone urbanization.

The US Census Bureau defines a TAZ the following way:
"A traffic analysis zone (TAZ) is a special area delineated by state and/or local transportation officials for tabulating traffic-related data- especially journey-to-work and place-of-work statistics. A TAZ usually consists of one or more census blocks, block groups, or census tracts."

The Roanoke Valley Area MPO has 224 TAZs (see Map 2.1). The US Census Bureau numbering system is different than the numbering system used in the modeling software. Both numbers are provided in the Table 2.5 at the end of this chapter. The US Census Bureau numbering is shown on the maps in this chapter.

Methodology for 2000 Updates

Population
The population for each TAZ was calculated by aggregating the 2000 census block data for each TAZ. Population numbers for the 2025 Long Range Transportation Plan were aggregated in 2001, prior to the release of the CTPP. Final CTPP data released in 2004 show slight variations in population numbers, and any future updates should incorporate the latest CTPP data.

Housing Units
Housing unit data was not available from the 2000 Census when the estimates were made in 2001. Housing unit estimates were a calculated by using the ratio of population to housing units from the 1995 data set, which can be expressed as follows:

2000 Population * (1995 population/1995 Housing Units)=2000 Housing Units.

This was calculated for each TAZ independently. Housing units should be updated with the newer CTPP data release.

Households
Household data was not available from the 2000 Census when the estimates were made in 2001. Household estimates were a calculated by using the ratio of population to households from the 1995 data set, which can be expressed as follows:

2000 Population * (1995 population/1995 Households)=2000 Households

This was calculated for each TAZ independently. Households should be updated with the newer CTPP data release.

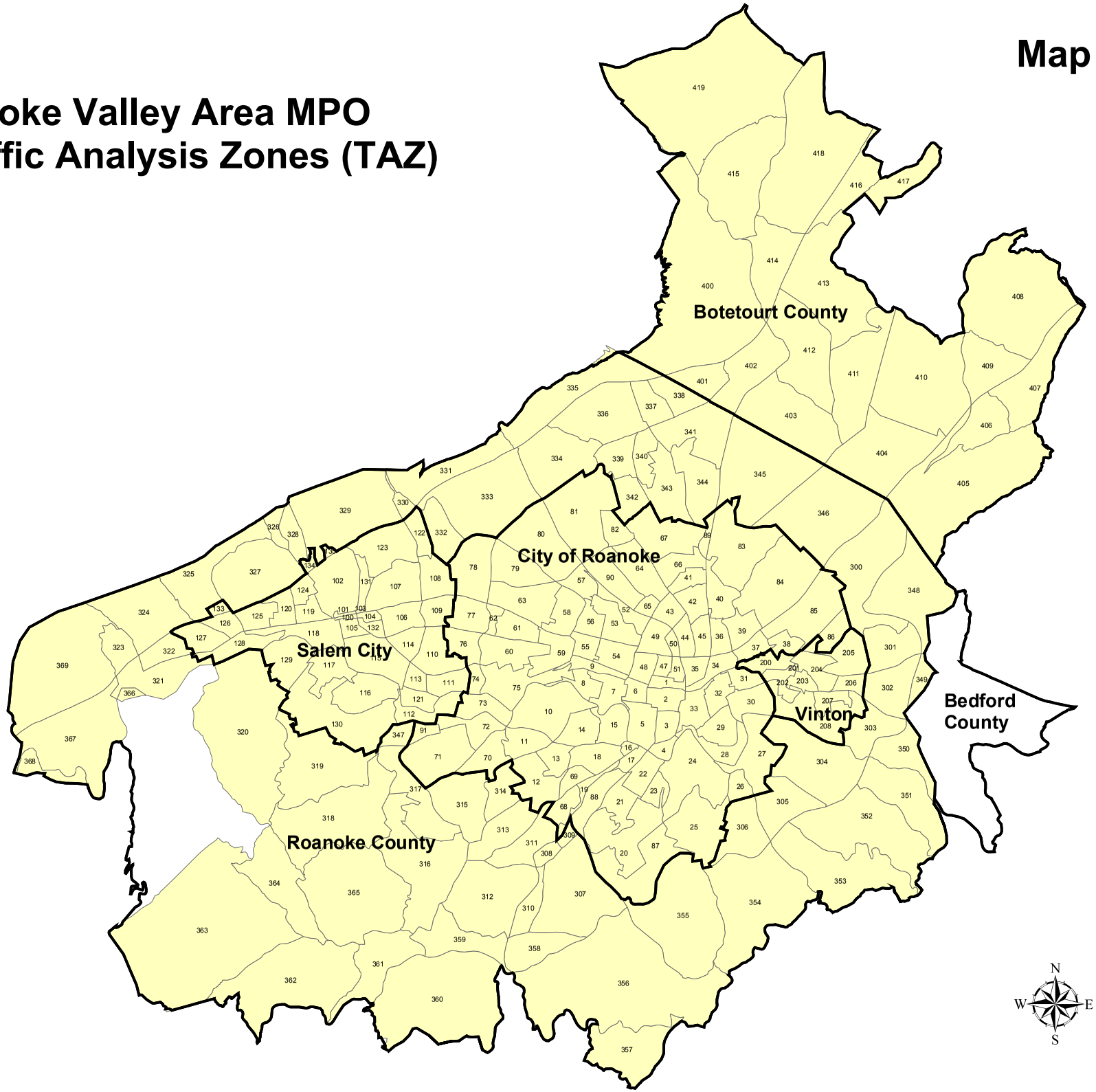
Passenger Vehicles Available
Vehicles available data was not available from the 2000 Census when the estimates were made in 2001. Vehicles available were a calculated by using the ratio of population to vehicles available from the 1995 data set which can be expressed as follows:
2000 Population * (1995 Population/1995 Vehicles available)=2000 Vehicles Available
Vehicles available were calculated for each TAZ independently. Vehicles available should be updated with the newer CTPP data release.

Employment
Employment data for 2000 was not available from the CTPP in early 2001. The employment data is based on corrected estimates based on the 1990 CTPP. The 1990 data was updated (in 1996) to1995 data using the following methodology.

Map 2.1

Roanoke Valley Area MPO
2000 Traffic Analysis Zones (TAZ)

January 2006



March 2005

Employment records were obtained for 1990 and 1995 from the Virginia Employment Commission (VEC). All businesses with more than 100 employees were examined. The time and resources required to examine smaller businesses was deemed too great at the time. It was assumed that for the five-year period between 1990-1995, employment in businesses less than 100 employees remained static. Each locality was given the option to review the data and provide input on the increase or decrease of small businesses by TAZ.

Approximately 200 large businesses were examined to identify changes in employment after they were located in TAZs using address matching. Some addresses were clarified by using a telephone directory. Employment figures for 1990 were compared with 1995 figures to identify a change in employment for each business for the five-year period. Businesses that could not be located in a TAZ were assigned a net employment change of zero. Likewise, some businesses had one listing for multiple locations (ie. Burger King may have one VEC listing for multiple restaurants in the Roanoke area). Since assigning employees to multiple locations was determined to be too time consuming for this study, these businesses were also given a net change value of zero. The one exception to the multiple location rule was government. Local government employment increased from 1990-1995 according to VEC records. This increase was incorporated by applying 5 people for each school in the MPO area and adding 10-30 people at each government center or facility. In eight cases, an employment type for 1995 was estimated to have a negative total. These eight values were changed to zero since a negative number of workers is not possible.

In the past, three employment groups were used by the Roanoke Valley Area MPO to classify transportation planning data. For the 1995 estimates, four groups were used instead of three to produce more accurate trip generation calculations. These four groups are described in the *Quick Response Freight Manual-Final Report September 1996.* This document is available from the Bureau of Transportation Statistics and was on the Internet at **http://www.bts.gov/tmip** in late 1997. The groups are as follows:

Table 2.1 Employment Types

Type	Employment Description	SIC Codes	NAICS Codes
A	Agriculture, Mining and Construction	1-19	11,21,23
B	Manufacturing, Transportation, Communications,	20-51	31-33,48-49
	Utilities and Wholesale Trade		22,42
C	Retail Trade	52-59	44-45
D	Office and Services	60-97	51-92

When the 1995 data required updating to 2000 numbers, staff collected new information from the Virginia Employment Commission, (VEC). While this information was being collected and compared to the 1995 data, staff realized that the 1990 CTPP data was not correct for the urban portions of Botetourt and Roanoke counties. The 2000 employment estimates attempted to rectify those errors. The following table summarizes the employment data errors and new estimates.

Table 2.2 Employment Estimates

Employment Data/Estimates	Botetourt County	Roanoke County	Roanoke City	Salem City	Notes:
CTPP Urban1990*	94	15660	71333	21148	Botetourt and Roanoke urban portions not correct
CTPP County1990	5955	20056	71315	21166	County wide totals seem reasonable
VEC 1990	4666	25971	71557	20880	VEC County wide totals
estimated 1995*	787	17778	76553	22516	based on ctpp urban-Botetourt and Roanoke not correct
VEC 4/99	7023	32551	75549	25807	VEC County wide totals
Estimated 2000	7050	32600	75500	25200	NS layoffs and Rowe Furniture move-county wide
Estimated 2000*	**4000**	**31000**	**75500**	**25200**	**2000 estimates for MPO urban area**

*mpo portions only

Additionally, the 2000 estimates only reflect the total employment for the TAZ. No attempt was made to break out employment into the four categories used in previous data calculations. It should be determined if multiple employment categories are necessary for future long-range plan updates.

Each locality was given the opportunity to adjust 2000 TAZ employment numbers for each TAZ. However, total employment was kept similar to the estimates developed from the VEC data (see last row in above table). Most employment data by TAZ was changed from 1995 to 2000 in the City of Roanoke, Botetourt County and Roanoke County. These changes corrected errors in the counties and allowed for a "redistribution" of employment in the city, as deemed necessary by city staff. Data for the City of Salem changed little from 1995 to 2000. Therefore, it is not reasonable to compare 2000 employment data with any historical TAZ employment numbers.

The release of the 2000 employment data in the current CTPP should yield more accurate data. The next update should incorporate the CTPP data, but should be crosschecked with VEC employment totals for each city and county to be sure they are reasonable. The CTPP data is based on the Census "long-form" that only measures 1 in 6 households. Historically, these sampling and extrapolation has created errors, especially in Roanoke and Botetourt Counties, which are not 100% in the MPO study area.

Methodology for 2025 Updates

A linear regression was used to compute 2025 population projections directly from the TAZ data for 1990, 1995, and 2000. These were benchmarked to VEC population projections that were available at the time for 2010. The VEC has since made new population projections, which should be used during the next update. Local staff was given the opportunity to provide input in the 2025 employment estimates. Their estimates for employment from 2000 to 2025 are as follows:

Table 2.3 2025 Employment Estimates

Roanoke City Employment

2% increase from 2000-2025 in all categories except the following: (slow historical growth in past 20 years)

2025 Employment

10 percent increase in 1,2,3 (downtown)
10 percent increase in 24 (Roanoke Memorial Hospital)
10 percent increase in 52 (vacant, developable land along I-581)
10 percent increase in 81 (airport area)
10 percent increase in 84 (Center for Industry and Technology)
57 =300 employees (vacant, developable land near I-581 interchange)
4=2500 employees (biomedical center)

Salem City Employment

5% increase from 2000-2025 in all categories (slow historical growth in past 20 years and city already built out.) (Salem estimate of 5%)

Roanoke County Employment

10% increase from 2000-2025 in all categories except the following: (moderate historical growth in past 20 years) (County estimate of 10%)

2025 Employment

20% increase in 311, 312, 313, 315, 316, 317 (Route 419 corridor)
300=300 employees (US 460 east corridor)
303=50 employees (McDonald farm near Vinton)
334=1500 employees (Valley Pointe)
346=500 employees (US 460-US 220 interchange-planned Wal-Mart-County estimate)
369=500 employees (Center for Research and Technology-Roanoke County estimate)
367=550 employees (US 460 West- Valley Gateway-Roanoke County estimate)
356=190 employees (County estimate)
355=40 employees (County estimate)

Botetourt County Employment

15% increase from 2000-2025 in all categories except the following: (moderate-high historical growth in past 20 years)

2025 Employment

404=1100 employees (Alt 220 corridor near US 460)
414=350 employees (US 220 Corridor)
415=350 employees (US 220 Corridor)
418=400 employees (US 220 Corridor)
419=600 employees (US 220 Corridor, Greenfield)

While most of these estimates were included, some were adjusted further or changed in a final review. Not all changes were completely documented. Table 2.4 shows a summary of TAZ data by locality for 1990 through 2025. The employment data in Botetourt County and Roanoke County for 1990 and 1995 should not be used since the CTPP data from the Census had some errors.

Table 2.4 Transportation Planning Data by Locality

Locality and Year	Total Population	Housing Units	Number of Households	Vehicles Available	Total Employment
Botetourt County 1990	12147	4547	4466	9642	94
1995	14323	5216	5145	11089	787
2000	15919	5963	5836	12549	5225
2025	18307	6857	6712	14431	8154
Change 2000-2025	15.00%	15.00%	15.00%	15.00%	56.05%
Roanoke City 1990	96407	44394	41074	60506	71333
1995	97917	45056	41724	61673	76553
2000	94911	43917	40806	60560	74283
2025	96809	44794	41620	61770	81314
Change 2000-2025	2.00%	2.00%	2.00%	2.00%	9.46%
Roanoke County 1990	73292	29398	28112	56716	15660
1995	79804	31882	30500	61672	17778
2000	79489	32165	30756	61968	25869
2025	87438	35381	33832	68165	29777
Change 2000-2025	10.00%	10.00%	10.00%	10.00%	15.11%
Salem City 1990	23746	9599	9169	16578	21148
1995	24671	9992	9549	17258	22516
2000	24747	10417	9839	17731	21958
2025	25984	10938	10331	18617	23056
Change 2000-2025	5.00%	5.00%	5.00%	5.00%	5.00%
MPO 1990	205592	87938	82821	143442	108235
1995	216715	92146	86918	151692	117634
2000	215066	92462	87238	152808	127335
2025	228538	97971	92496	162983	142301
Change 2000-2025	6.26%	5.96%	6.03%	6.66%	11.75%

Note: Bedford County data not included in 2000-2025 update

Maps 2.2 and 2.3 show projected population and employment change by TAZ. Detailed data by TAZ can be found in Table 2.5 at the end of this chapter.

Map 2.2

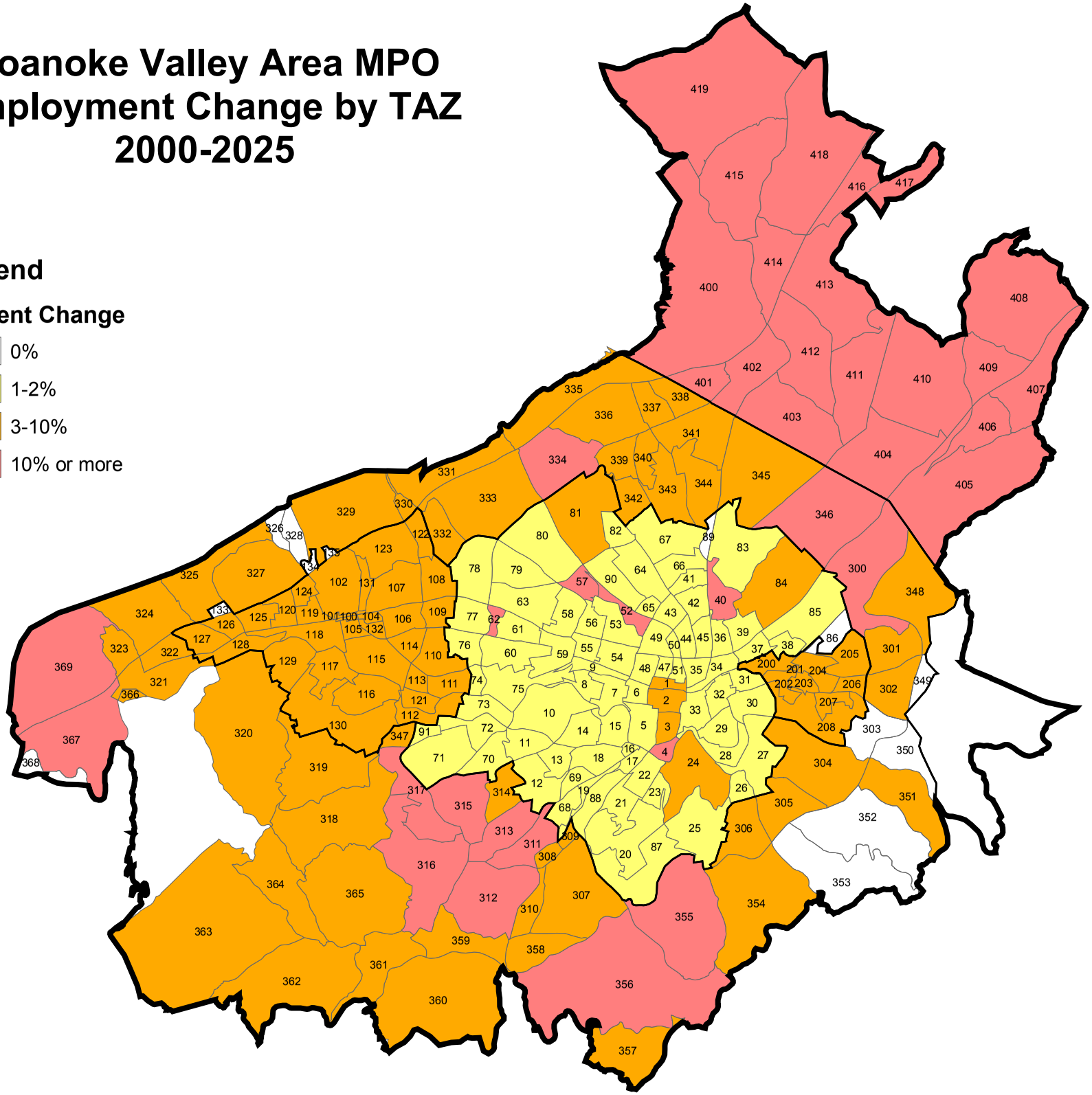
Roanoke Valley Area MPO
Employment Change by TAZ
2000-2025

January 2006

Legend

Percent Change

- 0%
- 1-2%
- 3-10%
- 10% or more



Roanoke Valley Area MPO

Long-Range Transportation Plan

Technical Report (2025)

March 2005

Roanoke Valley Area MPO
Population Change by TAZ
2000-2025

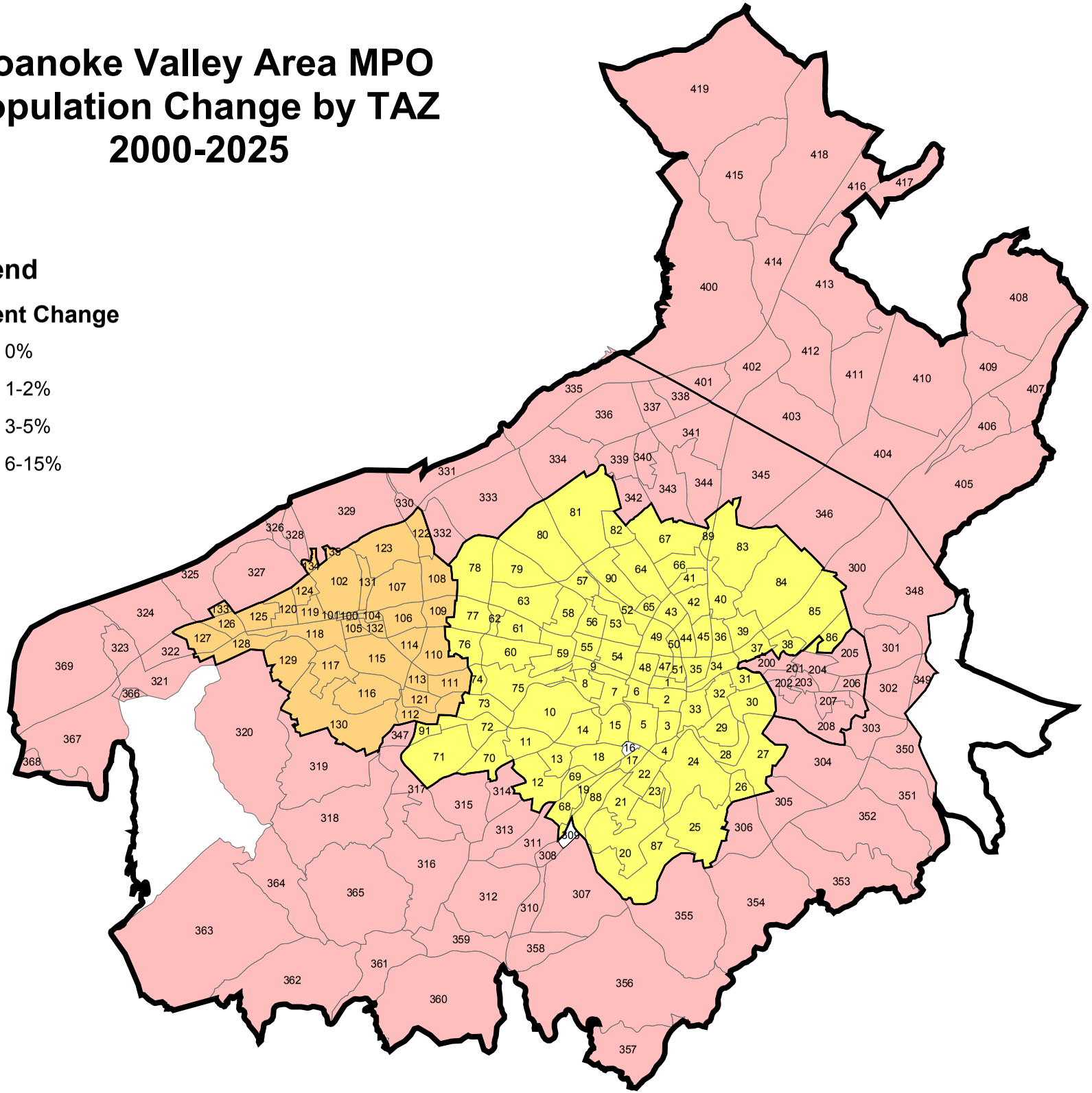
Map 2.3

January 2006

Legend

Percent Change

- 0%
- 1-2%
- 3-5%
- 6-15%



Roanoke Valley Area MPO

Long-Range Transportation Plan

Technical Report (2025)

March 2005

Explanation of Tables

The following is a description of the data variables and sources for the transportation planning data developed by staff. For a detailed explanation of the data collection techniques used by the Census Bureau, the reader is directed to read census documentation or contact their Data User Services Division.

- **TAZ Number** - The number assigned to the TAZ. TAZs in Roanoke City are numbered from 1 through 91; TAZs in the City of Salem are numbered from 100 through 135; TAZ numbers in the Town of Vinton range from 200 through 208; TAZ numbers in Roanoke County range from 300 through 368 and TAZ numbers in Botetourt County range from 400 through 417. The MINUTP model uses numbers from 1-224. See the **Tables** at the end of this report for the cross reference.

- **Total Population** - (Source: 2000 Census block data) The total number of people residing in the TAZ.

- **Number of Households** - (Source: Estimates based on historical data and 2000 population) The total number of households residing in the TAZ. A household includes all persons who occupy a housing unit.

- **Number of Housing Units** - (Source: Estimates based on historical data and 2000 population) The total number of housing units in the TAZ. A housing unit is an occupied or vacant house, apartment, mobile home or trailer, group of rooms or a single room occupied as separate living quarters. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements. Both occupied and vacant housing units are included in the housing unit inventory. Recreational vehicles, boats, vans, tents, railroad cars, and the like are included only if they are occupied as someone's usual place of residence.

- **Vehicles Available** - (Source: Estimates based on historical data and 2000 population) This data shows the number of vehicles kept and available for use by households. Vehicles include passenger cars, vans, and pickup or panel trucks of one-ton capacity or less. Vehicles rented or leased for one month or more, company vehicles, and police and government vehicles are included if kept at home and used for non-business purposes. Dismantled or immobile vehicles are excluded. Data is displayed by place of residence.

- **Employment** - (Based on 1990 CTPP data, totals adjusted to VEC county/city data, substantial input from local governments. Staff only estimated total employment for the 2000 data in this report. Data is displayed by place of employment.

Recommendations for Future Data Updates

In order to achieve accurate transportation planning data for the next Long Range Plan update, the following steps should be followed:

- Staff should consider if a boundary review is necessary, and update the MPO boundary if necessary with assistance from the TTC and Policy Board
- Several TAZ's need to be created in Bedford County and Roanoke County to areas added during the boundary adjustment in 2000. Data for these new TAZ's will need to be calculated based on block data, CTPP (if available) and other estimates. Note: The Lynchburg Area MPO did not appear to designate TAZ's for Bedford County in 2000, so small area data may not be available.
- Staff should consult VDOT to determine if there are standards or preferred formats for TAZ data.
- Final 2000 CTPP population data released in 2004 show slight variations in population numbers. The 2000 population numbers were calculated in 2001 based on block groups, but they should be updated with the new data.
- Housing unit, household and vehicle data for 2000 should be updated using the 2004 CTPP data release.
- Employment data (by place of work) should be updated using the 2004 release of the CTPP data. The numbers should be calibrated to Virginia employment Commission data to determine if any irregularities exist. Local governments should also be consulted to verify current employment data.
- Finally, any projections should be calibrated to VEC or Census projections. Local governments should be consulted to provide employment estimates, but care should be taken that the estimates correspond to projected population growth (within 10% of VEC projections).
- Staff should evaluate the usefulness of measuring land use data by TAZ. The MPO has not developed a methodology for measuring land use or land use change at the TAZ level. Staff should consult with VDOT to determine if such data would be useful in the future, and how the data should be created.

Table 2.5 Detailed 2000 and 2025 TAZ Data

2000 Census TAZ	MINUTP TAZ	2000 Non-Employment				2000
		Census Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
1	1	77	26	18	13	1190
2*	2	88	14	29	44	9224
3	3	880	642	604	498	3557
4	4	1	1	1	1	300
5	5	2829	1742	1419	1674	1100
6	6	424	248	173	159	1346
7	7	1640	682	613	574	1000
8	8	721	350	292	345	1586
9	9	24	12	8	12	292
10	10	4842	2562	2433	3409	1215
11	11	2073	992	956	1607	17
12	12	1942	942	920	1512	200
13	13	521	257	226	467	195
14	14	2421	1249	1167	1832	372
15	15	1662	845	832	1151	425
16	16	0	0	0	0	807
17	17	90	68	55	66	269
18	18	1082	576	583	709	326
19	19	338	235	201	310	100
20	20	1008	371	409	879	300
21	21	1048	388	413	781	600
22	22	1349	829	709	1144	673
23	23	929	417	409	669	48
24	24	1165	547	502	731	2850
25	25	2012	787	831	1435	700
26	26	316	139	122	264	30
27	27	1676	719	638	885	520
28	28	156	78	52	78	1294
29	29	1980	836	758	1070	132
30	30	1461	702	682	800	753
31	31	596	231	185	229	178
32	32	1815	742	690	754	539
33	33	1976	805	654	999	839
34	34	36	10	9	10	1155
35	35	11	6	4	6	1391
36	36	240	134	129	200	431
37	37	712	333	268	454	220
38	38	716	328	310	464	4
39	39	656	285	279	360	276
40	40	690	279	271	422	258
41	41	724	352	357	497	768
42	42	1426	654	615	982	439
43	43	1565	745	664	936	562
44	44	360	198	140	203	595
45	45	591	315	341	504	1050
2*	46	702	108	234	351	3953
47	47	573	294	187	236	75
48	48	1113	547	488	350	85

Table 2.5 Detailed 2000 and 2025 TAZ Data

2000 Census TAZ	MINUTP TAZ	2000 Non-Employment				2000
		Census Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
49	49	985	356	380	360	347
50	50	513	219	187	84	131
51	51	287	142	105	77	100
52	52	273	118	112	148	90
53	53	1766	706	661	1060	20
54	54	1833	813	730	890	528
55	55	785	253	266	266	983
56	56	910	349	292	573	31
57	57	1457	641	659	893	61
58	58	2026	740	732	1088	104
59	59	1213	592	579	310	862
60	60	1701	583	588	845	900
61	61	1505	765	641	525	298
62	62	138	67	48	77	324
63	63	1770	746	643	1203	678
64	64	3262	1605	1507	2413	276
65	65	677	296	284	498	10
66	66	1148	566	559	819	693
67	67	3557	1811	1690	2716	1041
68	68	319	108	112	254	30
69	69	85	44	60	66	526
70	70	785	327	335	648	40
71	71	1800	931	849	1377	188
72	72	587	198	186	467	122
73	73	506	306	290	251	1600
74	74	229	86	87	156	125
75	75	1226	493	400	764	900
76	76	1035	540	466	748	650
77	77	1245	468	465	901	199
78	78	2395	950	965	1785	375
79	79	1332	459	444	967	200
80	80	1356	705	586	819	1290
81	81	101	178	101	178	4396
82	82	10	3	3	4	1793
83	83	2111	755	745	1388	15
84	84	442	176	170	185	4328
85	85	1655	672	700	1404	949
86	86	9	5	3	5	0
87	87	816	409	371	727	1300
88	88	946	570	462	618	799
89	89	190	140	132	180	0
90	90	536	349	274	611	2717
91	91	132	53	57	132	25
Roanoke City Total		**94911**	**43917**	**40806**	**60560**	**74283**
100	92	36	33	36	16	418
101	93	110	32	38	38	243
102	94	2231	648	607	1022	719
103	95	235	118	78	118	152

Table 2.5 Detailed 2000 and 2025 TAZ Data

2000 Census TAZ	MINUTP TAZ	2000 Non-Employment				2000
		Census Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
104	96	139	63	60	112	387
105	97	462	246	199	370	447
106	98	196	97	101	127	151
107	99	1496	683	659	1153	3290
108	100	1283	581	526	921	305
109	101	747	306	289	551	146
110	102	1126	466	447	689	2167
111	103	394	197	131	197	1308
112	104	698	412	333	553	2212
113	105	132	44	49	84	766
114	106	300	110	98	257	613
115	107	758	352	356	629	2474
116	108	1350	657	665	1053	447
117	109	1963	767	795	1426	122
118	110	770	380	384	531	2125
119	111	782	438	388	699	82
120	112	413	134	131	317	1092
121	113	800	431	314	552	193
122	114	151	53	51	120	69
123	115	565	223	237	339	30
124	116	278	96	88	206	63
125	117	629	313	268	575	685
126	118	325	150	149	246	157
127	119	1020	354	386	771	190
128	120	27	12	19	15	507
129	121	1752	624	609	1227	228
130	122	2313	826	813	1880	123
131	123	501	191	201	349	31
132	124	619	321	273	467	16
133	125	68	23	26	63	0
134	163b	53	23	27	45	0
135	164b	25	13	8	13	0
Salem City Total		**24747**	**10417**	**9839**	**17731**	**21958**
200	126	685	318	277	399	225
201	127	7	4	2	4	187
202	128	697	283	283	351	722
203	129	661	415	441	428	356
204	130	1266	634	538	947	781
205	131	1689	635	635	1257	125
206	132	301	128	115	290	212
207	133	781	301	281	472	656
208	134	1695	665	619	1376	823
300	135	902	335	290	710	121
301	136	1001	420	392	651	212
302	137	1281	508	480	1067	68
303	138	1022	307	339	722	50
304	139	539	205	194	477	22
305	140	390	181	163	327	82

Table 2.5 Detailed 2000 and 2025 TAZ Data

2000 Census TAZ	MINUTP TAZ	2000 Non-Employment				2000
		Census Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
306	141	1060	372	374	822	25
307	142	2763	1345	1286	2376	540
308	143	294	259	217	299	1032
309	144	0	0	0	0	700
310	145	432	201	188	328	180
311	146	3011	1640	1510	2295	356
312	147	4329	1690	1619	3389	1126
313	148	2158	835	814	1872	495
314	149	1312	528	505	1074	165
315	150	4195	2020	1856	3449	625
316	151	3389	1143	1199	2439	135
317	152	2385	1006	981	2030	1840
318	153	884	348	275	737	56
319	154	616	214	198	442	25
320	155	1074	339	353	821	25
321	156	91	34	40	77	400
322	157	1108	388	325	570	1120
323	158	328	122	124	294	250
324	159	1219	418	439	924	8
325	160	592	197	192	482	5
326	161	51	35	38	59	0
327	162	448	218	220	433	50
328	163	99	40	42	127	0
329	164	515	248	214	516	82
330	165	13	7	4	7	5
331	166	127	50	51	144	82
332	167	1169	398	415	871	19
333	168	3286	1136	1084	2548	1252
334	169	1492	634	617	1143	1263
335	170	103	28	38	91	20
336	171	2052	888	780	1894	425
337	172	716	221	188	425	2842
338	173	264	53	88	34	625
339	174	877	390	347	382	422
340	175	1217	582	547	992	421
341	176	1754	672	642	1532	150
342	177	1674	712	795	1132	856
343	178	3321	1239	1191	2109	795
344	179	802	316	308	600	856
345	180	793	301	290	656	50
346	181	3066	1179	1125	2479	213
347	182	170	57	62	125	650
348	183	686	215	211	608	30
349	184	182	73	64	191	0
350	185	6	3	2	3	0
351	186	30	39	30	12	42
352	187	432	150	147	349	0
353	188	314	115	117	248	0

Table 2.5 Detailed 2000 and 2025 TAZ Data

2000 Census TAZ	MINUTP TAZ	2000 Non-Employment				2000
		Census Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
354	189	973	447	361	990	22
355	190	594	282	239	633	30
356	191	663	245	265	443	125
357	192	241	102	98	159	10
358	193	685	279	258	398	2
359	194	686	270	237	751	185
360	195	706	229	245	560	6
361	196	273	102	98	238	2
362	197	495	252	230	546	56
363	198	1211	423	458	959	35
364	199	419	134	131	251	8
365	200	1144	370	371	839	23
366	201	41	34	24	21	25
367	202	461	195	192	403	420
368	203	60	24	24	55	0
369	222	1021	345	325	815	20
Roanoke County Tota		**79489**	**32165**	**30756**	**61968**	**25869**
400	204	149	51	50	52	12
401	205	140	138	95	174	82
402	206	582	244	278	374	1100
403	207	2404	1045	934	1944	346
404	208	1317	351	320	799	788
405	209	446	170	139	421	120
406	210	111	53	50	79	180
407	211	498	223	162	535	170
408	212	1645	569	623	1231	68
409	213	1045	330	338	720	26
410	214	2034	735	690	1800	27
411	215	325	97	83	181	85
412	216	708	246	309	557	422
413	217	745	286	295	589	468
414	218	408	200	202	399	245
415	219	1454	490	540	1203	259
416	220	389	178	138	369	89
417	221	157	67	58	146	243
418	223	533	193	212	387	250
419	224	829	295	322	590	245
Botetourt Co. Total		**15919**	**5963**	**5836**	**12549**	**5225**

2025 Data

2000 Census TAZ	MINUTP TAZ	2025 Non-Employment				2025
		Estimated Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
1	1	79	26	18	14	1309
2*	2	90	14	30	45	10146
3	3	898	655	616	508	3913
4	4	1	1	0	1	2500
5	5	2886	1776	1448	1707	1122
6	6	432	253	177	162	1373
7	7	1673	695	625	585	1020
8	8	735	357	298	352	1618
9	9	24	12	8	12	298
10	10	4939	2613	2481	3477	1239
11	11	2114	1011	975	1639	17
12	12	1981	961	939	1542	204
13	13	531	262	230	476	199
14	14	2469	1274	1190	1868	379
15	15	1695	862	849	1174	434
16	16	0	0	0	0	823
17	17	92	69	56	68	274
18	18	1104	587	595	723	333
19	19	345	239	205	317	102
20	20	1028	378	417	897	306
21	21	1069	396	422	796	612
22	22	1376	845	723	1167	686
23	23	948	425	418	682	49
24	24	1188	558	512	745	3135
25	25	2052	803	848	1464	714
26	26	322	142	125	269	31
27	27	1710	734	651	903	530
28	28	159	80	53	80	1320
29	29	2020	852	773	1092	135
30	30	1490	716	696	816	768
31	31	608	236	188	234	182
32	32	1851	757	704	769	550
33	33	2016	822	667	1019	856
34	34	37	10	9	10	1178
35	35	11	6	4	6	1419
36	36	245	137	132	204	440
37	37	726	339	273	463	224
38	38	730	335	316	474	4
39	39	669	290	284	367	282
40	40	704	285	276	431	350
41	41	738	359	364	507	783
42	42	1455	667	628	1002	448
43	43	1596	760	677	955	573
44	44	367	202	143	207	607
45	45	603	322	348	514	1071
2*	46	716	110	239	358	4348
47	47	584	300	191	240	77
48	48	1135	558	498	357	87

2025 Data

2000 Census TAZ	MINUTP TAZ	2025 Non-Employment				2025
		Estimated Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
49	49	1005	363	388	367	354
50	50	523	223	191	85	134
51	51	293	145	107	79	102
52	52	278	121	114	151	700
53	53	1801	721	674	1081	20
54	54	1870	829	744	908	539
55	55	801	258	271	271	1003
56	56	928	356	298	585	32
57	57	1486	654	672	911	300
58	58	2067	755	746	1110	106
59	59	1237	604	591	317	879
60	60	1735	595	600	861	918
61	61	1535	780	654	536	304
62	62	141	69	49	79	389
63	63	1805	761	656	1227	692
64	64	3327	1638	1537	2462	282
65	65	691	302	290	508	10
66	66	1171	577	570	836	707
67	67	3628	1847	1723	2770	1062
68	68	325	110	114	259	31
69	69	87	45	61	68	537
70	70	801	334	342	661	41
71	71	1836	949	866	1405	192
72	72	599	202	190	477	124
73	73	516	312	295	256	1632
74	74	234	88	89	159	128
75	75	1251	503	408	779	918
76	76	1056	551	475	763	663
77	77	1270	478	475	919	203
78	78	2443	969	985	1821	383
79	79	1359	469	452	987	204
80	80	1383	719	597	835	1316
81	81	103	182	103	182	4836
82	82	10	1	2	2	1829
83	83	2153	770	760	1416	15
84	84	451	180	174	188	4761
85	85	1688	686	714	1432	968
86	86	9	5	3	5	0
87	87	832	417	378	742	1326
88	88	965	582	471	631	815
89	89	194	143	134	184	0
90	90	547	356	280	623	2771
91	91	135	54	58	135	26
Roanoke City Total		**96809**	**44794**	**41620**	**61770**	**81314**
100	92	38	34	38	17	439
101	93	116	34	40	40	255
102	94	2343	681	638	1073	755
103	95	247	123	82	123	160

2025 Data

2000 Census TAZ	MINUTP TAZ	2025 Non-Employment				2025
		Estimated Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
104	96	146	66	63	117	406
105	97	485	258	209	389	469
106	98	206	102	106	134	159
107	99	1571	717	691	1210	3455
108	100	1347	610	553	967	320
109	101	784	322	304	579	153
110	102	1182	490	469	724	2275
111	103	414	207	138	207	1373
112	104	733	432	350	581	2323
113	105	139	47	51	88	804
114	106	315	116	103	270	644
115	107	796	369	373	661	2598
116	108	1418	690	699	1106	469
117	109	2061	805	834	1497	128
118	110	809	399	403	558	2231
119	111	821	460	408	734	86
120	112	434	141	138	333	1147
121	113	840	452	330	579	203
122	114	159	56	54	126	72
123	115	593	234	249	356	32
124	116	292	101	92	216	66
125	117	660	328	281	604	719
126	118	341	158	156	259	165
127	119	1071	372	406	809	200
128	120	28	13	20	15	532
129	121	1840	655	639	1288	239
130	122	2429	867	854	1974	129
131	123	526	200	211	366	33
132	124	650	337	287	491	17
133	125	71	24	27	66	0
134	163b	56	24	28	48	0
135	164b	26	13	9	13	0
Salem City Total		**25984**	**10938**	**10331**	**18617**	**23056**
200	126	754	349	305	439	248
201	127	8	4	3	4	206
202	128	767	311	312	386	794
203	129	727	456	485	471	392
204	130	1393	697	592	1041	859
205	131	1858	698	698	1383	138
206	132	331	140	126	319	233
207	133	859	331	309	519	722
208	134	1865	732	681	1513	905
300	135	992	369	319	781	300
301	136	1101	462	432	716	233
302	137	1409	558	528	1174	75
303	138	1124	338	373	795	50
304	139	593	226	213	525	24
305	140	429	199	179	360	90

2025 Data

2000 Census TAZ	MINUTP TAZ	2025 Non-Employment				2025
		Estimated Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
306	141	1166	409	412	905	28
307	142	3039	1480	1415	2614	594
308	143	323	285	239	329	1135
309	144	0	0	0	0	770
310	145	475	221	207	361	198
311	146	3312	1805	1662	2525	427
312	147	4762	1859	1781	3728	1351
313	148	2374	919	896	2060	594
314	149	1443	581	555	1181	182
315	150	4615	2222	2042	3794	750
316	151	3728	1257	1319	2683	162
317	152	2624	1106	1079	2234	2208
318	153	972	383	302	811	62
319	154	678	236	218	487	28
320	155	1181	373	389	903	28
321	156	100	38	44	85	440
322	157	1219	427	357	627	1232
323	158	361	134	137	323	275
324	159	1341	459	483	1016	9
325	160	651	217	211	530	6
326	161	56	38	41	64	0
327	162	493	239	242	477	55
328	163	109	44	46	140	0
329	164	567	273	236	568	90
330	165	14	7	5	7	6
331	166	140	55	56	158	90
332	167	1286	438	457	958	21
333	168	3615	1250	1192	2803	1377
334	169	1641	697	678	1257	1500
335	170	113	31	42	100	22
336	171	2257	977	858	2083	468
337	172	788	244	207	467	3126
338	173	290	58	97	37	688
339	174	965	429	382	420	464
340	175	1339	640	602	1092	463
341	176	1929	739	706	1685	165
342	177	1841	783	875	1245	942
343	178	3653	1363	1310	2320	875
344	179	882	348	338	660	942
345	180	872	331	319	722	55
346	181	3373	1297	1237	2726	500
347	182	187	63	68	138	715
348	183	755	237	232	668	33
349	184	200	80	70	210	0
350	185	7	3	2	3	0
351	186	33	43	33	13	46
352	187	475	165	161	383	0
353	188	345	127	128	273	0

2025 Data

2000 Census TAZ	MINUTP TAZ	2025 Non-Employment				2025
		Estimated Population	Estimated Housing Units	Estimated Households	Estimated Vehicles Available	Estimated Employment
354	189	1070	491	397	1089	24
355	190	653	310	262	696	40
356	191	729	270	291	488	190
357	192	265	112	108	175	11
358	193	754	306	283	438	2
359	194	755	296	261	826	204
360	195	777	252	270	616	7
361	196	300	112	108	262	2
362	197	545	277	254	601	62
363	198	1332	465	504	1055	39
364	199	461	147	144	277	9
365	200	1258	407	408	923	25
366	201	45	38	26	23	28
367	202	507	214	212	443	550
368	203	66	26	26	61	0
369	222	1123	379	358	896	200
Roanoke County Tota		**87438**	**35381**	**33832**	**68165**	**29777**
400	204	171	58	57	60	14
401	205	161	159	109	201	94
402	206	669	281	320	430	1265
403	207	2765	1201	1074	2235	398
404	208	1515	404	368	919	1100
405	209	513	196	159	484	138
406	210	128	61	57	90	207
407	211	573	257	187	615	196
408	212	1892	654	716	1415	78
409	213	1202	379	389	827	30
410	214	2339	845	793	2070	31
411	215	374	112	95	208	98
412	216	814	283	355	641	485
413	217	857	329	339	678	538
414	218	469	230	232	459	350
415	219	1672	564	621	1383	350
416	220	447	205	159	424	102
417	221	181	77	67	168	279
418	223	613	222	244	445	400
419	224	953	339	370	679	2000
Botetourt Co. Total		**18307**	**6857**	**6712**	**14431**	**8154**

Chapter 3

Travel Demand Model

Goal 1: Document Assumptions and Decisions

Goal 2: Serve as a starting point for the next long-range plan update

Overview

Federal regulations implemented as a result of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 require urbanized area metropolitan planning organizations to develop and approve a financially constrained long-range transportation plan. The long-range plan 2025 was developed in accordance with those regulations.[1]

This chapter describes the modeling methodologies used in the development of the long-range plan 2025 adopted by the Roanoke Valley Area Metropolitan Planning Organization on February 26, 2004. The Roanoke urbanized study area includes the Cities of Roanoke and Salem, the Town of Vinton, and the urbanized portions of Roanoke and Botetourt Counties.

The computer package used to model the region is the microcomputer based modeling program MINUTP (v. 99), developed by COMSIS Corporation.

EXISTING TRANSPORTATION SYSTEM

Area Primary System

The Roanoke metropolitan area transportation system consists of a complex system of highway, bicycle, rail, trail and air facilities. There are several arterials in the Roanoke area that are notable and provide important links in the transportation system. Several are primary highways that serve the region.

Interstate 81 is a four-lane highway that traverses the northern portion of the study area from Botetourt County in the north through Roanoke County in the South. I-81 is the most prominent interstate highway running the entire length of the western portion of the state.

Interstate 581 is a six-lane limited access facility that provides access to the Roanoke Central Business District. This arterial runs from I-81 in the north to Route 24 (Elm Ave) in the downtown area, then becomes a six-lane facility designated as *Route 220* and continues through to the southern end of the study area boundary into Franklin County.

1 Information, Tables and Narrative for this chapter was provided by VDOT Modeling Team; specifically Nelson Newton, who serves as modeler for the Roanoke area. A more complete document concerning the 4-step Travel Demand Modeling process will be published by VDOT in FY 2006.

Route 11 is a principle arterial with various street designations throughout the study area. In the western portion of the study area, it junctions with Route 460 through Roanoke County into the Salem Central Business District and then separates with the 460 designation and turns northeast through the City of Roanoke. It follows the I-81 corridor in the northeastern section of the study area through Roanoke County and into Botetourt. It is also known as Apperson Drive, Texas Street, and Main Street in Salem and Brandon Road, Campbell Avenue, Williamson Road, and Lee Highway in Roanoke and Botetourt.

Route 24 is a four-lane divided thoroughfare from I-581 in downtown Roanoke that traverses the Town of Vinton and extends eastward through Bedford County.

Route 101 (Hershberger Rd) is a two-lane route from Route 117 (Peter's Creek Road) to Cove Road, where it becomes a six-lane facility connecting I-581 to the Roanoke Airport and Valley View mall.

Route 115 is an undivided two-lane facility that runs from Orange Avenue in the City of Roanoke, north to Interstate 81, paralleling Tinker Creek. It is also known as Plantation Road.

Route 117 (Peter's Creek Road) is a four-lane thoroughfare extending from Route 11 (Lee Highway) in northeast Roanoke County to Melrose Avenue (Route 460) in the City of Roanoke. This route was recently extended to Brandon Road (Route 11) in the southwest part of the county.

Route 220 is a Principle Arterial that serves as a major north-south route through western Virginia. In the Roanoke study area, it enters Roanoke County in the south, follows the Southwest Expressway and I-581 to I-81, and then leaves I-81 near Cloverdale and travels north through Botetourt County.

Alternate Route 220 follows Route 460 westward from I-581/220 in the Roanoke CBD, and then leaves Route 460 near Bonsack in Roanoke County, travels north to I-81 near Troutville in Botetourt, where it reconnects with Route 220. This last section of Alternate 220 is a recently improved four-lane divided highway.

Route 419 (Electric Road) is a four-lane circumferential arterial located along the western Roanoke City Limits. It runs from Route 220 and the Southwest Expressway to Route 460 in Salem and northward to I-81 in Roanoke County. It serves as a connector between radiating arterials from the Roanoke Central Business District.

Route 460 is a four-lane divided facility that is the area's primary east/west highway through the cities of Roanoke and Salem. It is co-designated as Route 221 or Route 11 throughout most of the Roanoke metropolitan area. It is also designated as Orange Avenue and Melrose Avenue in Roanoke, and Main Street in Salem.

The existing (2000) average daily traffic volumes of the aforementioned facilities are illustrated in **Table 3.1**.

Table 3.1

2000 Average Daily Traffic of Selected Primaries

Facility	*Location of Highest Volumes*	*ADT*
Interstate 81	Between Rte. 419 & I-581	71,000
Interstate 581	Between Wells Ave & Orange Ave	81,000
Route 11	Between 10th St & Hershberger Rd	24,000
Route 24	Between Roanoke CL & Pollard St	30,000
Route 101	Between I-581 & Valley View Blvd	42,000
Route 115	Between Fleming Rd & Rte 601	19,000
Route 117	Between Melrose Ave & Hershberger Rd	26,000
Route 220	Between Blue Ridge Pkwy & Rte 419	39,000
Route 220A	Between Rte 460 & Rte 654	19,000
Route 419	Between Rte 220 & Ogden Rd	50,000
Route 460	Between Williamson Rd & Hollins Rd	50,000

FOUR STEP MODELING PROCESS

Model Development

The basic modeling process is to develop a set of mathematical equations that relate trip characteristics (productions and attractions) to socio-economic and land use parameters. The model is obtained through a process of synthesizing trip ends and assigning these trips to the existing highway network using the traditional four step transportation planning process (Trip Generation, Trip Distribution, Mode Split and Assignment).

Trip ends are predicted for differing trip types or purposes. For the trip generation process, the trip purposes for the Roanoke study fall into four categories. Three of these trip purposes begin and end within the study area. The first is home-based-work (HBW), where one trip end is at home and the other at work. The second is home-based-other (HBO), which includes trips that either begin or end at home but do not involve trip ends to or from work. These trips include shopping, recreational, school, etc. The third trip purpose is non-home-based (NHB), where neither trip end is at home. The fourth purpose has one trip end inside the study area and the other outside the study area. These are called internal-external trips (IX). Outside of the trip generation process, there is another set of trips that are external-external (X-X), where both trip ends are outside of the study area. These are added to the trips generated for the internal trip

purposes after the trip distribution process and are derived from Origin & Destination survey data.
The next step in the model development is the trip distribution process. This is where the production and attraction end of each trip is linked. This results in a zone-to-zone table or matrix of the number of trips for each purpose. The matrices are added together with the X-X trip table for input into the assignment module.

The third step in the modeling process is a modal split, where trips are separated into specific modes of transportation such as transit bus or train. However, for the Roanoke model, transit trips were not considered due to their limited use and impact they have in the region.

The final step in the modeling process is traffic assignment where each synthesized zone-to-zone trip is assigned to the roadway network using the shortest path, in travel time, between two zones. An "all-or-nothing" assignment, with an equilibrium volume adjustment, was used for this model. The equilibrium technique attempts to balance assigned volumes with coded link speed and capacity. An iterative process is used. The first iteration is an all-or-nothing assignment using the shortest path based on coded speed and capacity. On successive iterations, link speeds (i.e. travel times) are adjusted using the traditional BPR speed-volume curve. Then the next all-or-nothing iteration is run using the newly calculated path impedance. Iterations continue to run until the link volumes reach a stable value within a certain tolerance level. For Roanoke, the tolerance level was set at 0.01.

The synthesized trips are then compared for accuracy to the observed counts as they occur on the roadway network. Parameters in the computer model are then adjusted until the assigned volumes most closely match the observed traffic counts. Future travel can then be predicted based on trips generated from forecasts of the existing land use and socio-economic data. The future trips are then assigned to the existing highway network (plus any committed improvements) to identify any network deficiencies. Alternative networks can be developed and tested to resolve any such deficiencies. This process results in a recommended thoroughfare plan that will meet the future travel demands of the area.

The four-step transportation planning process as it applies to the Roanoke Valley modeling effort is explained in detail below.

BASE YEAR NETWORK

Network Development

The 2025 RVAMPO Long Range Transportation Plan was initiated in 1999 and based on 2000 census data. The original base network was obtained from the consulting firm, Harland Bartholomew & Associates, Inc. (HBA), who had developed the model for the East Roanoke Circumferential Corridor Study in 1988. This model was modified and used as the base network for the 2015 RVAMPO Long Range Transportation Plan.

The network was again revised to reflect the 2000 base year conditions in the study area. This includes an expansion of the study area to include a greater portion of rapidly developing sections of Botetourt County. The 2000 census also identified a small part of western Bedford County as being urbanized. This was not, however, included as part of the model analysis as it was not regarded as having a significant impact on the area travel patterns. The traffic entering the modeled area from Bedford was instead regarded as external station traffic.

The observed counts on the network were updated to 2000, from VDOT's Highway Performance Monitoring System (HPMS) database, to match the 2000 census data. The turn penalty file used for input into the path-building module was also updated to reflect current conditions.

The study area is divided into 224 internal traffic analysis zones and 21 external stations. The network includes 1313 two-way links and 44 one-way links connected by 1086 nodes and encompasses all of the roadways in the study area classified as collector and above. Several local roadways are also included to ensure more realistic and appropriate model connectivity.

BASE YEAR MODEL

Trip Generation

Trip productions and attractions are directly related to various socio-economic characteristics of a given area. The socio-economic (land use) data for the 2025 LRTP was acquired from the 2000 census. The RVAMPO staff developed the socio-economic data for each traffic zone, for model input.

Another separate trip table is developed to include trips that pass through the study area altogether. These external trip tables were developed by BMI and Associates in 1999, and evolved by conducting origin-destination field studies. These counts were updated to reflect the year 2000 counts.

The land use data needed for calculating trip productions and attractions for the Roanoke model were provided by the RVAMPO staff, in cooperation with the relevant local jurisdictions, and are shown in **Table 3.2**.

Table 3.2

Land Use Data Input For Trip Generation

Variables
1. Population
2. Employment
3. Auto Ownership
4. Households

These assumptions were used for input into trip generation equations developed by HBA, from previously conducted origin-destination surveys and travel diaries. The relationships derived from these studies are assumed to remain constant; therefore, the equations can still be used to predict current and future trip productions and attractions. The 2000 Roanoke area land use characteristics were used to validate the 2000 model year observed counts while the 2025 projected data were used to determine trip productions and attractions for the 2025 model.

The land use variables were developed for each traffic analysis zone in the study area and were generated as vehicle trips. The external-internal trips were calculated as productions from observed traffic counts taken at the external stations where vehicles entered the study area. The attraction ends of these trips were derived from the IX attraction equation. A return trip was assumed. The trip generation equations used in the model are shown in **Table 3.3**.

Table 3.3

Equations Developed From Travel Surveys

Production Equations
HBW trips for internal zones: (10.95068)+(1.00434*Autos)
HBO trips for internal zones: (-48.64429)+(1.88601*Autos)
NHB trips for internal zones: (-3.90186)+(0.80839*Households)+(0.93287*Employment)
X-I production trips derived from machine counts taken at the external stations

Attraction Equations
HBW trips for internal zones: (39.62939)+(0.95168*Employment)
HBO trips for internal zones: (72.33960)+(0.71693*Autos)+(0.84291*Employment)
NHB trips for internal zones: (-3.90186)+(0.80839*Households)+(0.93287*Employment)
I-X trips for internal zones: (46.38660)+(0.05436*Population)+(0.65902*Employment)

The HBW trips were balanced on attractions. The HBO, NHB and IX trips were balanced on productions. As an initial step in validating the accuracy of the socio-economic data, the region-wide balance between productions and attractions should be checked for reasonableness. Ideally, the ratio between productions and attractions should be in the range of + / – 10%, prior to any adjustments. The pre-adjusted ratio of productions and attractions for the Roanoke area trip generation was 15%. While this is not ideal, it is still acceptable. Some minor adjustments may be needed for the trip generation equations in the next model update.

Special generators are used for zones that have trip rates significantly different than the standard trip rates derived from the production and attraction equations. Zones in this category include land uses such as airports, military bases, universities, regional malls and regional recreational

facilities. A significant difference between observed traffic volumes and the assigned volumes in a particular location indicate the need to consider the zone as a special generator. Several zones in the Roanoke study area were regarded as special generators for this study. Trips generated for these zones were derived outside the model's trip generation process using trip rates from the **Institute of Transportation Engineers** (ITE) Trip Generation manual. The methodology used to generate these trips can be found in **Table 3.4**.

Table 3.4

Special Generators

Generator	*Location*	*GLA*	*Occupancy Rate*	*Occupied GLA*	*Daily Volume**
Towers Mall	Zone 16	316,000	91%	288,000	10,540
Crossroads/Town Sq	Zone 82	928,000	85%	789,000	21,930
Hunting Hills Plaza	Zone 87	150,000	91%	137,000	7,140
Valley View Mall	Zone 90	886,000	85%	753,000	21,080
Tanglewood Mall	Zone 144	766,000	91%	697,000	19,805

*Volumes resulting after 15% reduction for Pass-By Trips.

The distribution of generated trips by trip purposes is shown in **Table 3.5**.

Table 3.5

Generated Trips Distributed by Purpose

Purpose	*Trips Generated*	*% of Total*
HBW	131,782	18%
HBO	261,638	36%
NHB	182,319	25%
IX	144,063	20%

Trip Distribution

Trip distribution is the process by which trip ends produced in each zone are linked to trip ends attracted to each of the other zones in the study area, forming a matrix of distributed trips. The trip distribution module in Minutp (and most other travel demand software) utilizes the traditional gravity model equation for distributing trips generated through the trip generation process. The gravity model equation is illustrated in **Table 3.6**.

Table 3.6

The Gravity Model

$$T_{ij} = \frac{P_i \times A_j \times FF_{ij}}{\sum (A_j \times FF_{ij})}$$

T_{ij} = Total Trips from zone i to j
P_i = Productions at zone i
A_j = Attractions at zone j
FF = Friction Factors from zone i to j

According to the gravity model theory, the number of trips between any two zones is directly proportional to the relative attraction (number of productions and attractions) between the zones and inversely proportional to an exponential function of the spatial separation (travel time) between zones. The spatial separation between zones is indicated through the use of friction factors and adjusts the relative attraction of each zone for the ability, desire, or necessity of the trip maker to overcome the spatial separation involved. A friction factor table was used for input into the Roanoke trip distribution module. The table was developed by HBA from field surveys conducted in 1986 for the East Roanoke Circumferential Plan.

Mode Choice

The 3rd step in the transportation planning process is the mode split, whereby trips are distributed between vehicle and transit modes. For a medium sized area such as Roanoke, transit patronage makes up too small a percentage of trips to affect the highway assignment volumes, so it was not considered in this modeling effort.

Traffic Assignment

Traffic assignment is a process that can be used to predict the probable traffic volumes on the various highway thoroughfares of a transportation network. This procedure applies the total trip tables and assigns zone-to-zone trips along an optimum time/distance route. As mentioned above, an “all or nothing” assignment was applied for the Roanoke model using an equilibrium volume adjustment. This method was chosen to determine which paths would be used given existing capacity restraints and congestion.

BASE YEAR ASSIGNMENT VALIDATION

Calibration versus Validation

The traditional four-step modeling process, initiated over 40 years ago, originally called for urbanized areas to conduct large-scale origin-destination (O-D) studies by collecting information from household interviews, travel diaries and individual traffic surveys. This is an expensive and time-consuming process. Calibration was accomplished by modifying model parameters until they replicated travel patterns exhibited by the acquired survey data. After the models were calibrated, a validation effort was undertaken.

Validation involves testing the models predictive capabilities. Travel models need to replicate observed conditions within reason before being used to produce future-year forecasts. Today, due to their expense, large-scale O-D surveys are not usually carried out. Instead, default model parameters from past surveys are used in the trip generation and trip distribution process. These "calibrated" models are then run with current socioeconomic data and the simulated volumes are compared to the observed (ground) counts. The validation process consists of adjusting certain model values, such as speeds and capacities, to obtain simulated volumes that closely match, within established tolerances, the actual observed traffic counts.

Validation of the Model Assignment

As with trip generation and distribution, the assignment output for the region should be checked for reasonableness, ensuring that observed conditions are closely replicated by the assignment output.

The validation tests for highway assignment are presented at three levels: 1) system-wide, 2) corridor, and 3) link specific.

1. There are several system-wide validation measurements of the auto assignment process, including vehicle miles traveled (VMT), cordon line volume summaries, and VMT per household. The observed data are obtained from HPMS data, VDOT's ongoing traffic count program, and special traffic counts requested for individual planning projects. The HPMS data is compared to the modeled data for accuracy. Modeled regional VMT should generally be within 5 percent of observed regional VMT. Reasonable ranges of VMT per household are 40-60 miles per day for large urban areas and 30-40 miles for small urban areas. If volumes are consistently high or low across the region, then system-wide characteristics must be adjusted to correct the problem.

   Characteristics that can be adjusted to affect system-wide volumes are:

   - Auto occupancy rates
   - Trip generation rates
   - Average trip length
   - Intrazonal impedance for all zones

- Socioeconomic data for all zones

2. The next level of validation of the highway assignment is the comparison of observed vs. estimated traffic volumes on the highway network. Screen lines and cut lines were developed for the network in order to compare the model's traffic output with actual ground counts. A screen line is established to intercept major traffic flows and is located to minimize "double" crossings. The Roanoke River was chosen as the screen line for the Roanoke 2025 Long Range Transportation Plan. Cut lines are shorter than screen lines, travel along one axis, and cross-corridors rather than intercept major flows. An acceptable target is 5% difference for screen lines and 10% for cut lines.

   If there are major differences in volumes across corridors, adjustments may need to be made in the following areas:

   - Zone to link loading points (centroid connectors) in the area of the corridor
   - Trip generation rates for zones near the corridor
   - Auto occupancy rates for facilities in the corridor
   - Intrazonal times in zones near the corridor
   - Intersection (turn) penalties

3. Once the cordon lines and screen lines are validated, the assignment volume-delay functions can be modified to produce the desired individual link assigned volumes.

   For changes that affect only specific links, the following characteristics may be modified:

   - Speed and capacity
   - Turn penalties
   - Centroid connector locations
   - Special generators
   - Local network configuration

Although there are no absolute criteria for assessing the validity of all model systems, some guidelines have been developed to evaluate the relative performance for a particular model.

One criterion involves making statistical comparisons to the model output with other metropolitan areas. These comparisons should be made with similar sized study areas.

The distribution of assigned vehicle miles traveled (VMT) by facility type furnishes one comparison method. The Roanoke study area population is approximately 215,000. Typical VMT distribution by functional classification for a medium sized study area (population: 200,000 to 1 million) is compared to the Roanoke study VMT in **Table 3.7**.

Table 3.7

Distribution of 2000 VMT by Functional Class

Facility Type	*VMT*	*Typical Area*	*Roanoke*
Freeways	1,846,901	33-38%	38%
Principle Arterials	1,737,883	27-33%	35%
Minor Arterials	845,160	18-22%	17%
Collectors	494,648	8-12%	10%

The Federal Highway Administration (FHWA) and various states DOT's have established targets for the acceptable range of deviation between assigned and observed counts. **Table 3.8** shows how the Roanoke area model compares with FHWA and Michigan (MI) DOT targets.

Table 3.8

Percent Deviation of Link Volumes
(Assigned vs. Observed)

Facility Type	*FHWA Targets*	*MI DOT Targets*	*Roanoke Results*
Freeways	+/- 7%	+/- 6%	+ 5.3%
Principle Arterials	+/- 10%	+/- 7%	+ 0.4%
Minor Arterials	+/- 15%	+/- 10%	– 2.3%
Collectors	+/- 25%	+/- 20%	– 7.5%

Statistical Measures

The Federal Highway Administration (FHWA) publication *Calibration and Adjustment of System Planning Models* (FHWA-ED-90-015), and the Travel Model Improvement Program (TMIP) publication *Model Validation and Reasonable Checking Manual*, identifies four commonly accepted techniques for determining how well the model output matches the observed data. These procedures and the results for the Roanoke Valley Area 2000 base year model are listed below.

1) *Absolute Difference:* Calculated as the difference between the estimated and observed volume totals (estimated–observed) to obtain a positive or negative value, which can be an indicator of performance. For the Roanoke model the absolute difference is a negative value (-131,985), indicating that the overall assignment is slightly lower than the actual traffic volumes.

2) *Relative Difference:* This is expressed as the percentage difference between observed and assigned volumes. The percentage difference is calculated as: {(estimated ─ observed) /

observed}. An acceptable range for the region wide model would be ±5%. The value for the Roanoke assignment falls within 1%.

3) *Correlation:* This is a regression analysis procedure that relates a dependent variable to one or more independent variables and determines the degree to which they are related. The most commonly used measure of correlation is the coefficient of determination (R^2). In modeling, this is an indication of the strength of the relationship between the assigned volumes (dependant variable), and observed volumes (independent variable). The R^2 value can range from 0, indicating no correlation, to 1.00, revealing a precise relationship between the variables. A reliable assignment should have an R^2 value greater than 0.88. The R^2 value for the Roanoke assignment was 0.96.

4) *Variance:* Another statistical measure used to compare observed vs. estimated volumes is known as the Percent Root Mean Square Error (%RMSE). This value represents the statistical amount of error occurring between the assigned and observed volumes. According to the Montana Department of Transportation, an appropriate aggregate %RMSE is less than 30%. The %RMSE for the Roanoke model assignment is 20.6%. A comparison of the %RMSE for Roanoke and several other cities, by facility type, is displayed in **Table 3.9.**

Table 3.9

Percent Root Mean Square Error Comparisons

Facility	*Roanoke*	*Reno*	*Phoenix*	*Concord*
Freeways	10.5	18.6	25.4	na
Arterials	18.7	36.8	38.5	na
Collectors	37.1	77.5	62.7	na
Total	20.6	36.8	40.6	36.8

After the validation process, the projected (2025) network was assembled.

FORECAST YEAR MODEL

Existing and Committed Network (E &C)

The future (2025) roadway network consisted of a combination of the existing 2000 network, and all committed improvements included in the VDOT Six Year Improvement Program. This includes one new facility, the Green Ridge Road connector from Route 419 to Dalewood Road in the City of Salem.

Developing Forecast Data

The Roanoke Valley Area MPO, in cooperation with the local jurisdictions, developed the projected (2025) socio-economic data used for input into the trip generation equations for the forecast model. The data evolved by anticipating future growth and development in the area. VDOT, using a traditional historical trend methodology, developed the projected external station volumes.

Forecast Trips

Applying the validated trip generation equations from the base year model to the projected 2025 socioeconomic data generates the future zonal productions and attractions. These are then distributed through the gravity model and applied to the 2025 existing and committed network, producing future arterial volumes. For reasons mentioned above, a transit network was not developed for the forecast model.

Forecast Assignment

The additional facilities and capacities, resulting from planned roadway improvements incorporated into the E & C network, will alter the paths traveled during the assignment process, providing projected traffic volumes on the E&C network.

As an offline procedure, the projected traffic was compared to the calculated E & C network capacities on a link-by-link basis, using standard HCM procedures. Future levels of service are then determined based on these projected volume to capacity (V/C) ratios. Improvements to the thoroughfare system can be proposed and tested to relieve any projected deficiencies.

Recommendations for Next Long-Range Plan Update

- Use a scenario planning process to potentially generate multiple sets of population, housing and employment projections depending on the scenario employed.

Chapter 4

Public Involvement and Participation

Goal 1: Document Assumptions and Decisions	Goal 2: Serve as a starting point for the next long-range plan update

In this technical report, either the box for "*Goal 1*" or the box for "*Goal 2*" is typically highlighted to indicate, whether the primary focus of the chapter is to document assumptions and decisions, or to serve as a starting point for the next long-range plan update. Chapter 4 on *Public Involvement and Participation* and its companion Chapter 5 on *Project Evaluation and Selection* intertwine these two goals so thoroughly that it is difficult to present the chapters as satisfying one or the other goal predominantly.

Public involvement and participation for the Long-Range Plan 2025 proceeded along two primary avenues: direct public participation and representative public participation. As the name implies, direct public participation involves strategies that facilitate involvement and participation directly from citizens through a variety of means. In the case of the 2025 Long Range Transportation Plan survey and various publicly advertised meetings and workshops served as the primary components of direct public participation.

Representative public participation is a concept that the reader may not be entirely familiar with. Some aspects of the planning process such as the development of worthwhile goals and objectives do not lend themselves easily to afternoon/ evening workshops or transportation surveys. Instead, these concepts should be developed over time, refined and debated to yield best results. Representative public participation techniques such as the formation of a Community Advisory Committee (Figure 4.1 Page 46) and/or the formation of ad hoc committees at the local level provide a forum in which a diverse citizen committee can "represent" the community at large in the development of goals and objectives or the selection of projects (to be discussed in Chapter 5). An illustration of how direct public involvement approaches go hand-in-hand with representative public participation approaches is presented in **Figure 4.0.**

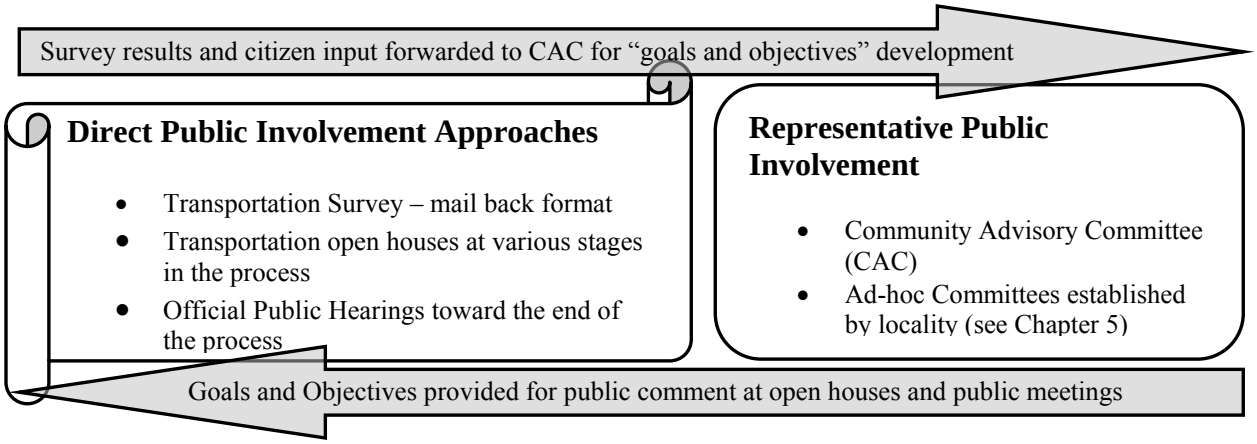


Figure 4.0

The remainder of this chapter is organized using **Figure 4.0** as a guide. Direct public involvement techniques such as the transportation survey will be described first. Then the role and function of the CAC will be described leading up to this representative body's development of the Long-Range Plan "Goals and Objectives." This chapter will leave off at the point that the "Goals and Objectives" have been developed and accepted by the RVAMPO as the guiding framework for the Long-Range Plan 2025. Chapter 5 will describe how this leadership framework was translated into selection of specific projects for the "Financially Constrained List of Projects." This chapter will end with a public participation log highlighting public involvement and participation opportunities throughout the process.

Transportation Survey:

Methodology: The Community Advisory Committee (CAC) contributed substantially to the design and content of the transportation survey. The front page of the survey features nineteen questions grouped into six categories, all answered using what is called a "Likert Scale." This scale provides respondents an opportunity to indicate the extent to which they agree or disagree with the proceeding statement. Respondents were asked to fill in the oval that corresponds to their level of agreement with the statement using the scale: 1 (strongly agree), 2 (agree), 3 (neither agree nor disagree), 4 (disagree), and 5 (strongly disagree). The reverse page of the transportation survey is divided horizontally with the mailing address showing in the top half and additional open ended questions on the bottom half (see appendix). This report addresses the results from the front page and the transportation dollar question on the reverse page only. The open ended and subjective feedback provided is on file; however, it is too verbose for direct inclusion in this report.

Typically surveys are fielded in such a manner as to ensure that the results from the sample (those who took the survey) can be scientifically applied to the population at large. This is done through a process of selecting a "random" sample of adequate size, gathering the results, and using statistical properties, usually of the normal distribution also known as the "bell curve," to apply the results from the sample to make predictions concerning the population as a whole. This process requires a specifically defined random sample in order to have "scientific" validity.

Unfortunately administering a survey in the aforementioned manner does not allow additional surveys to be subsequently distributed as various opportunities arise, or to be used as a general public participation tool outside of those included in the "random" sample. With this in mind, staff chose not to field the survey as a "scientific" survey; rather, to employ the survey as a general public participation vehicle. Consequently, the results obtained can only be applied as summary statistics for the sample itself and cannot be attributed to the population as a whole with any scientific validity.

Results: Two hundred and five (205) respondents returned surveys to staff. The survey was distributed to several public libraries, the regional chamber of commerce's "Chamber Advantage" mailing, the City of Roanoke Neighborhood Partnership, the Roanoke Valley Association of Realtors and other avenues of opportunity as they became available. With this in mind, the results may be slightly skewed towards the "business" perspective due to the willingness of "business" organizations and associations to distribute the survey at little or no cost. Nevertheless the reader of this report should find the results informative.

Question **1 (strongly agree), 2 (agree), 3 (neither agree nor disagree), 4 (disagree), and 5 (strongly disagree)**	**Average**
1.) Have you completed the survey before?	N/A
2.) Traffic congestion is a serious problem in our area.	2.94
3.) Increased tourism is a good reason for road improvements.	2.49
4.) More funds should be available to promote, carpools, transit use and other means to reduce one occupant travel.	2.87
5.) More money should be spent on road maintenance even if it reduces funds for new construction projects.	2.43
6.) New highways should be built in outlying areas to open up land for development.	3.51
7.) Bicycle and pedestrian facilities should be included on new or improved roadways when feasible.	2.25
8.) Off-road trails and greenways should be eligible for public funding (i.e. general highway or maintenance money.)	2.53
9.) I would pay more in local tax dedicated to the improvement of local or regional transportation facilities and systems.	2.82
10.) Developers should pay more to improve transportation facilities associated with or impacted by their projects.	1.95
11.) I would pay more in state gasoline taxes to fund regional transportation improvements.	2.78
12.) Improved highway and multi-modal access to the airport would be beneficial.	3.04
13.) Airport funding and development are essential to the region's economy.	2.08
14.) The existing public transit systems are sufficient.	3.24
15.) Additional public transit opportunities are needed for the elderly and those with physical and mental challenges.	2.63
16.) Air pollution is a serious problem in our area.	2.57
17.) Passenger rail service should be reestablished in the region.	1.98
18.) Transportation improvements should be coordinated with land use planning.	1.71
19.) Transportation decisions involve tradeoffs and compromises.	2.00

Table 4.0

Some of the results listed above are worthy of specific mention. Keep in mind that the average scores listed above should be interpreted using the previously mentioned scale: 1 (strongly agree), 2 (agree), 3 (neither agree nor disagree), 4 (disagree), and 5 (strongly disagree). For instance, an average of 3.00 would indicate that the sample as a whole neither agreed nor disagreed with the statement. An average less than 3 indicates that the sample tends towards agreeing with the statement with its agreement intensifying as the average approaches 1. Likewise an average of greater than 3 indicates that the sample tends towards disagreeing with the statement with its disagreement intensifying as the average approaches 5.

Question #2 came close to averaging 3 at 2.94, which indicates that the sample is ambivalent about the statement "Traffic congestion is a serious problem in our area." Along those lines the sample tended to slightly disagree with the statement "New highways should be built in outlying areas to open up land for development" averaging 3.51. Interestingly, given the aforementioned representation of business interests in the sample, the sample agrees (average 1.95) with the statement "Developers should pay more to improve transportation facilities associated with or impacted by their projects." Likewise, the sample agreed on average (tending towards strongly agree: 1.71) with the statement "Transportation improvements should be coordinated with land use planning." Also the bicycle and greenway related questions #7 and #8 fared well with an average of 2.25 and 2.53 respectively. Curiously, the average results for the airport related questions #12 and #13 differed by almost one. For instance, the sample was basically ambivalent about the statement "Improved highway and multi-modal access to the airport would be beneficial" reporting an average of 3.04. However the sample agreed with the statement "Airport funding and development are essential to the region's economy" reporting an average of 2.08. This could indicate that the sample is not very concerned about airport access but is supportive of various forms of airport development. We do not know all the forms of airport development the sample would tend to support; however, a statement pertaining to the attraction of a low-cost airline was included in the optional feedback section of various returned surveys in the sample. The remaining results in the **Table 4.0** should be interpreted in a similar manner depending on the average reported.

On the reverse side of the survey there was a section, which allows respondents to divide a transportation dollar (which represents their tax dollar) among 12 categories including a "write in" category. One hundred seventeen (117) respondents chose to complete this section with each individual allocation summing to total one dollar. (Note: all allocations by respondents, which did not total to one dollar, are not included in this analysis.) The results are summarized in **Table 4.1** below.

How would you spend your transportation dollar?	Average
Bicycle and pedestrian improvements	0.08
Maintenance of the existing system.	0.25
Increased bus service.	0.06
New roadway construction.	0.10
Widening of existing roadways.	0.14
Increased transportation services for the elderly and disabled.	0.06
Projects that encourage ridesharing.	0.02
New Technology and management techniques for existing system.	0.04
Telecommuting, videoconferencing or other communications substitutes for transportation.	0.02
Rail development.	0.13
Airport Development	0.09
Other (Please Specify)	0.01
Total $	1.00

Table 4.1

The clear favorite among respondents is "Maintenance of the existing system" with 25 cents of an average transportation dollar. The next highest average allocation is for "Widening of existing roadways" at 14 cents followed by "Rail Development" at 13 cents. One cent, on average, was allocated to the "Other" category. The write in responses are too numerous to mention in entirety, however examples included: "Greenways off road connections to neighborhoods, communities & parks," "Better rural intersection lighting," and "Rail (maglev etc.) to Blacksburg." All write-in responses are kept on file at the RVARC offices.

Conclusion:

As was mentioned on several occasions, please be careful when applying these results to the population or community as a whole. First of all, the sample is not "random" so the averages technically only apply the 205 people who chose the complete the survey. Secondly, this survey is designed to be regional in nature and is not designed to offer guidance on neighborhood or community scale projects.

Community Advisory Committee:

In Fiscal Year 2001 Regional Commission staff prepared a public participation plan for the RVAMPO. This plan lists various goals and objectives for seeking public participation in transportation planning using two main strategies: direct participation and representative participation. Representative public participation is provided by the Community Advisory Committee (CAC). The CAC consists of 25 members roughly half of which are nominated by member local governments of the RVAMPO. The CAC is charged with advising the RVAMPO from a "community perspective." It is often difficult to adequately define what is meant by "community perspective" because individual members of the community may have perspectives, needs and desires which are in conflict with those of other individuals in the community. Nevertheless, the CAC advises the RVAMPO on such matters as "goals and objectives" for the long-range transportation plan update; as well as, various critical issues which come before the RVAMPO. The CAC is also charged to assist commission staff in developing effective methods of addressing the other main public participation strategy "direct public participation." In this manner the two strategies of seeking public participation are tied together in a mutually beneficial framework. As such the CAC assisted in the development of the transportation survey that was fielded to the general public.

The CAC is an advisory group that operates on a consensus basis. As such, the CAC does not pass "official resolutions" and it does not elect officers. However the CAC does have a general structure depicted in **Figure 4.1**, which represents its intended makeup. Nonetheless, the actual membership of the CAC may deviate from the goal due to vacancies and or interests from unforeseen sectors. As of the writing of this report, the RVAMPO has not turned down any interested citizen who desired to serve on the CAC.

Community Advisory Committee (CAC)
Goal 25 Members

Local Government Representation (11)		At Large Representation (14)	
• Roanoke City	3	• Regional Chamber of Commerce	2
• Roanoke County	3	• Greenways and Bicycle Groups	2
• Salem	2	• Museum and Cultural Interests	2
• Botetourt County	2	• Business Leaders	2
• Vinton	1	• Local Area Agency on Aging	1
		• Total Action Against Poverty	1
		• Independent Living Center	1
		• Minority Business Association	1
		• Workforce Investment Board	1
		• University/HEC Representative	1

Figure 4.1

The main contribution of the CAC during the long-range planning process was the vision statement and the goals and objectives, which serve as guiding principles for the Long-Range Plan 2025. The goals and objectives also served as a framework, which helped guide the project selection process, which is detailed in chapter 5 of this report.

The remainder of this chapter presents the Vision Statement, Goals and Objectives in their final form. The chapter ends with a log of all public participation activities undertaken in the completion of the Long-Range Plan 2025.

VISION STATEMENT: Pursue excellence in regional multi-modal transportation planning, in such a manner, that the results benefit area residents, and attract leaders from other regions to visit this region for "inspiration and ideas;" thereby, establishing the Roanoke Valley Area Metropolitan Planning Organization (RVAMPO) as a benchmark and/or best practice in small-medium sized urban transportation planning.

GOAL A: Partner with the New River Valley (NRV) to establish the combined "Roanoke Valley and NRV" as a premier transportation research and innovation region.

- Capitalize on the proximity of the smart road and the research facilities at Virginia Tech to enhance the synergy between the Roanoke Valley and NRV by:
    - Encouraging the use of the Roanoke Valley as a "small to medium sized "**urban test bed**" for emerging transportation technologies.

        - Encouraging the combined Roanoke Valley + NRV to market itself as a home to innovative transportation industries.
- Facilitate and encourage the deployment of technology to monitor and manage traffic flow in order to increase safety and efficiency.
    - Investigate strategies to manage speed differentials between vehicles on the highway, coordinate traffic control signals, and improve safety and operations characteristics of the transportation system.
- Encourage research into innovative uses of ridesharing, car sharing, light rail and passenger rail possibilities.
- Encourage research into the transportation – land use connection especially as it applies to transportation and travel demand, new urban development, transit oriented development and financial and policy initiatives.
- Encourage research into pedestrian use of and safety on major transportation arterials, and research on retrofitting existing transportation structures for pedestrian use/cohabitation.

GOAL B: Encourage the development of a regional transportation/economic development land-use strategy where local governments share in the benefits of urban brownfield/greyfield reuse and redevelopment.

- Facilitate a dialog with local governments to promote the idea of extending and/or developing "gains sharing agreements" that apply to urban redevelopment efforts such as brownfield/greyfield redevelopment and/or "downtown development."
    - Such agreements could be modeled on existing "greenfield type gains sharing agreements," i.e. the Regional Industrial Park at Pulaski or the McDonald Farm site in Roanoke County, except the focus would be greyfield, brownfield and/or downtown development.
- Develop a marketing and public education strategy to address the transportation/land-use relationship as it applies to sprawl, greenfield development, brownfield redevelopment and vibrant downtowns.

GOAL C: Develop alternative transportation strategies that serve their own primary land-use and economic development objectives as well as assist in development and/or redevelopment of adjacent public and private lands.

- Support the Greenway Commission in their efforts to develop an interlinked network of urban and suburban greenways.
- Develop bicycle and pedestrian zones, which support small business and retail.
- Develop transportation strategies that enhance tourism development.

GOAL D: Facilitate and encourage the deployment of technology and other strategies to balance freight and passenger flows over multiple transportation modes.

- Develop a consumer education program, possibly using computer models and simulations, which present to the public the "true costs" of passenger and freight transportation using various modes (including societal, subsidized and other indirect costs).
- Encourage the development of revenue sharing among transportation modes and/or a public private partnership strategy analogous to the "revenue sharing" and "gains sharing" agreements at regional economic development parks (i.e. the regional industrial park in Pulaski, VA). Encourage strategic public-private partnerships leading to double tracking key private rail corridors with provisions for public access for passenger and freight service.
- Investigate the feasibility of "smaller scale" intermodal transfer points for freight transportation.
- Encourage state and federal decision-makers to balance economic factors between transportation modes by adopting fiscal and tax-policies which encourage efficient use of transportation infrastructure.
- Maximize the potential of the Roanoke Regional Airport by developing "global trans-park" or "regional inland port" concepts to expand the airport's involvement in freight transportation and to better tie air, rail and road transportation modes together.

GOAL E: Transportation projects for the "New Economy" shall empower communities in a livable, healthy and sustainable manner.

- Develop landscaping and design criteria (in conjunction with the local governments when possible) and encourage the local governments to enhance regional transportation thoroughfares, crossings and gateways.
    - Incorporate pedestrian safety into landscaping and design measures at major thoroughfare crossings.
    - Encourage Interstate Interchange Landscaping
- Recycle and adaptively reuse existing assets such as buildings and infrastructure.
- Develop and implement transportation enhancements that attract tourists and technology and information oriented employees possibly including:
    - A "Transit Loop" connecting cultural institutions
    - Safe and convenient bicycle transportation
    - Trail and greenway transportation and recreation
    - Pedestrian improvements
- Cooperate with similar initiatives from other agencies such as: chambers of commerce, business and tourist organizations.

GOAL F: Develop a transportation system that will address changing community and population needs over the next 25 years.

- Establish and support a transportation education and public relations program that includes transportation safety, healthy lifestyle awareness, environmental impacts/issues, alternative transportation modes, and transportation choice.
- Develop a "user friendly" multimodal regional transportation system that serves all ages and income groups, part-time, project based, consulting and/or other non-traditional workforce arrangements.
- Encourage and facilitate ADA accessible use and adaptive re-use of transportation assets such as rail corridors, boulevards and walkways.
- Strategically develop regional paths and corridors for both motorized and non-motorized transportation to serve growth and changing demographic needs.
- Develop and leverage management strategies such as: Rideshare, Intelligent Transportation Systems (ITS), Paratransit etc., to obtain the greatest benefit from existing transportation assets and to take advantage of economies of scope and scale.
- Use available land-use and transportation objectives, strategies and tactics to address "spatial mismatch." "Spatial mismatch" refers to situations where employment creation is geographically separate from concentrations of unemployed and/or underemployed populations, and the existing transportation options place an undue burden on said populations' ability to benefit from employment creation.

GOAL G: The RVAMPO should provide a forum for public comment and public participation on all major transportation projects in the RVAMPO boundary including public-private partnerships, innovative and non-traditional projects.

- RVAMPO should invite stakeholders and interested parties to discuss the issues.
- Pursue the formation of a statewide association of MPOs to provide a forum for the discussion of statewide transportation planning issues, which affect more than one MPO.
- Continue the innovative improvements outlined in RVAMPO's "Public Participation Plan." (Updated 2001)
- Be pro-active in addressing economic and social justice concerns as they apply to the transportation planning process.

Roanoke Valley Area Constrained Long Range Plan (2025) Public Participation Summary (FY 2003-04)

- ***March 13, 2003*** – Virginians for Appropriate Roads (VAR) addressed the MPO Policy Board with a 15 minute presentation concerning TSM on Route 220 as an alternative to a new terrain location for proposed I-73. Question and answer between MPO board members and VAR representatives followed.
- ***May 15, 2003*** Advertisement sent to ***Roanoke Times*** and ***Roanoke Tribune*** for May 29, 2003 public input meeting. Advertisement will run in the Sunday May 18, 2003 Edition (Roanoke Times) and Thursday May 22, 2003 edition (Roanoke Tribune).
- ***May 16, 2003*** – Notice of May 29th public meeting in Regional Chamber's Monthly Electronic Newsletter "Member Connections"
- ***May 19, 2003*** – May 29th meeting **press release** to following recipients (Joe McKean, WDBJ-TV; Melissa Preas, WSLS-TV; Ray Reed, The Roanoke Times; Chris Kahn, Associated Press; Rex Bowman, Richmond Times-Dispatch; William Little, Fincastle Herald; Claudia Whitworth, The Roanoke Tribune; Jeff Walker, The Vinton Messenger; Meg Hibbert, Salem Times Register; Rick Mattioni, WVTF-FM (Public Radio); Kevin LaRue, WFIR-FM (Roanoke's News Radio)
- ***May 27, 2003*** – Retransmission of above press release[1]
- ***May 29, 2003*** – Interview with Dan Heyman WVTF News[2]
- ***May 29, 2003*** – Public Meeting Roanoke County Headquarters Library (28 Attendees)
- ***June 15, 2003*** – Advertisement for public comment during upcoming Thursday June 19, 2003 Joint MPO and TTC meeting appears in Sunday edition of "Roanoke Times" (see files)

May 29, 2003 Public Meeting – Ride Solutions Display in Background

- ***June 19, 2003*** – Public Input Session at joint MPO/TTC meeting (Vinton War Memorial) held – 3 speakers addressed the joint MPO/TTC board/committee.

[1] Joint Ozone EAP and Long-Range Plan Public Input Meeting (May 29, 2003)
[2] IBID

- ***June 19, 2003 onward*** – Various emails concerning long-range planning projects and/or issues received. Emails stored in at RVARC offices.
- ***July 28, 2003 and August 28, 2003*** – Meeting with Roanoke County Stakeholder Group about Long Range Plan Constrained List.
- ***August 21, 2003*** – Meeting with Vinton Town Stakeholder Group about Long Range Plan Constrained List.
- ***City of Roanoke Stakeholders Group Constrained List Meetings*** – Various Dates (August 8, 2003 – August 15, 2003 – August 22, 2003 – September 5, 2003)
- ***September 29, 2003*** – Minimum 30 Day Public Comment Period advertised in Roanoke Times for TIP and Long Range Plan.
- ***October 10, 2003*** - Minimum 30 Day Public Comment Period advertised in Roanoke Times for TIP and Long Range Plan. Published in Roanoke Tribune.
- ***October 19, 2003*** – Notice of Opportunity for Public Comment (Nov 6 MPO Meeting) published in "Roanoke Times" section B5

City of Roanoke Stakeholders Meeting – August 22, 2003

- ***October 23, 2003*** Notice of Opportunity for Public Comment (Nov 6 MPO Meeting) published on Page 9 of "Roanoke Tribune."
- ***October 26, 2003*** – Notice of Opportunity for Public Comment (Nov 6 MPO Meeting) published in section B4 of "Roanoke Times."
- ***November 5, 2003*** – Press Release concerning Long-Range Plan Public Comment Period (Nov 6 MPO Meeting) released to RVARC Media Contacts List.
- ***November 6, 2003*** – Public Comment Period at MPO meeting. – Verbatim Comments Available Upon Request
- ***January 11, 2004 –*** Legal advertisement in "Roanoke Times" announcing January 20, 2004 Public Hearing"
- ***January 18, 2004 –*** Follow-up legal advertisement in "Roanoke Times" announcing January 20, 2004 Public Hearing"
- ***January 11 – 20, 2004*** – 2 legal advertisements (consecutive

November 6, 2003 Public Comment Opportunity/ Open House/ MPO Meeting

issues) in "Roanoke Tribune" for January 20, 2004 public hearing.

- ***January 20, 2004 –*** Long Range Plan Public Hearing.
- ***October 15, 2004*** – CAC meeting to "test" the long-range transportation focus group questions in a simulated neighborhood group meeting.
- ***November 10, 2004*** – Focus group invitation mailed to Presidents of City of Roanoke Neighborhood groups. Bob Clement at City of Roanoke Neighborhood Services partnering with RVARC staff to organize Long-Range Transportation Focus Groups with recognized Neighborhood Groups.

Recommendations for Next Long-Range Plan Update

- Develop an electronic kiosk to receive continuous direct public input from multiple locations within the MPO.
- Partner with established Neighborhood Groups and Civic Leagues to host focus groups concerning regional transportation issues.
- Host at least one advertised public "open house" per fiscal year leading up to the adoption of the next long-range plan update.

Chapter 5

Project Evaluation and Selection

Goal 1: Document Assumptions and Decisions

Goal 2: Serve as a starting point for the next long-range plan update

By federal law, a MPO's long-range transportation plan must contain a list of projects, which are constrained to a "reasonable" estimate of federal funding available over the 25-year horizon. This list is called the "Financially Constrained List of Projects."

Typically, fewer than half of the "candidate projects" can be accommodated within the financial constraints of the long-range plan. The long-range plan contains a "Vision List" of projects, which contain projects that could me moved to the financially constrained list should funding become available. Selection of projects for inclusion in the financially constrained list is of primary importance. In fact, a project must be included in the financially constrained list of the long-range plan if it is to be included in a future Transportation Improvement Program (TIP).

Twenty-five (25) year financial estimates for highway related projects are provided by the Virginia Department of Transportation (VDOT). In fact, VDOT provides a 25-year federal funding estimate for each of its functional categories (interstate, primary, secondary, urban etc.). In essence, the financial constraint is the total of individual financial constraints for the various funding categories and functional classes. Federal funds for public transportation are estimated from current funding levels and trends.

Various inputs and criteria are used to generate and evaluate candidate projects. The 4-step travel demand model process (Chapter 3) provides a list of projects, which address the forecasted level-of-service deficiencies that result from the 4-step process. Adopted local comprehensive plans provide goals, objectives and values for the evaluation of projects. Professional judgment is used to when all other factors are equal, and occasionally financial considerations dictate project selection due to limitations on available funds. **Table 5.0** lists the prominent decision makers and the factors influencing the project selection decision for each funding source. The remainder of this chapter will detail the project evaluation and selection process for several of constrained funding categories.

Funding Category to be constrained	Prominent Decision Makers	Factors Influencing Decision (Model Results, Comprehensive Plans, Judgment etc.
Interstate and NHS	VDOT	Finance and Project Management
Primary System	VDOT with MPO	Finance and Project Management
City of Roanoke Urban System	City of Roanoke and VDOT with MPO	Comprehensive Plan: Vision 2020, Stakeholder Group Judgment and Model Results
City of Salem Urban System	City of Salem and VDOT with MPO	Financial Considerations and City Priorities
Town of Vinton Urban System	Town of Vinton and VDOT with MPO	Financial Considerations and City Priorities
County of Roanoke Secondary System	County of Roanoke and VDOT	Comprehensive Plan, Model Results and Professional Judgment
County of Botetourt Secondary System	County of Botetourt and VDOT	Model Results and Professional Judgment
County of Bedford Secondary System	County of Bedford and VDOT	Professional Judgment
Public Transportation	Greater Roanoke Transit Company(Valley Metro), Greater Roanoke Human Services Transportation (RADAR), VDRPT and FTA	Financial Projections, Changing Demographics, Capital, Operations and Maintenance needs.

Table 5.0

City of Roanoke – Urban System:

The process that lead to development of the financially constrained list for the City of Roanoke Urban System is an excellent example of interaction between the 4-step technical process, comprehensive planning process and stakeholder evaluation. **Figure 5.0** provides a representation of the process to guide further discussion.

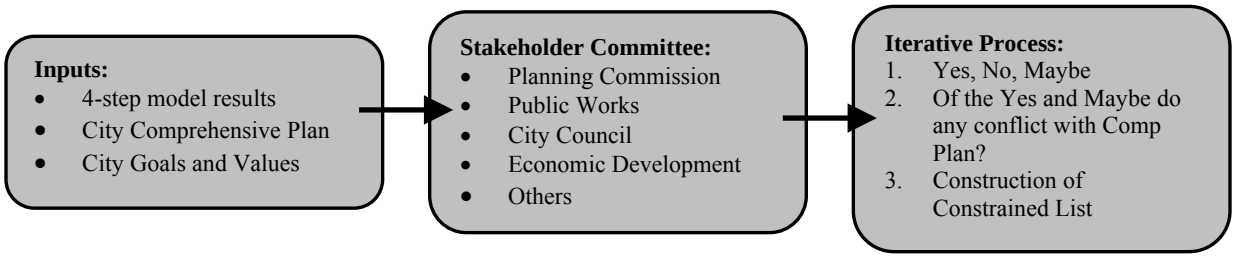


Figure 5.0

As **Figure 5.0** indicates the inputs to the selection process were the 4-step model recommendations (**Table 5.1**), the recently completed City Comprehensive Plan, and established City Goals and Values. The City of Roanoke empanelled a stakeholder committee consisting of: 3 planning commission members, one city council member, public works staff, planning staff, economic development staff and Regional Chamber of Commerce staff. The stakeholder committee took the initial 4-step model recommendations (**Table 5.1**) and proceeded through a first round evaluation, which consisted of a group consensus of yes, no, or maybe for the individual recommendation. Recommendations which received a consensus yes or maybe were evaluated individually with reference to the comprehensive plan and overall city goals and values. In some cases recommendations were modified (i.e. a four lane recommendation was changed to a three lane – two lanes and a center turn lane – recommendation) to conform to the long-range plan. VDOT staff provided the cost estimate framework, so that new planning costs could be generated for the modified recommendations. After this second round a reduced slate of projects – including the modified projects – were ready for final consideration.

City	Route	Facility	From	To	Length (mi)		Recommend	Cost (1000s)
Roanoke	Rte 101	Hershberger	Peter's Creek	Cove Rd	1.36	2L	U4L	$12,186
Roanoke	Rte 11	Brandon	Mud Lick	Grandin	1.00	2L	U4L	$8,960
Roanoke	Rte 11	Williamson	10th St	Hershberger	1.29	4L	U6L	$14,861
Roanoke	Rte 11	Williamson	Campbell	Wells	0.24	4L	U6L	$3,456
Roanoke	Rte 115	Plantation	Liberty	Hollins	0.70	2L	U4L	$6,272
Roanoke	Rte 116	Lafayette Blvd	Cove Rd	Melrose	0.73	2L	R2 24'	$2,409
Roanoke	Rte 116	Mt Pleasant Blvd	Roa Co CL	Bennington	0.71	2L	U4L	$5,964
Roanoke	Rte 116	Riverland	Bennington	Garden City Blvd	0.15	2L	U4L	$1,344
Roanoke	Rte 220	Franklin	R Co CL	Rte 419	1.43	4L	U8L	$20,592
Roanoke	Rte 220		Wonju	Elm Ave	1.45	6L	UI 8L	$20,880

Roanoke	Rte 220/221	Jefferson	Elm Ave	Campbell	0.34	2L	U4L	$3,808
Roanoke	Rte 24	Dale	Jamison	WCL Vinton	0.70	4L	U6L	$8,064
Roanoke	Rte 24	Jamison	13th St	Dale	0.17	4L	U6L	$2,448
Roanoke	Rte 460	Orange	Salem TP	10th St	0.94	3L	U4L	$8,422
Roanoke	Rte 460	Orange	I-581	11th St	0.90	6L	U8L	$16,200
Roanoke	Rte 460	Orange	11th St	R Co CL	2.59	4L	U8L	$46,620
Roanoke	Rte 460	Salem TP	Melrose	Orange	0.16	3L	U4L	$1,434
Roanoke	I-581		Elm Ave	Walmart Int	2.84	6L	UI 8L	$40,896
Roanoke		Brambleton	R Co CL	Overland	1.47	2L	U4L	$12,348
Roanoke		Brandon	Grandin	Brambleton	0.82	2L	U4L	$6,888
Roanoke		Brandon	Brambleton	Main St	0.16	4L	U6L	$1,728
Roanoke		Campbell	Williamson	Norfolk Ave	0.55	2L	U4L	$4,620
Roanoke		Colonial	R Co CL	Wonju	1.09	2L	U4L	$9,156
Roanoke		Cove Rd	Green Ridge	Peter's Creek	0.65	2L	U4L	$5,824
Roanoke		Cove Rd	Peter's Creek	Lafayette Blvd	2.18	2L	U2L	$7,194
Roanoke		Elm Ave	Franklin	Jefferson	0.31	2L	U4L	$3,472
Roanoke		Elm Ave	Jefferson	Jamison	0.34	2L	U6L	$4,896
Roanoke		Franklin	Jefferson	Williamson	0.15	2L	U4L	$1,680
Roanoke		Franklin Rd	Expressway	Elm Ave	0.64	2L	U4L	$5,376
Roanoke		Garden City Blvd	Valley View	Bandy	1.37	2L	U2L	$4,521
Roanoke		Grandin	Garst Mill	Brandon	1.18	2L	U4L	$9,912
Roanoke		Green Ridge	Salem CL	Cove Rd	0.58	2L	U2L	$1,914
Roanoke		Hershberger	Williamson	ECL Roanoke	0.58	2L	U4L	$5,197
Roanoke		Hollins	Dale	Orange	0.93	2L	U4L	$7,812
Roanoke		Hollins	Orange	Liberty	1.00	2L	U4L	$8,400
Roanoke		King St	Gus Nicks	Orange	1.45	2L	U4L	$12,180
Roanoke		Main St	Brandon	Elm Ave	0.95	2L	U4L	$7,980
Roanoke		McClanahan	Franklin	Jefferson	0.44	2L	U4L	$3,696
Roanoke		Norfolk Ave	Campbell	Wise	0.13	2L	U4L	$1,092

Roanoke		Overland	Brambleton	Colonial	0.35	2L	U4L	$2,940
Roanoke		Salem TP	ECL Salem	36th St	1.32	2L	U2L	$4,356
Roanoke		Salem TP	36th St	24th St	1.22	2L	U4L	$10,248
Roanoke		Shenandoah	ECL Salem	10th St	4.20	2L	U4L	$35,280
Roanoke		Tazewell	Williamson	9th St	0.46	2L	U4L	$3,864
Roanoke		Williamson	Franklin	Campbell	0.12	4L	U6L	$1,728
Roanoke		Wise	Norfolk	WCL Vinton	1.16	2L	U2L	$3,828

Table 5.1 Original 4-Step Model Recommendations[1]

The constrained amount for all projects was $97,105,773 and the total for the 4-step model recommendations was $412,946,000. Thus, after the first two rounds of the process diagrammed in **Figure 5.0** the resulting projects still totaled more than the financially constrained amount. The final round of the process consisted of selecting which of the resulting projects would be included in the financially constrained list and which projects would be included in the vision list of projects.

It is important to note that despite the fact that desirable roadway projects could not conform to the financial constraint, the stakeholder committee decided to dedicate $2,913,173 to transit improvements and $4,855,289 to each of the following categories: mobility/ accessibility improvements, signal/ ITS improvements, and intersection/ miscellaneous spot improvements. This total of $17,479,040 (18% of City of Roanoke Urban System Constrained List) could have been allocated to more traditional roadway improvements. It is testament to the process that 18% of the constrained amount was allocated to various mobility, ITS and transit priorities.

County of Roanoke - Secondary System:

The County of Roanoke proceeded along similar lines as the City of Roanoke in the development of a secondary system financially constrained list. However, secondary funding does not have the flexibility of urban funding. Consequently, County stakeholders could not readily transfer funds to transit, mobility or ITS improvements the way City of Roanoke stakeholders did.

City of Salem Urban System, Town of Vinton Urban System, County of Botetourt Secondary System and County of Bedford Secondary System:

The financially constrained amounts in the above systems are relatively small compared to needs. Consequently, the decisions in these four localities were primarily based on accounting and financial considerations. In the County of Bedford's case, only one project could fit within the constrained amount. Decision-making dynamics at this level of funding are often dominated by financial concerns. A few projects have the potential

[1] $412,946,000 total project cost for **Table 5.1.** The constrained amount is $97,105,773

to dominate and use up the relatively small financially constrained amounts. This is a fertile topic to be addressed as a part of the next long-range plan update. One potential solution would be to constrain the secondary system as a whole and not by locality. This may add political considerations if a given locality does not receive a project due to other regional priorities.

Interstate System:

By its nature the interstate system is connected to statewide and national needs. In addition there is currently a Public Private Transportation Act (PPTA) process in negotiation for Interstate 81. "Future" Interstate 73 is funded for Preliminary Engineering only and Interstate 581 is funded for various corridor-wide improvements. As such, VDOT provides its priorities for the interstate system within the RVAMPO boundary for MPO Policy Board consideration. This situation is much more like a check and balance system where the MPO approves or disapproves VDOT recommendations, but does not modify or change scope, funds or details of the recommendations. Much of this is due to the interregional and interstate function of the interstate system. However, there may be improvement in this particular project selection method during the next long range plan update.

Primary System:

In a similar manner, VDOT planners recommend primary system needs based on state level and VDOT Construction District level projections, needs and priorities. There is some flexibility in modifying details concerning the primary system needs. However, VDOT retains prerogative in the initial needs recommendation based on their statewide planning models.

VTRANS 2025:

Concurrent with development of the Long Range Plan 2025 the Commonwealth of Virginia (through the Virginia Department of Transportation, Virginia Department of Rail and Public Transit, Virginia Port Authority and Virginia Aviation Administration) developed the VTRANS 2025 Statewide Multimodal Plan. The purpose of VTRANS 2025 is to identify multimodal corridors/networks of statewide significance. This indicates a potential opportunity to integrate MPO and statewide planning concerning the Interstate and Primary system. The MPO may have a greater opportunity to influence Interstate and Primary recommendations through the VTRANS 2025 process, while the Commonwealth will have a multimodal plan on which to base its recommendations. The VTRANS 2025 process is an opportunity to assist future long-range plan updates.

Recommendations for Next Long-Range Plan Update

- Participate fully in the VTRANS 2025 process in order to link statewide decisions and priorities with MPO decisions and priorities.
- Work with VDOT District Planners to develop a solution to the "small financial constraint" problem for localities such as Bedford, Botetourt, Salem and Vinton.
- Work with VDOT to obtain "early" draft funding constraints in order to get an early start with each locality on the projects selection process.
- Use scenarios developed in a scenario planning process to provide alternate regional frameworks for project selection and evaluation.

Chapter 6

Bicycle Planning Methodologies

Goal 1: Document Assumptions and Decisions	**Goal 2: Serve as a starting point for the next long-range plan update**

Funds for bicycle facilities were included in the "Financially Constrained List" of the Long-Range Plan 2025. For example, the City of Roanoke has constrained $4,855,289 that can be programmed for various mobility and accessibility improvements, which include bicycle and pedestrian facilities. Additionally, the City of Roanoke allotted $10,000,000 in there "vision list" that can be the new VDOT Policy for Integrating Bicycle and Pedestrian Accommodations mandates that bicycle and pedestrian accommodations and will be considered in the development of all highway projects. However, decisions must still be made in allocating limited constrained funding for bicycle accommodations. To facilitate the decision-making and fund allocation process the RVAMPO has utilized the Level of Service (LOS) concept in long-range planning efforts. The LOS concept, and associated LOS modeling can be used, not only to evaluate the ability of existing roadways to accommodate motor vehicles and bicycles, but also allows for evaluation of a range of possible bicycle accommodations and associated costs. Level of service modeling and examples of the application of bicycle LOS modeling is discussed in detail in latter sections.

Bikeway Plan for the Roanoke Valley Area

The Bikeway Plan for the Roanoke Valley Area MPO, which was last updated in 1997, has served as the primary reference document for bicycle-related transportation planning in the RVAMPO. The Bikeway Plan is currently being update as part of the *FY 2005 Unified Transportation Work Program* and will be completed in June 2005. The updated Bikeway Plan, upon completion, will replace the 1997 document. The Bikeway Plan update is utilizing work products and findings from the *Regional Bicycle Suitability Study*, which is outlined below.

Regional Bicycle Suitability Study

The Regional Bicycle Suitability Study, consisting of Phase I and Phase II, was completed in FY 2003 and FY 2004, respectively. The primary purpose of the Regional Bicycle Suitability Study was to develop planning level data and tools to facilitate development of a regionally significant bikeway network in the RVARC service area. Work products from the study will be utilized future bicycle-in the related transportation planning in the region. The *Regional Bicycle Suitability Study,* and associated work products, are available online at http://www.rvarc.org/bike/home.htm.

Level of Service Modeling

A major component of the Regional Bicycle Suitability Study was the application of the level of service (LOS) concept to evaluate a corridor's ability to accommodating both bicyclists and motorists. Two models widely accepted models for bicycle level of service calculations have been developed to evaluate the LOS offered by existing roadways or proposed bicycle facility improvements- the Bicycle Compatibility Index (BCI) and the Bicycle Level of Service (BLOS) model. Two widely accepted models were utilized throughout the Regional Bicycle Suitability Study and the Bikeway Plan update.

Level of Service modeling, utilizing these models, can be used for the following applications:

- Operational Evaluation

Existing roadways can be evaluated using the BCI model to determine the bicycle LOS present on all segments. First, a bicycle compatibility map can be produced to indicate the LOS bicyclists can expect on each roadway segment. Compatibility maps may assist bicyclists in making informed decisions regarding route selection. Second, roadway segments or "links" being considered for inclusion in the bicycle network system can be evaluated to determine which segments are the most compatible for bicyclists. Once identified, the most appropriate routes can be designated as part of the community bicycle network. Additionally, "weak links" in the bicycle network system can be determined, and prioritization of sites needing improvements can be established on the basis of the index values. Once identified, these areas can be addressed in future planning efforts. Finally, alternative treatments (e.g., addition of a bicycle lane vs. removal of parking) for improving the bicycle compatibility of a roadway can be evaluated using the BCI model.

- Design

New roadways or roadways that are being re-designed or retrofitted can be assessed to determine if they are bicycle compatible. The planned geometric parameters and predicted or known operational parameters can be used as inputs in the model to produce the BCI value and determine the bicycle LOS and compatibility level that can be expected on the roadway. If the roadway does not meet the desired LOS, the model can be used to evaluate changes in the design necessary to improve the bicycle LOS.

- Planning

Data from long-range planning forecasts can be used to assess the bicycle compatibility of roadways in the future using projected volumes and planned roadway improvements. The model provides the user with a mechanism to quantitatively define and assess long-range bicycle transportation plans and needed roadway improvements to maintain or enhance bicycle compatibility levels. The model can also be used to assess the impact of proposed developments or changes in land use that may change traffic volumes and/or patterns.

Level of Service Catagories

As shown in the following tables, both models provided a numerical score as well as a LOS grade (A, B, C, D, E, F). Additionally, the BCI provides a 'compatibility level' based on LOS.

Bicycle Compatibility Index (BCI) Categories

LOS	BCI Range	Compatibility Level
A	≤ 1.50	Extremely High
B	1.51 – 2.30	Very High
C	2.31 – 3.40	Moderately High
D	3.41 – 4.40	Moderately Low
E	4.41 – 5.30	Very Low
F	> 5.30	Extremely Low

Table 6.1

Bicycle Level of Service (BLOS) Categories

Level of Service	Bicycle Level of Service (BLOS)
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

Table 6.2

An overview of both the BCI and the BLOS model is available in Appendix C of the Phase I Final Report. Additionally, worksheets for both the BCI and BLOS models are available on the *Regional Suitability Study* website (http://www.rvarc.org/bike/Workshop.htm).

Level of Service Modeling - Data Requirements

The bicycle LOS models require various geometric and operational data inputs. The data requirements for the two model BCI and the BLOS although quite similar to have slight variations that should be noted by those using the models. Examples of BCI Data Entry and Level of Service spreadsheets are available in Chapter 6 Appendix.

Bicycle Compatibility Index (BCI)

- Number of travel lanes – one direction
- Curb (outside) lane travel width
- Bike lane width
- Shoulder width

- Land use - residential/commercial
- Speed limit
- 85th percentile speed (BCI suggests adding 9 mph/15kmp to posted to estimate 85th percentile speed, unless it is otherwise known)
- Annual average daily traffic (AADT)
- Heavy Vehicle percent (HV%)
- Right turn percent
- On-street parking time limit

Bicycle Level of Service Model (BLOS) Inputs

- Number of travel lanes – both direction
- Roadway configuration – divided/undivided
- Annual average daily traffic (AADT)
- Heavy Vehicle percent (HV%)
- Speed limit (BLOS model automatically adds 9 mph/15kmp to posted to estimate 85th percentile speed)
- Pavement width
- On-street parking occupancy (percent)
- Rumble Strip
- Lane pavement condition
- Shoulder pavement condition

Traffic volume and heavy vehicle percentages for all corridors evaluated are based on *2002 Virginia Department of Transportation Daily Traffic Volume Estimates Including Vehicle Classification Estimates* available Online at http://www.virginiadot.org/projects/pr-traffic-DATA-2002-jurisdictions.asp.

Data Collection and Training

Data for the models were collected using both primary and secondary research methods. Primary methods included fieldwork to measure roadway design and operational parameters, surrounding land use and other characteristics of the corridor and surrounding area. Secondary methods involved compiling and reviewing existing data regarding the corridor and surrounding area, such as traffic counts and demographic information.

Bicycle Suitability Analysis Training

To ensure proper data inputs, the Roanoke Valley Area Metropolitan Planning Organization hosted bicycle suitability analysis training seminar to provide instruction on data requirements and collection methods needed for the each model. The following training material is available online at http://www.rvarc.org/bike/Workshop.htm:

- BCI Model Summary
- BLOS Model Summary
- Bicycle Suitability Analysis Training Seminar

- BCI Worksheet
- BLOS Tutorial
- BLOS Worksheet
- Field Data Collection sheet
- Width Measurement Examples

When conducting fieldwork all roadway measurements were rounded as follows:

- 0-3 inches, round down to the nearest foot (i.e., 10 ft., 2 in. rounds to 10 ft)
- 4-9 inches, round to the half-foot (i.e., 10 ft., 8 in. rounds to 10.5 ft)
- 10-12 inches, round up to the nearest foot (i.e., 10 ft., 10 in. rounds to 11 ft.)

Additionally, if the marked shoulder of a roadway was not consistently at least one (1) foot in width (i.e., useable pavement width), the width of the shoulder was entered as zero (0) feet in the LOS model spreadsheets. However, this width of the shoulder is included in the total pavement width measurement, when applicable. It should be noted that while conducting fieldwork, data beyond what is required for the models is collected to assist planning efforts. The data collection sheet used when conducting fieldwork is provided in the Chapter 6 Appendix.

Bicycle-Friendly Community Workshop

The RVAMPO also hosted a Bicycle-Friendly Community Workshop as part of the Bikeway Plan Process. This workshop included a presentation developed by the Association of Pedestrian and Bicycle Professionals for the National Highway Traffic Safety Administration as part of the National Strategies for Advancing Bicycle Safety program. Local bicycling conditions were also discussed. Material from the Bicycle Friendly Community Workshop is available at http://www.rvarc.org/bike/bikeped/home.htm.

Application of LOS Modeling and Design Alternatives - LTRP and TIP

Figure 6.1 is a Level of Service Map for all corridors evaluated as part of the Regional Bicycle Suitability Study. A corresponding list of all evaluated segments and associated LOS is presented in the Chapter 6 Appendix.

As previously discussed, in addition to operational evaluation, the LOS models can be used to evaluate design alternatives and assist in future planning efforts. These models can be employed to assist local governments in prioritizing how to spend limited transportation funds. This is especially applicable to the long-range plan and TIP where funding for bicycle enhancements is constrained.

Figure 6.1. Shenandoah Avenue has wide travel lanes along extended portions.

The Regional Suitability Study identified several corridors along which significant

increases in bicycle compatibility can be achieved with minimal improvements. Often, reconfiguring roadway design, using existing pavement, can be a cost-effective way to better accommodate bicyclists. A few examples include Shenandoah Avenue, Colonial Avenue, and Brambleton Avenue and are briefly discussed here. A more detailed discussion is provided in Chapter 4 of the study.

Figure 6.2. Wide travel lane on Brambleton Avenue (northbound).

As shown in Figure, Shenandoah Avenue has wide travel lanes along extended portions between 5th Street and 24th Street. Both models indicate that the LOS could be significantly improved by utilizing reconfiguring the existing lane to include a paved shoulder or bike lane. Either action would raise the LOS from a D to a C, which represents a significant increase in LOS.

Another example is Brambleton Avenue, which has wide travel lanes and/or shoulders in both directions. **Figures 6.2** shows the wide travel lane in the northbound direction. Using the BCI to evaluate various design alternatives, it was noted that the LOS could be raised from a grade of D to a grade of C. Using basic graphics software, a bike lane was inserted into the travel lane for "visioning" purposes (**Figure 6.3**).

Figure 6.3 Using the BCI and basic graphics software, a bike lane was inserted into the travel lane for "visioning" purposes.

The City of Roanoke has been responsive to this concept of As illustrated in Figures, Colonial Avenue was reconfigured to include a bike lane, while maintaining on-street parking and a sufficiently wide travel lane for motorists. **Figure 6.4** shows a section of Colonial Avenue before the roadway was reconfigured during repaving. **Figure 6.5** shows the same section of Colonial Avenue

Figure 6.4. Wide travel lane along Colonial Avenue between Broadway and Persinger.

Additionally, Brandon Avenue was restriped to allow for a 2 foot paved shoulder on the section between Mudlick and the Salem corporate limit. This improved the LOS on this busy section, which also serves as a direct connection to Salem, from an E to a D. These examples are discussed in detail in Chapter 5 of the Regional Bicycle Suitability Study.

Another useful example of the application of the LOS modeling is the evaluation of LOS and alternative design possibilities for Route 419/Electric Road. Although, as shown in Route 419 has a wide paved shoulder along much of its length, it received a low LOS grade from both models. Moreover, evaluation of various accommodations indicated that significant improvements in LOS would be difficult to realize due to high traffic volumes and high travel speeds. Based on this analysis, an alternate corridor would likely be a better option. As illustrated in this example, such application of LOS models can be useful in prioritizing allocation of limited funding from the LRTP constrained list.

Figure 6.5. Colonial Avenue between Broadway and Persinger after repaving. Note reconfiguration of existing pavement with to accommodated on-street parking and a bike lane.

Observations on Level of Service (LOS) Models

One component of the *Regional Bicycle Suitability Study* was comparison of the BCI and BLOS models in assessing the capability of roadways to accommodate both bicycle and motor vehicle traffic.

A total of 192 individual roadway segments were evaluated in x number of corridors. As shown in **Table 6.3**, considerable differences exist between the LOS the models assign for evaluated segment.

Comparison of Level of Service Grades for Evaluated Segments
from the Regional Bicycle Suitability Study
BCI and BLOS

LOS Grade for Evaluated Segments	BCI Total	BLOS Total
A	0	10
B	0	30
C	21	45
D	80	86
E	69	14
F	22	7

Table 6.3

Model Input Sensitivities

Working with the LOS models it was noted that certain aspects of the models are weighted differently, thereby exerting greater influence on the LOS score of a given

roadway segment. For instance traffic volume and speed are major factors in determining LOS, whereas right turn percentage has less influence.

In an attempt to better understand the impacts of various data inputs on the LOS the following observations were noted:

- BLOS model consistently gave higher LOS grades to measured segments than did the BCI model, although variations were generally consistent. However, on roadway segments with low traffic volumes, the BLOS model consistently gave these segments considerably higher LOS grades, indicating that BLOS model appeared to weight traffic volume greater than roadway width.
- Traffic volume, roadway width, and speed limit appear to be the primary factors impacting LOS in both models.
- BLOS model is more sensitive to higher vehicle traffic (AADT) than the BCI model
- BLOS model is more sensitive to higher percentages of heavy vehicles (HV%)
- Once a road reaches a certain traffic volume or speed, increases in lane or shoulder width have minimal impacts on LOS (i.e. 419/Electric Road)
- On corridors where traffic volume and speed have not reached conditions referenced above, considerable improvement in LOS can be achieved by increasing the separation between the cyclist and traffic; this may be achieved by increasing the width of the shoulder or curb lane or addition of a bike lane
- Paved shoulders and bike lanes give identical LOS improvements in the BCI.
- Paved shoulders and bike lanes received a slightly higher LOS than wide curb lanes in both models
- Right turn percentages had minimal impact on the LOS score

LOS Improvement

It should be noted that although an increase in a LOS letter grade (i.e., A, B, etc.) may not be realized by a specific accommodation, a measurable improvement in the LOS score (i.e., numerical score in model) is likely if even if the improvement is not sufficient to increase the letter grade.

Recommendations for Next Long-Range Plan Update

- Review the paving/restriping schedule for localities in the MPO for inclusion of possible bicycle accommodations.
- Review local comprehensive, neighborhood, greenway, and other relevant plan for references to bike/ped accommodation to consider in the LRTP.

Chapter 7

Public Transportation and Rideshare

Goal 1: Document Assumptions and Decisions	**Goal 2: Serve as a starting point for the next long-range plan update**

Overview:
The Public Transportation and Rideshare programs within the Roanoke Valley Area Metropolitan Planning Organization are intended to provide general citizens with transportation alternatives to the single-occupancy vehicle, while simultaneously proactively addressing air quality issues. The chapter below outlines the various public transportation options available to the citizens within the jurisdiction of the RVAMPO.

Fixed Route Services:

Valley Metro (Greater Roanoke Transit Company):

Valley Metro, the Roanoke Valley's public transit provider, serves the City of Roanoke and portions of Roanoke County, Salem, and Vinton. Bus service operates Monday through Saturday, 5:45 a.m.–8:45 p.m. Buses run every half hour during weekday peak periods (5:45 a.m.–9:15 a.m. and 3:15 p.m.–6:45 p.m.) and every hour during other times. One-way fare is $1.25 for adults and children age five and younger ride free when accompanied by a paying adult passenger. Transfers are free for any one-way, continuous trip. http://www.valleymetro.com/

Fiscal Year	Total Ridership
2001	1,967,860
2002	1,908,611
2003	1,914,948
2004	1,887,245

Table 7.1 Valley Metro Ridership

Demand Response Services:

RADAR:

RADAR (Unified Human Services Transportation System, Inc.) is a non-profit corporation which contracts with social service agencies, governments, and other private organizations to provide transit services primarily in the Roanoke Valley area. RADAR contracts to provide transportation service for, the CORTRAN service for Roanoke County, and the VM-STAR service, Hollins Express, Maroon Express and Ferrum Express for Valley Metro. RADAR's goal is to provide safe, efficient, and quality service to those unable to provide their own transportation and those in need of specialized transportation. A description of the programs operated by RADAR is provided below. http://www.radartransit.org/

CORTRAN:

CORTRAN (County of Roanoke Transportation) is a contract service with RADAR which provides transportation for Roanoke County residents who are sixty years of age and over or mentally or physically disabled as defined by the Americans with Disabilities Act, or ADA (service is available to the general public within the non-urbanized area of the Roanoke County only). Specially equipped lift vehicles are available for disabled patrons. This demand-responsive, curb-to-curb service is provided to any location within the Roanoke Valley area for a one-way fee of $2.50, and is in service during weekdays from 7am until 6pm.

VM-Star:

VM-STAR, operated by Radar, is a demand-responsive transportation service for disabled citizens of the City of Roanoke who are unable to take advantage of the normal transit system. The one-way trip fare for VM-STAR is $2.50. People desiring VM-STAR service, must be certified in advance by Valley Metro. Reservations for VM-STAR must be made 24 hours to 14 days in advance of the actual trip.

Maroon Express:

The Maroon Express is a public bus service consisting of an hour-long circular route, beginning and ending at Marion Hall on the campus of Roanoke College. The circular route has stops at Elizabeth Campus, Roanoke's Campbell Court, Logan's Roadhouse on Valley View Blvd., Valley View Mall, and terminates at Roanoke College's Marion Hall to complete the route. The Maroon Express runs on Friday and Saturdays, running on Friday from 4 p.m.- 12p.m. midnight and on Saturday from 12a.m. noon to 12p.m. midnight. The Maroon Express is a public service offered to the Roanoke and Salem areas free of charge. The Maroon Express began operations in August of 2004.

Hollins Express:

The Hollins Express is a public bus service consisting of a linear route, that begins at Hollins University, stops at Valley View Mall before completing its half hour headway at Campbell Court in downtown Roanoke and returning to Hollins. The Hollins express runs free of charge on Friday from 4pm to 12pm, and on Saturdays from 12 a.m. noon to 12p.m. midnight. The Hollins Express began operations in August of 2003

Ferrum Express:

The Ferrum Express is public bus service providing transportation services between Franklin County and Roanoke. The linear route, with an hour-long headway, begins at Ferrum College, stops at the Farmers Market, Eagles Cinemas, The Rocky Mount Wal-Mart and terminates at Campbell Court in downtown Roanoke. The Ferrum Express is open to the public and operates free of charge on Fridays from 5p.m. until 1a.m. and on Saturdays from 1p.m. until 1a.m. The Ferrum Express has been in service since September 2004. (Note: the Ferrum Express contains route portions that lie beyond the RVAMPO boundary.)

Ride Solutions:

RIDE Solutions is the regional ridesharing program operated by the Roanoke Valley-Alleghany Regional Commission. It is a grant-funded program providing free carpool matching services for citizens of the Roanoke Valley and surrounding areas. RIDE Solutions also provides directions to area park and ride lots, and information about alternative modes of transportation, such as public transit service, walking, and bicycling. RIDE Solutions is also responsible for managing and maintaining the Ozone Early Action Plan (EAP) data and contacts. The program provides studies on regional park and ride facilities, transit research surveys, and performs public outreach services. Through efforts to lower ground level ozone and improve air quality, RIDE solutions serves as the "implementation arm" for transportation related air quality planning and improvement programs.

RIDE Solutions currently has 175 commuters enrolled. Of those, thirty-five are bicycle commuters and nineteen registered as pre-established carpools. Seventy-nine drive alone commuters are registered for carpools, of which thirty-two are successfully matched. Thirty-six members are transit users, three are telecommuters, and three walk to work. The total distance traveled daily by those members using alternatives to the SOV commute is approximately 1,176 miles a day.

Alternative to the SOV	Miles Traveled
Cyclist Miles	231
Carpool Miles	693
Telecommuter Miles	25
Walker's Miles	3
Transit Miles	224
Total	**1,176**

Table 7.2
Alternatives to the Single Occupancy Vehicle Miles traveled Daily Commute

There are fifty-six registered commuters who are not successfully matched into a carpool. These unmatched SOV drivers account for 499.7 Vehicle Miles Travel (VMT).

Type of Vehicle Trips Reduced	Passenger Trips Reduced
Cyclists	35
Transit users	36
Carpool Matchers	68
Telecommuters	3
Walkers	3
Total	**145**

Table 7.3 Vehicle Trips reduced

In the past year RIDE Solutions has had 115 new members join. As of June 2004 the database had never been purged of old or outdated commuters. In an effort to improve ride-matching capabilities and clean up the files, RIDE Solutions performed an extensive outreach update and customer satisfaction study. Through this exercise staff purged 60 outdated files. Through advertising, exhibits, and the Employer Outreach Program RIDE Solutions gained 115 new members bringing our current membership to 175 commuters.

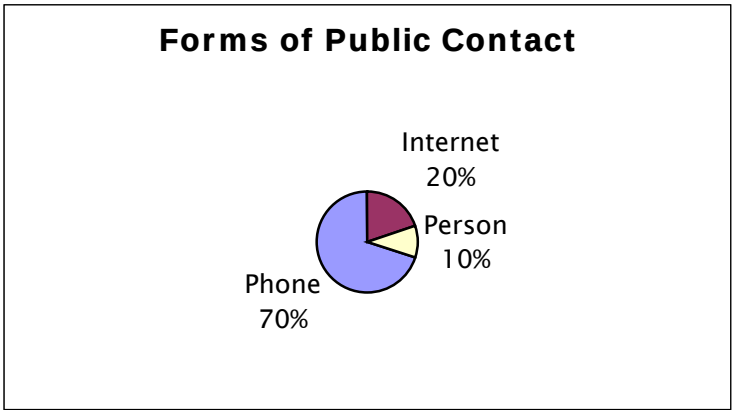


Figure 7.0

The RIDE Solutions manager is the regional outreach representative for the Ozone Early Action Plan (EAP). This program, designed to lower ground level ozone to permissible standards by 2007, is a regional effort to combat pollution. The RIDE Solutions coordinator maintains an

electronic listserv that includes all agencies, citizens, and companies in agreement with the program. In addition, there are pledges from all of the main media outlets in the region to send out "Ozone Alert" messages on Ozone Action days. The Virginia Department of Environmental Quality identifies these days in advance in order to alert the region in a timely fashion.

Program support commitments

MEDIA		BUSINESS	
WBDJ		Goodwill Industries	Addecco Staffing
WSLS		Salem Avalanche	Workforce Staffing
RVTV		Workman Oil	Echostar
WVTF		COX Communications	RADAR
VIBE100 Radio		Roanoke Times	Spee-Dee Oil Change
Roanoke Civic Center		Southern Soft Cloth Auto Wash	Roanoke/Botetourt Fitness Club
Roanoke Times		Liberty Cab	Roanoke Downtown Sports Club
COX Cable		Yellow Cab	Cardinal Bicycles
Adelphia Cable		Valley Metro	Peddlers Bicycles
Valley Metro Ad. Department		Blue Ridge Home and Garden Magazine	East Coasters
Blue Ridge Home and Garden Magazine		Blue Ridge Outdoors	Air-Lee Dry Cleaners

Table 7.4

RIDE Solutions works closely with local advertisers and media sources. From Jan 2004 to Jan 2005 the program received a total of $15,503.00 in added value for advertising and donations. These added value advertisements and donations demonstrating the support and appreciation receive from the private sector and local community for the RIDE Solutions program.

RIDE Solutions has prepared a regional park and ride report. This report includes Regional Park and ride locations and maps, amenities such as handicap parking, lighting, and phones. Also included in the report is information on commuter county of origin and commuter trends, and recommendations for park and ride facility improvements and maintenance.

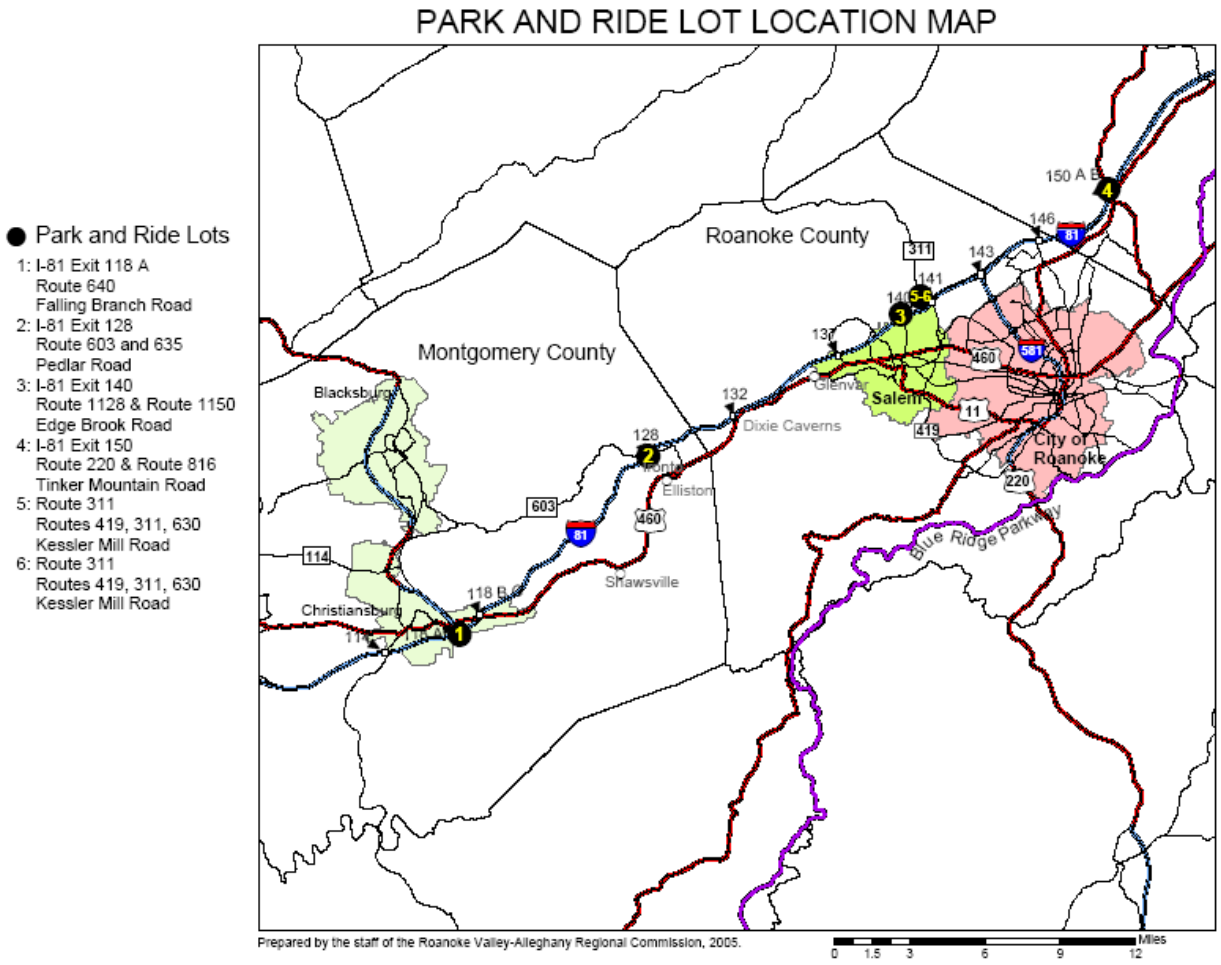


Figure 7.1

TRANSIT STUDIES

RIDE Solutions is responsible for public transit survey research collection and analysis for the region. Valley Metro and RIDE Solutions have partnered to provide the region with the "Smart Way". The Smart Way is a long distance transit line connecting the Roanoke and New River Valleys. RIDE Solutions designed the survey instrument, collects, and analyzes the data to assess customer satisfaction. In addition to the Smart Way survey research and support, RIDE Solutions has completed a similar study for the Ferrum Express line. This transit line is also owned and run by Valley Metro. This bus line runs from Ferrum College, through the town of Rocky Mount, to Roanoke. The instrument was designed as a random sampling call study of 5% of the Rocky Mount population. 66.5% of respondents did not know that the service existed. 33.5 % of respondents did know it exists. Of those who did not know that the service was available, 68% said that they would not use it. 32% of the respondents who knew of the service said that they would use it. There was no relationship found between knowledge of the service and willingness to use it.

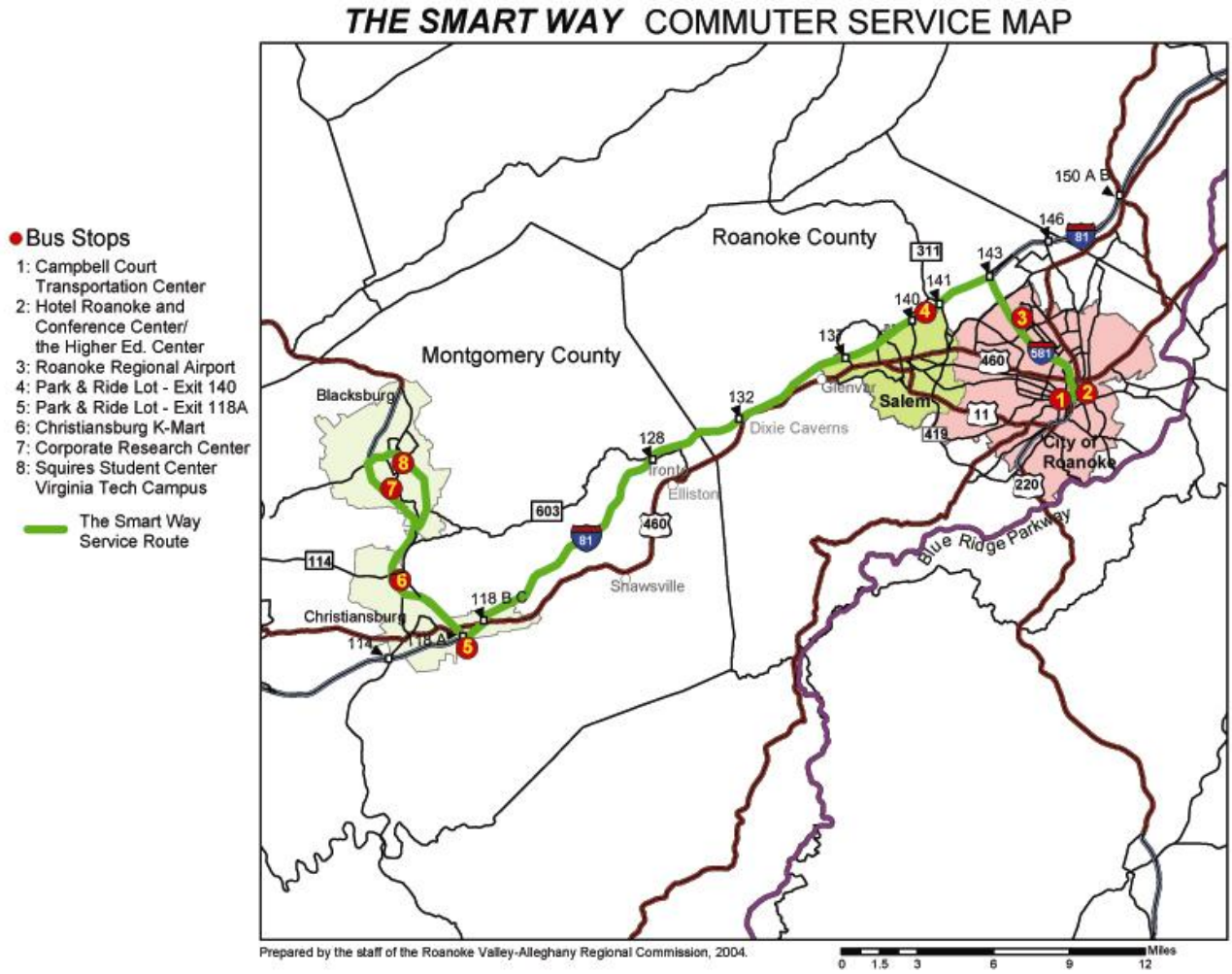


Figure 7.2

PUBLIC OUTREACH

RIDE Solutions is responsible for the Clean Commute Day Picnic. This picnic serves to raise awareness of Clean Commute alternatives and celebrate the region's commitment to clean commuting and cleaner air. This year the program was expanded to be more of an exhibit showcase for clean commuting and clean air advocates. There were free exhibit spaces for the following organizations/programs: The Ozone Early Action Plan, The Greater Roanoke Clean Air and Asthma Coalition, the Bikeways/Greenways advocates group, Safe Kids Coalition, Valley Metro, and RADAR. In 2005 RIDE Solutions coordinated the Clean Commute Day Picnic as the same day and location as the "Strawberry Festival" hoping for increased attendance.

RIDE Solutions provides K-12 education and outreach in addition to our employer and adult education programs. In the fall of 2005 we will continue this program to bring the clean air and smart commuting message to K-12 school classes. The RIDE Solutions program manager teaches science classes for schools one day a year, per interested school. This program is in correspondence to the Standards of Learning (SOL) Life Sciences Section LS.12 that states that, "The student will investigate and understand the relationship between ecosystem dynamics and human activity. Key concepts include environmental issues…air quality." In this K-12 education program RIDE Solutions educates the students about their affects on the environment and what they can do to help improve air quality.

RIDE Solutions Employer outreach program works with public and private sector agencies, as well as civic associations, to assist commuters and teach clean commuting and air quality messages. Roanoke County, Allegheny County, Botetourt County, Craig County, Franklin County, the cities of Roanoke, Salem, and Vinton, and the towns of Covington and Clifton Forge promote the RIDE solutions program to all government employees as a free employee benefit. Each of the above listed government agencies and private sector companies has had a presentation by the RIDE Solutions staff manager and has agree to promote alternative commuting to their employees via the RIDE Solutions program. Each organization supports and participates on the regional Ozone Early Action Plan (EAP).

The RIDE Solutions manager serves the public as a source for mediation and conflict resolutions. Trained in administrative leadership, public policy, and corporate mediation, the RIDE Solution Manager is called on at times to serve the community through "guided discussion" exercises to mediate conflict and resolve community challenges. This mediation services have been employed by a loc public school, and Leadership Roanoke Valley. This service may be employed soon by the City of Roanoke. The RIDE Solutions manager will serve as a translator and mediator for agencies as needed.

Link to long range plan through "constrained list" funding

In the last few years new transit services (Maroon Express, Ferrum Express, Smart Way) have been established in the Roanoke Valley region. The City of Roanoke allocated an additional $2,913,173.00 to support these transit facilities. These funds could have been used for traditional transportation improvements, such as road repairs, but was given for transit improvements that coordinate well with the alternative transportation, increased mobility, and increased connectivity aspects addressed in the long range plan. These transit improvements were paid for by surface transportation funds flexed over to support transit infrastructures, bus shelters, bus pullouts, downtown circulator routes, and additional public transit enhancements. The rapid expansion of transit services in the region is a successful step in improving mobility and balancing the inequities of "highway funds".

Recommendations for Next Long-Range Plan Update

- Continue encouraging localities to flex over surface transportation funds to support public transportation.
- Continued development, implementation, and management of the RIDE Solutions program to encourage individuals to use an alternative to the single occupant vehicle, particularly when commuting to and from work. Goal: Add 100 commuters annually.
- Expansion of the EAP communication listserv and public/private commitments from regional partners to cooperate in lowering ground level ozone. Goal: 20 pledges annually.
- Continue the K-12 Education and Outreach programs to teach children about air quality issues as they relate to transportation and health and human impact. Goal: 2-3 programs annually.
- Since the long-range plan was adopted, several additional private sector delivery fleets have made commitments. Thereby expressing the connection between transportation practices and air quality. The program recommends continuing these efforts in order to raise air quality our region and partnerships between the public and private sector.

Chapter 8

Freight Planning

Goal 1: Document Assumptions and Decisions	**Goal 2: Serve as a starting point for the next long-range plan update**

Freight is becoming an increasingly important topic in the transportation planning process. In recent years both the Federal Highway Administration (FHWA) and the Virginia Department of Transportation (VDOT) have encouraged MPOs to better incorporate freight perspectives in the transportation planning process. In 2001 VDOT purchased the 1998 TRANSEARCH database by REEBIE Associates. This database is the industry standard collection of commodity flow data. In 2002 the Roanoke Valley-Alleghany Regional Commission (RVARC) contracted Wilbur Smith Associates to conduct an in-depth freight study that included all jurisdictions in the RVARC and RVAMPO. The remainder of the chapter is a summary of study findings and results from the 2002-2003 freight study.[1]

The 2002-2003 Freight Study used 2001 RVARC service area (City of Roanoke, City of Salem, Towns of Clifton Forge and Vinton, Counties of Alleghany, Botetourt, Craig and Roanoke.) as the base unit of geography. All references to the Roanoke Valley-Alleghany Region in the subsequent paragraphs concerns this unit of geography. All references to "VDOT District" applies to the VDOT Construction District organizational framework.

Although the freight study was completed in 2003, most of the recommendations and findings serve as a starting point for the next long-range plan update (Goal 2).

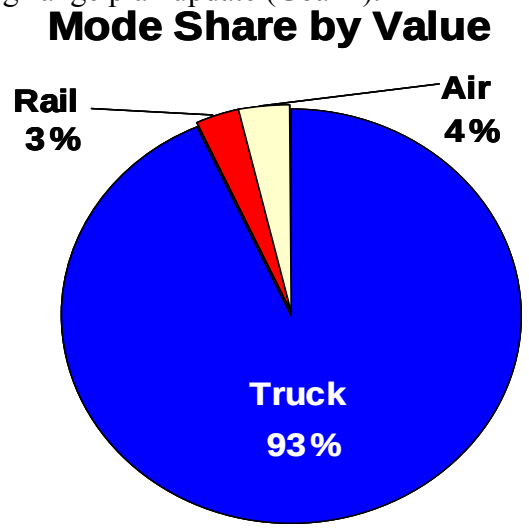


Figure 8.0[2]

[1] Roanoke Valley-Alleghany Regional Freight Study -Final Report. Roanoke Valley-Alleghany Regional Commission and Wilbur Smith Associates, January 2003. Figures, diagrams, maps and graphs are taken from report. All Page numbers for figures correspond to Roanoke Valley-Alleghany Regional Freight Study – Executive Summary.
[2] Roanoke Valley-Alleghany Regional Freight Study – Executive Summary – Page 2

REGIONAL FREIGHT PROFILE

Each year more than 16 million tons of freight, with values exceeding $30 billion, originate in or are destined to the Roanoke Valley-Alleghany Region. Nearly 80% of the region's tonnage moves by truck, with railroads claiming the remaining share (by weight air cargo is less than 1%).

By value, the share of freight moving by truck jumps even higher to 93%, with air (4%) and rail (3%) splitting the remainder. By weight, 57% of all commodity flows to or from this region have origins or destinations within the State of Virginia. North Carolina, West Virginia and the Ohio Valley region are the top interstate origins and/or destinations.

The greatest single commodity flow in the Roanoke Area is referred to as "secondary traffic." Secondary traffic is mixed commodities moving to and from warehouse or distribution facilities in the region; this traffic makes-up half of all shipments by value and one-third of all shipments by weight in the Roanoke Valley-Alleghany Region, indicating that the region fulfills an important role in the modern business logistics model. The majority of this traffic is moving between Roanoke and ports at Hampton Roads / Norfolk.

COMMODITY MOVEMENTS

Commodity flows between the study area and other regions within Virginia (intrastate flows) account for 57% of commodity flows by tonnage and 55% by value.

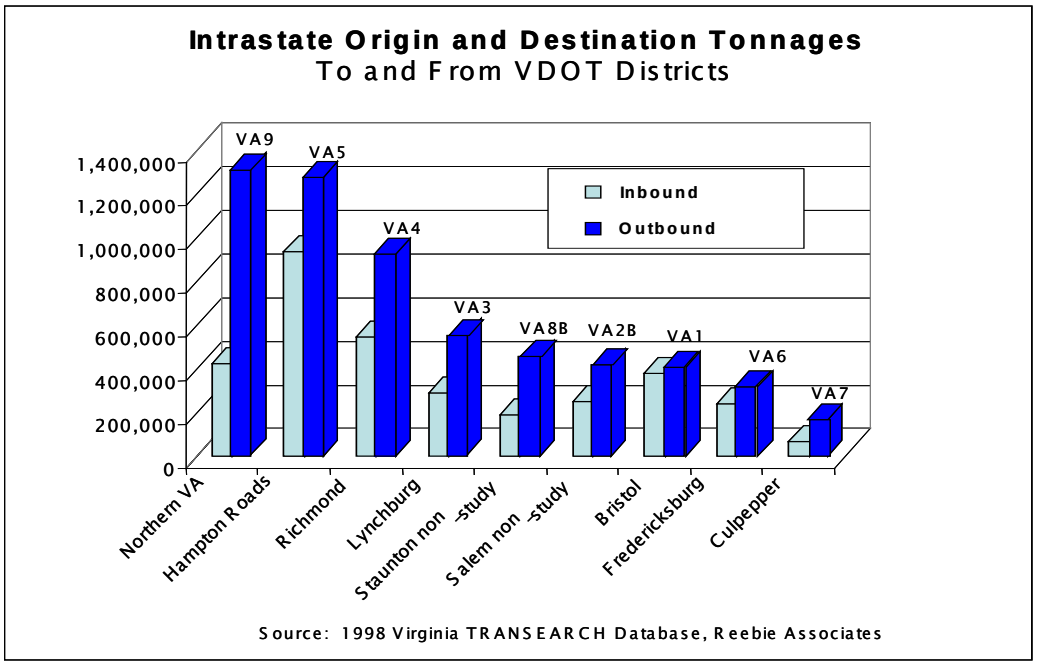


Figure 8.1[3]

[3] Roanoke Valley-Alleghany Regional Freight Study – Executive Summary – Page 3

Within Virginia the Roanoke Valley-Alleghany Region produces more than it consumes, i.e. the volume of goods leaving the region to other areas of the Commonwealth exceed the volume of goods moving into the region from those areas. The imbalance is most pronounced in the flows to and from Northern Virginia. Implications of significant flow imbalances are that shippers may find it difficult to locate or position equipment for outgoing shipment and carriers may find it difficult to locate backhauls. The Hampton Roads District and the Northern Virginia District, which includes suburbs adjacent to Washington, D.C., together account for nearly half of the outbound truck flows from the Roanoke Valley-Alleghany Region to other locations in Virginia. Hampton Roads ranks highest by value, while Northern Virginia ranks highest by tonnage.

Interstate domestic commodity origins and destinations to and from the Roanoke Valley-Alleghany Region were also examined. Unlike intrastate movements, where outbound flows exceeded inbound flows in every instance, interstate balances vary by region. The Roanoke Valley-Alleghany Region remains a producer region in its trade relationship with North Carolina, the North East Region, and to a lesser extent Maryland, Pennsylvania and the Pacific Region. For interstate truck flows the East North Central Region (Illinois, Indiana, Michigan and Ohio) and North Carolina rank 1st and 2nd by value of shipments. These two regions remain on top but trade places if ranked by weight. Maryland and the North East Region rank 3rd and 4th by value, and also trade places by weight. By rail, *Stone* is the primary outbound movement to North Carolina, and *Food Products* is the largest inbound commodity movement from North Carolina. *Coal* is the primary movement from West Virginia

air freight movements are *Mail and Contract Traffic*, going to North Carolina.

Interstate Truck Flows to/from the Roanoke Valley-Alleghany Region - Tons

RVA LOGISTICS PATTERNS

Previous studies have found that a few commodities usually comprise the majority of goods moving in most states or regions: “By addressing each of these industries individually, planners can address economic development and the impact of infrastructure improvements... it is not necessary to analyze the entire range of goods movement at the same time… specific industry sectors are likely to have similar transportation requirements.”[4]

The Roanoke Valley-Alleghany Freight Study examines the logistics patterns for five major commodity groups in the Roanoke Valley-Alleghany Region, using the Commodity Information Management System (CIMS), a software program developed by Wilbur Smith Associates and provided to the RVARC.

Secondary Traffic, the top commodity movement in the RVA Region, has three components:

1) Freight moving between warehouses or distribution centers;

2) Rail intermodal truck drayage; and,

[4] Virginia Transportation Research Council, “*A Methodology for Statewide Intermodal Freight Transportation Planning*”, December 1998

3) The truck drayage portion of air cargo traffic.

More than 99% of *Secondary Traffic* in the Roanoke Valley-Alleghany Region is warehouse/ distribution traffic. In fact, movements to and from warehouses and distribution facilities comprise half of all shipments by value, and one-third of all shipments by weight, in the Region.

A key intermodal hub within hours by truck to the Roanoke Valley-Alleghany Region is Hampton Roads. Intermodal containers arriving from international origins such as China, other parts of Asia, and Europe are placed on a truck chassis and driven to distribution centers located in the Roanoke Valley-Alleghany Region.

At the distribution centers containers are unloaded and the contents consolidated with other products in trucks for redistribution throughout Virginia and the East Coast. A nearly equivalent level of *Secondary Traffic* heads back to Hampton Roads for containerized export to international markets. Based on the interviews with shippers in the Roanoke Valley-Alleghany Region, substantial amounts of this traffic are sent as partial loads to consolidators located at the ports. Carriers interviewed indicated that the preferred route from Roanoke to Hampton Roads is I-81 North to I-64 East, as opposed to the more direct U.S. Route 460. The more circuitous route of I-81 / I 64 adds 30 miles in each direction to the trip. The CIMS software estimates that Secondary Traffic moving between the Roanoke Valley-Alleghany Region and Hampton Roads results in nearly 60, 000 truck trips per year. If all these trips used I-81 / I-64, the result is nearly 2 million *additional* miles of truck travel per year than if the most direct route (US 460) were used.

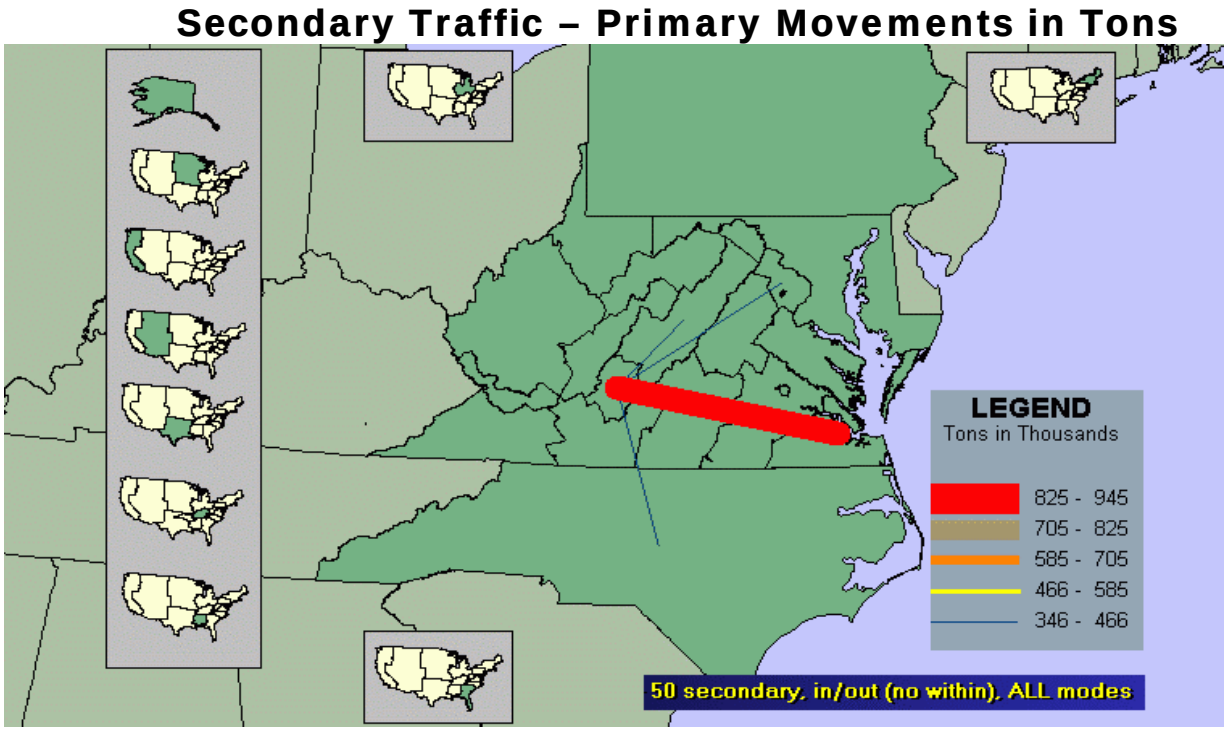


Figure 8.2[5]

[5] Roanoke Valley-Alleghany Regional Freight Study – Executive Summary – Page 3

Interstate Truck Flows to/from the Roanoke Valley-Alleghany Region - Tons

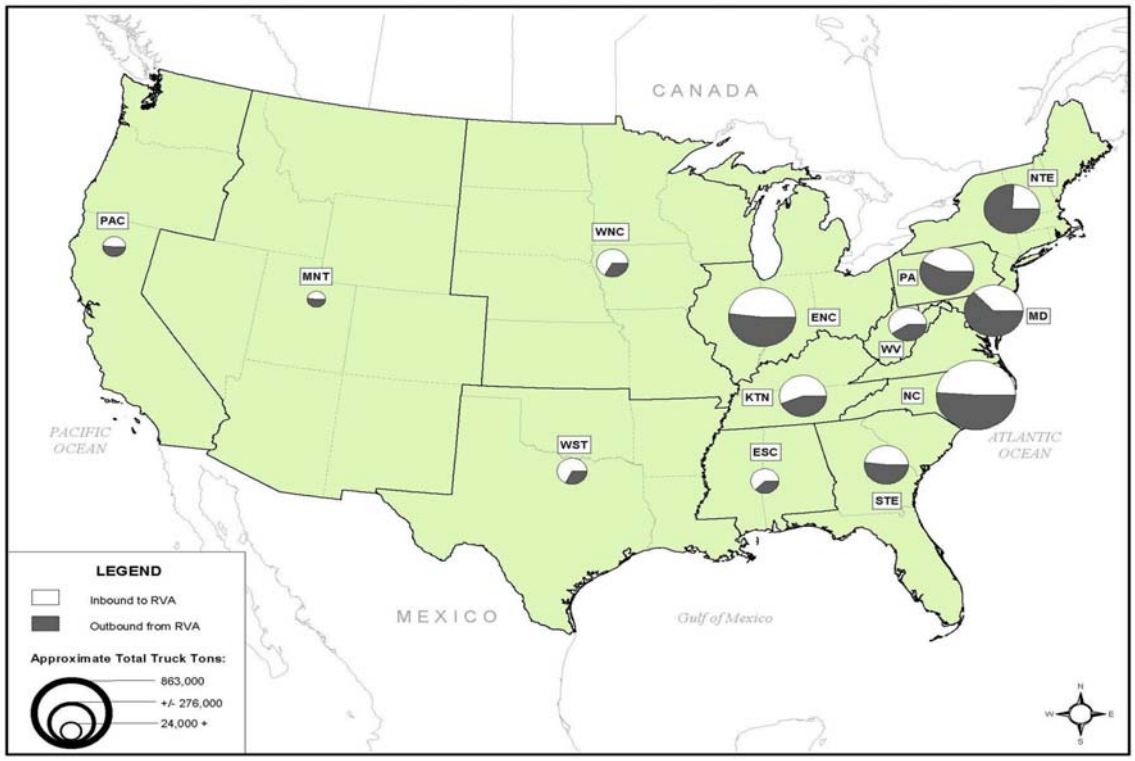


Figure 8.3[6]

CURRENT & EMERGING ISSUES

The Roanoke Valley-Alleghany Freight Study team conducted in-person and telephone interviews with commercial users (shippers) and providers (carriers) of freight transportation services in the Region. Fifty businesses and freight service providers were contacted for their opinions about regional transportation issues.

The interviews found that shippers in the Roanoke Valley-Alleghany Region are largely satisfied with the transportation services they receive.

As one transportation manager stated: "Overall, things work pretty smooth; transportation is the easiest part of logistics." Interviews were structured to gain insights about freight in the region at several levels:

1) *Specific problems at specific locations;*
2) *Broad issues related to limitations in the overall system;*
3) *Patterns and trends in the nature freight transport needs.*

Shipper Concerns:

[6] Roanoke Valley-Alleghany Regional Freight Study – Executive Summary – Page 4

- Pressure to further reduce inventory
- Heightened concerns over security
- Consistent, reasonably priced service to North Eastern US
- Access to ports via U.S. 460
- Time required to access super load permits
- Access to equipment
- Access to rail services
- Shipment consolidation
- The lack of adequate highway signs directing drivers to towns and facilities

Figure 8.4[7]

Carrier Concerns

- Lack of parking / staging areas
- Exit and Entrance ramps to I-581
- I-81 congestion
- Access to ports via U.S. 460
- Poor access routes to facilities
- Signal timing and alignments on major truck routes and at specific intersections

THE ROANOKE VALLEY-ALLEGHANY REGIONAL FREIGHT FORUM

Following initial stakeholder outreach, the RVARC and the Roanoke Regional Chamber of Commerce held a half day Regional Freight Forum to allow survey and interview participants an opportunity to provide additional thoughts and opinions.

Ten company representatives attended the Freight Forum and the small group allowed for a good interactive discussion. Participants were asked to respond to three questions:

- What should the overall goal(s) be for the outcomes of this study?
- What, if any issues/concerns has the study not addressed?
- What is the most effective means of engaging the freight community in the planning process?

Participants said a first step is to educate the public and bring more attention to the importance of freight to the region. There were strong sentiments that the general public and area businesses need to support freight issues to ensure the region's future economic vitality.

Business representatives said they would like more communication with the public sector about the impacts of major construction projects on local businesses. They also urged a comprehensive review of access control and truck route designations within the region, noting that many highways designated decades ago as "truck routes" today function as city streets due to the proliferation of traffic signals.

It was suggested that efforts to involve the business community in the transportation planning process should start small, and possibly prove a dual-role, both public sector planning *and* a business-to-business

[7] Roanoke Valley-Alleghany Regional Freight Study – Executive Summary – Page 6

networking opportunity. It was also suggested that the benefits of participating in the planning process be clearly communicated and that initial meetings of a freight advisory group focus on "hot buttons" using knowledgeable keynote speakers and good facilitators.

REGIONAL FREIGHT PLANNING

While commercial transport is important to the businesses generating and receiving freight, all facets of society benefit from efficient freight transport. Therefore, government agencies should undertake planning to ensure a reliable and sustainable freight transportation network. As a first step, the RVARC commissioned the Freight Study with several objectives in mind:

- To better understand the link between transportation investment and economic development;
- To protect the region's quality of life;
- To enhance the safety of the region's transportation systems;
- To raise awareness and educate the public about the importance of freight; and,
- To plan regional transportation systems, while addressing homeland security issues.

To meet these objectives and promote freight in the planning process after concluding this study, recommendations are provided at three levels:

- Policies affecting transportation planning;
- Strategies responding to current and emerging issues; and,
- Identification of "fast action" projects that could be included in the region's next Transportation Improvement Plan (TIP).

FREIGHT POLICIES

To insure a sustainable freight network that serves the needs of the region, policies addressing freight should be developed in three focus areas:

1) *Freight Mobility*
2) *Urban Design/Growth Management*
3) *Vitality and Quality of Life*

To assist in developing regional freight policy, the RVARC should work with regional businesses in developing a "Freight Advisory Committee" that can provide input to the planning process and forge a stronger partnership with the freight community.

Planning to Enhance Freight Mobility

- Introduce freight to the long range plan
- Focus on key truck corridors
- Incorporate trucks in traffic design
- Enhance freight operation using technology
- Support freight planning with data
- Promote intermodal operations
- Partner for effective freight planning
- Get advice

Urban Design & Growth Management Policy

- Land use planning for freight
- Regional zoning for freight infrastructure
- Design standards for freight infrastructure
- Urban development
- Using the development review process to benefit freight

Promote Economic Vitality & Quality of Life

- Air quality issues
- Environmental justice
- Lane balancing

FREIGHT STRATEGIES

The Roanoke Valley-Alleghany Regional Freight Study provides a recommended action plan for incorporating freight into the planning process of the region. The action plan is intended as a framework for developing and implementing policies, strategies and projects that enhance the mobility and productivity of freight transportation in the region while enhancing safety, efficiency and environmental quality.

A first step to incorporating freight into regional planning efforts is to recognize freight in the long range planning process. The RVARC in cooperation with the RVAMPO have established good foundations for regional freight planning goals in the Long Range Transportation Plan:

- A transportation system which will complement and promote the social, economic, and environmental goals of the Roanoke Urbanized Area.
- A coordinated transportation system that will continually provide for the safe and efficient movement of people and goods within and through the area.

An additional policy goal specific to freight transport in the region might be stated as:

- *Plan and develop a reliable, sustainable Roanoke Valley-Alleghany Regional freight network.*

The Roanoke Valley-Alleghany Regional Freight Study presents policies and strategies in three areas. A few of those freight strategies are discussed here:

Focus on Key Corridors -The region should focus freight planning efforts on a few key freight corridors. Continued investment in key through routes is important in sustaining the Roanoke Valley-Alleghany

Freight Villages

Clustering warehouse activities around specific areas that make operational sense can provide the basis for the development of a "freight village". The model definition of a freight village is where:

1. All modes are represented;
2. Land prices are lower than general commercial properties;
3. Adequate land is available for development;
4. Facilities are accessible by local arterials for local distribution;
5. Facilities have good access to interstates/freeways for regional and national distribution;
6. Accessible to rail facilities, directly tied to a Class I railroad main line;
7. Accessible to an airport (with frequent service to domestic and international cities);
8. Accessible to a port offering a wide variety of materials handling options.

Region's freight network. Moreover, investing in routes that function as viable alternatives such as adjacent arterials, and circumferential bypasses, will help sustain important corridors like I-81, I-581 and US 460. Designated trucks routes should be understood and protected as key links in the overall logistics network.

Economic Development - As a producer region, both rail and truck modes experience lane imbalance problems. Economic development efforts can strategically target those industries that might leverage imbalance opportunities by filling empty backhauls.

Land-Use Planning and Zoning - Land use policies should strategically manage the growth of distribution facilities in the area. The region should consider enhancing its status as an emerging staging point by clustering warehouse activities (freight villages) and consider adopting a Warehouse and Logistics zoning designation.

Get Advice - Creating a formal advisory group has become a first step for many MPOs wanting routine, meaningful dialogue between planners and freight interests. Too often shippers and their customers (who are also key stakeholders) are not engaged in the planning dialogue that affects their business. Planners, carriers, shippers and delivery customers should all be included, on a routine basis, in the sort of creative problem-solving that is required of this unique type of transportation planning.

Partner for Effective Freight Transport Planning – It is important that planners in the region view every transportation project as a potential freight project, as nearly all projects in the region (including private rail or warehouse development) will affect freight movements in some way. Within the Roanoke Valley-Alleghany Region many problems threatening freight mobility are not solely with Primary or Arterial roadways, but in fact are often associated with local/urban roadways as well.

KEY FREIGHT CORRIDORS IN THE ROANOKE-SALEM AREA

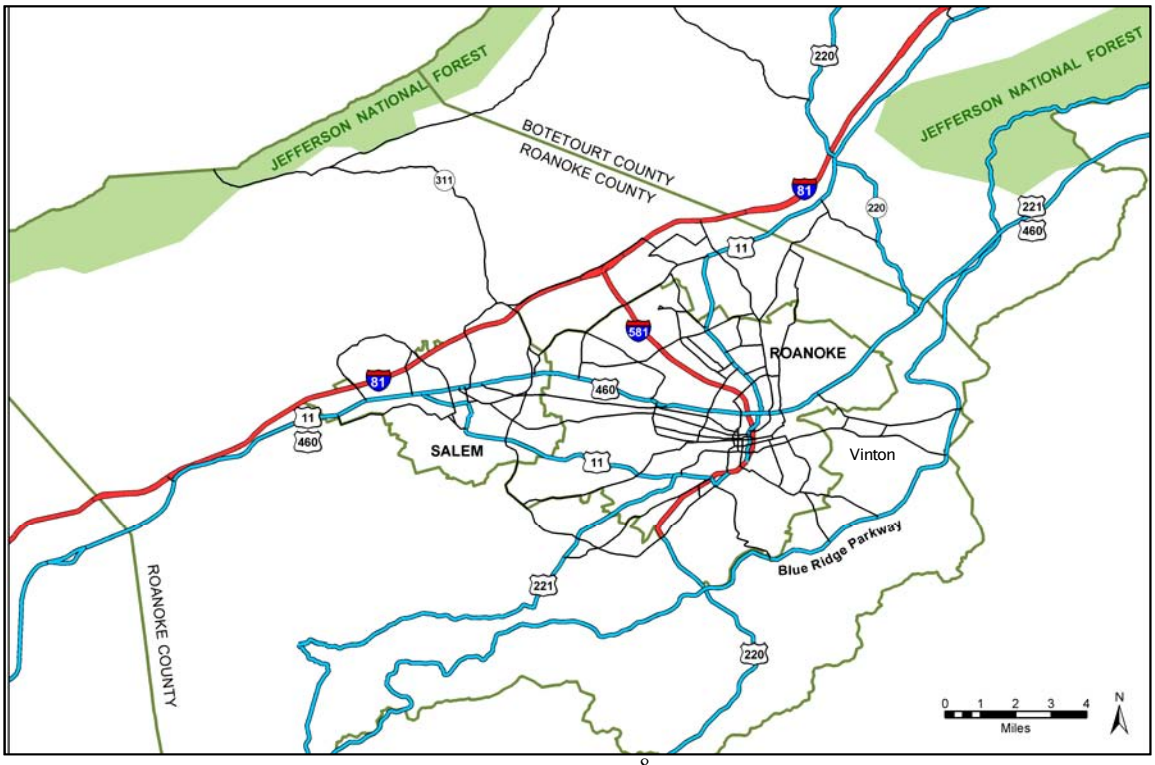
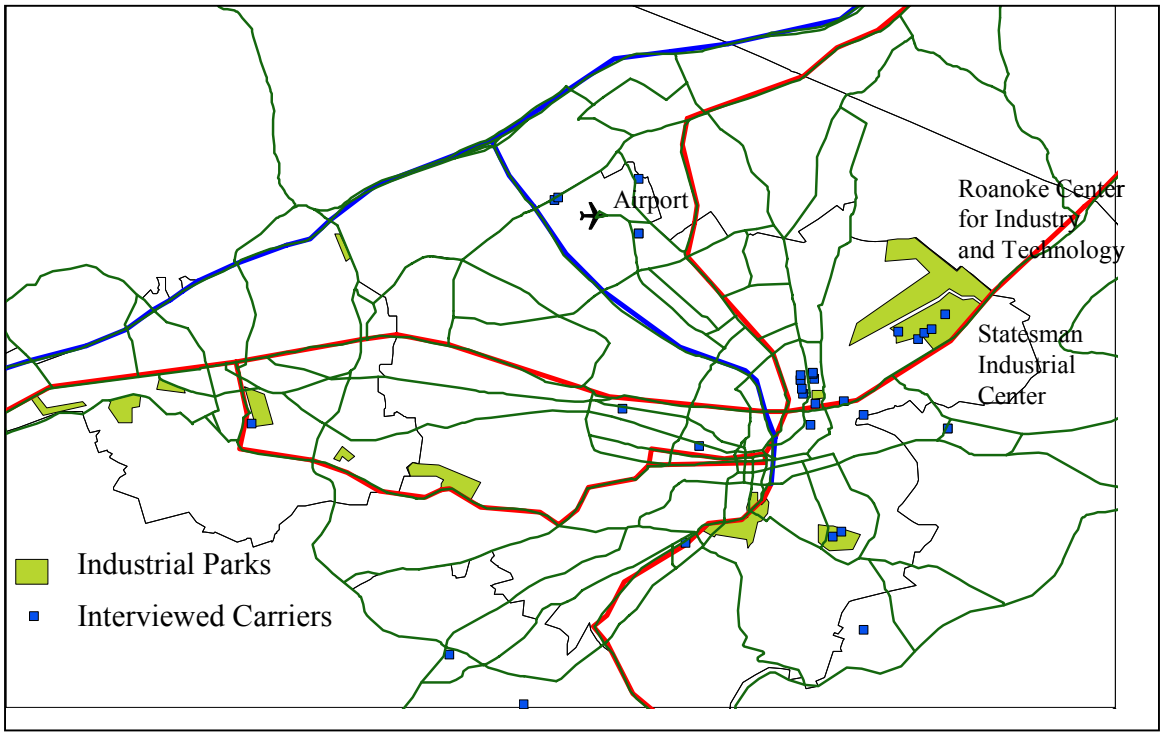


Figure 8.5[8]

Roanoke/Salem Industrial Parks

Figure 8.6[9]



[8] Roanoke Valley-Alleghany Regional Freight Study – Executive Summary – Page 8
[9] Roanoke Valley-Alleghany Regional Freight Study – Executive Summary – Page 9

FREIGHT PROJECTS

One of the outcomes from the stake-holder outreach process undertaken during the study was the identification of potential freight projects. Listed below are ten projects that can be considered in future regional Transportation Improvement Plans (TIP), resources permitting:

- Improve signage on I-81 and I-581
- Orange Ave. & I-581
- Elm Street & I-581
- Elm Street & Williamson
- Orange Avenue & 13th St.
- Salem Turnpike & Melrose Ave.
- Salem Turnpike & Peters Creek Rd.
- Lynchburg Turnpike & Electric Rd.
- US 460 & Granby Road
- US 460 & Challenger Avenue

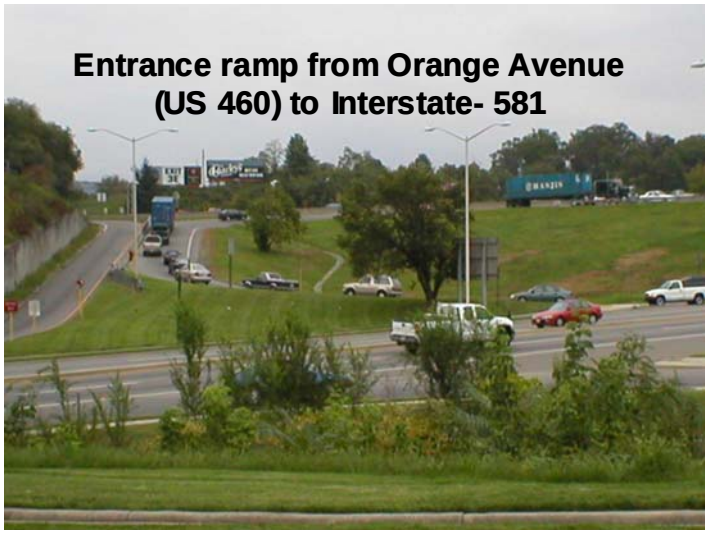


Figure 8.7[10]

The aforementioned list of projects will serve as a starting point for discussion of the financially constrained list of projects for the next long-range plan update.

Recommendations for Next Long-Range Plan Update

- Develop a small, medium and large freight village profile and translate profile to a GIS polygon for overlay on GIS related projects.
- Host a Regional Freight Forum concerning long-range planning issues.
- Incorporate freight issues into the scenario planning effort

[10] Roanoke Valley-Alleghany Regional Freight Study – Executive Summary – Page 10

Chapter 9

An Environmental Justice Evaluation of the Financially Constrained List of Projects

Goal 1: Document Assumptions and Decisions	**Goal 2: Serve as a starting point for the next long-range plan update**

As previously mentioned, the Roanoke Valley Area Metropolitan Planning Organization (RVAMPO) Long-Range Transportation Plan 2025 Technical Report has two primary goals: (1) to document the assumptions, technical process, and decisions leading to the development of the RVAMPO LRTP 2025 and (2) to serve as a starting point to the development of the next CLRTP update. In order to address goal # 2 and to ensure non-discrimination in transportation programs, the RVAMPO decided to apply a recently developed environmental justice evaluation methodology to the 2025 Long Range Transportation Plan. Application of this methodology to this plan and to the next update will allow decision makers to consult yet another tool when making ultimate decisions regarding which projects should be included in the constrained and in the vision list. This tool will also help to ensure that environmental justice concerns are being addressed in transportation planning both in terms of avoiding disparate impacts upon federally protected groups and in terms of ensuring equal distributions of investments across the region. This activity is also a part of the reinvigorated public involvement program set out in the recently adopted 2004 Update to the Public Involvement Manual of both the Roanoke Valley – Alleghany Regional Commission and the Roanoke Valley Area Metropolitan Planning Organization.

Environmental justice as a term entered the governmental parlance with the signing of Executive Order 12898 in 1994. EO 12898 requires that federal agencies and other entities making use of federal funding avoid "disproportionately high and adverse" effects on minority and low-income populations and seek involvement of the public toward the ends of ensuring environmental justice in governmental operations. The United States Environmental Protection Agency defines environmental justice as "…the fair treatment of all people, regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socio-economic groups should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies."

Environmental justice does more than simply ban intentional discrimination. In fact, it requires that all organizations/agencies receiving federal funds evaluate the consequences of their activities for any disparate impacts upon special protected groups, which include

racial minorities, Hispanics, low-income groups, those with Limited English Proficiency (LEP), the elderly, and the disabled.

As aforementioned, the goal of this chapter is to lead off into the next update of the CLRTP and to help ensure that environmental justice concerns are being addressed. For more information regarding the public involvement/nondiscrimination programs of the RVAMPO please consult the RVAMPO/RVARC Public Involvement Manual and the RVAMPO Demographic Profile.

Evaluation Methodology

After an extensive review of existing evaluation methods for environmental justice in regional transportation programs, staff identified the Delaware Valley Regional Planning Commission's (DVRPC) environmental justice evaluation methodology as a national best practice. The Delaware Valley Regional Planning Commission is one of the few regional planning bodies that attempt to evaluate environmental justice using a quantitative method based on regional demographic information.[1]

DVRPC's quantitative evaluation method is based on US Census Bureau (2000) data at the tract level. In this methodology, US Census Data for racial minorities, Hispanics, Limited English Proficiency, disabled populations, elderly populations, and populations without access to vehicles are collected and a regional average for each of these variables is computed. Each tract is then given a score based on whether or not it exceeds this regional average or 'threshold.' For each instance in which a tract exceeds the regional average, the tract is given one point or 'degree of disadvantage' (DOD). These 'degrees of disadvantage' are then totaled for each tract for its total 'degrees of disadvantage' score, which can be made into a single layer for an environmental justice evaluation map base.

Planned transportation projects are then overlaid on the evaluation map base for purposes of evaluating a transportation plan.

Staff has already utilized data from the RVAMPO Demographic Profile to evaluate the FY 2005-2007 Transportation Improvement Program[2]. Through testing the DVRPC method, staff identified a number of issues and made several important modifications to the methodology. For instance, it was originally noted that low regional averages of both Hispanic and Limited English Proficiency populations skewed the results and lessened the disparity in index scores between affluent areas and many low-income, minority areas. In the first version of the TIP Evaluation report, it was suggested that a system of

[1] The DVRPC first applied this methodology in the 2001 document entitled "…and Justice for All" and has modified its approach on an annual basis as new issues arise and as new data becomes available.

[2] An important note should be made in regards to the context of this evaluation methodology. This methodology is not designed to evaluate projects that have already proceeded through the NEPA process. The TIP projects were evaluated with the express purpose of testing the methodology design. Applied to the long-range planning process, the methodology will be used to evaluate projects that have not yet been programmed in VDOT's Six-Year Improvement Program or the RVAMPO TIP.

weights or priorities might be utilized to place more emphasis on certain variables such as race and poverty to avoid this issue. However, it was understood, of course, that an arbitrary assignment of weights would not be consistent with EJ goals and values; therefore, the idea was abandoned altogether.

Instead, staff adopted the approach of measuring not only whether a block group exceeded the regional average, but also by how much a block group exceeded a regional average. All variables are given the same weight in this approach, but areas that are characterized overwhelmingly by low-income and minority residents are given a much higher score by virtue of their higher concentrations thus solving the original problem.
Other modifications were made to the DVRPC method before application to the RVAMPO region. When measuring elderly populations, for instance, RVAMPO staff measured concentrations of those who were 65 and over in 2000, as opposed to measuring those who were 85 or over (as did DVRPC). Also, more categories of the disabled population were considered in the RVAMPO analysis than in DVRPC's.

As mentioned above, the most important change involved the scoring structure. In the RVAMPO analysis, a block group will receive a zero only if it is below the regional average of all variables. However, if the block group exceeds the regional average of any given variable the score will then be based upon the percentage by which it exceeds the average (Index score = Percent Above Regional Average / 100). Therefore, if, for instance, a block group has a disabled population that is 500% the regional average of disabled populations, the block group will receive a score of 5.0 for the disabled component of the index score. Each component or score for each variable is then totaled into a composite index. This change was implemented after comment from stakeholders indicating that a more sensitive sliding scale was in order.

Because of these changes, RVAMPO staff is referring to its quantitative measure of environmental justice sensitive areas as the **environmental justice index or EJ index** as opposed to DVRPC's 'degrees of disadvantage.'

Data on racial minorities was originally derived from the US Census as the block group level. Minority, as defined in this report, includes all racial categories other than 'White.' The regional average of racial minorities was computed at 16.6%. All block groups with higher minority concentrations were assigned points in the EJ index according to the percent by which the block group averages exceeded the MPO study area average. For example, the population of racial minorities in Block Group 2 of Tract 2 in Roanoke City was 510% the regional population of racial minorities; thus, this block group was given a score of 5.1 for the race component of the EJ index. Please note that the racial minority variable does not contain data on Hispanics, as Hispanics do not represent a racial group. Hispanics represent a cultural group, whose members may belong to numerous races. See Map 1 in Appendix A for visual depiction of racial minority concentrations within the region.

Hispanic ethnicity is the second variable included in this evaluation methodology. The regional average of Hispanics was computed at 1.13%. Block groups found to have

higher concentrations of Hispanic populations were assigned points in the EJ index according to the percent by which they exceeded the MPO study area average. For example, the population of Hispanics in Block Group 4 of Tract 5 in Roanoke City was 310% the regional population of Hispanics; thus, this block group was given a score of 3.1 for the Hispanic component of the EJ index. See Map 2 in Appendix A for regional concentrations of Hispanics.

Limited English Proficiency populations were considered next in the evaluation methodology. Federal guidance on the subject of Limited English Proficiency states that an LEP individual is someone who has a primary language other than English and must communicate in this language due to a limited proficiency in English. When completing the census survey form question on English proficiency, the respondent is asked whether he/she speaks English 'Very Well', 'Well', 'Not Well', or 'Not at All'. An LEP individual is defined here (for statistical purposes) as someone who stated that he or she speaks English 'Not Well' or 'Not at All'. The regional average of LEP individuals was found to be .71%. All block groups with higher LEP concentrations were assigned points in the EJ index according to the percent by which the block group average exceeded the MPO study area average. For example, the population of LEP individuals in Block Group 1 of Tract 3 in Roanoke City was 270% the regional population of LEP individuals; thus, this block group was given a score of 2.7 for the LEP component of the EJ index. See Map 3 in Appendix A for regional concentrations of LEP individuals.

Poverty is the fourth variable considered in this methodology. Census poverty data is based on whether an individual's household income is at or below the Department of Health and Human Services (HHS) federal poverty guidelines. US Census 2000 poverty data was based on the 1999 poverty guidelines, which are listed in the table below for reference.

Size of Family Unit	1999 Household Income
1	$8,240
2	$11,060
3	$13,880
4	$16,700
5	$19,520
6	$22,340
7	$25,160
8	$27,980
Each Additional Person	Add $2,820

Table 9.1
Source: Department of Health and Human Services, 1999.

The regional average of individuals with poverty status was found to be 9.7%. All block groups with higher concentrations of individuals in poverty were assigned points in the EJ index according to the percent by which the block group averages exceeded the MPO study area average. For example, the population of individuals with poverty status in

Block Group 1 of Tract 11 in Roanoke City was 420% the regional population of individuals with poverty status; thus, this block group was given a score of 4.2 for the poverty component of the EJ index. See Map 4 in Appendix A for geographic concentrations of individuals with poverty status.

An additional variable considered in DVRPC's TIP evaluation was that of the household without access to a motor vehicle. Given the nature of the program being evaluated, this variable is a good environmental justice indicator for transportation plans. The regional average of households without access to vehicles was found to be 8.11%. Each block group with a higher concentration of households without motor vehicle availability was assigned points in the EJ index according to the percent by which the block group exceeded the MPO study area average. For example, the population of households without access to vehicles in Block Group 1 of Tract 303 in Roanoke County was 190% the regional population of such households; thus, this block group was given a score of 1.9 for the limited mobility component of the EJ index. See Map 5 in Appendix A for information on concentrations of households without access to vehicles.

Next staff considered disability in the evaluation of the CLRTP[3]. The regional average of the disabled is 20.8%. All block groups with higher disabled concentrations were assigned points in the EJ index according to the percent by which the block group averages exceeded the MPO study area average. For example, the population of disabled in Block Group 2 of Tract 103 in Salem City was 130% the regional population of disabled individuals; thus, this block group was given a score of 1.3 for the disabled component of the EJ index. See Map 6 in Appendix A for concentrations of the disabled.

The final variable considered in this EJ evaluation is that of the region's elderly. The regional average of those over 65 was found to be 15.9%. All block groups with higher concentrations of the elderly were assigned points in the EJ index according to the percent by which the block group averages exceeded the MPO study area average. For example, the population of elderly in Block Group 2 of Tract 405 in Botetourt County was 160% the regional population of elderly individuals; thus, this block group was given a score of 1.6 for the elderly component of the EJ index. See Map 7 in Appendix A for concentrations of the elderly.

Evaluation Results

Maps 1-7 included in Appendix A show those block groups within the MPO service area that exceed the regional average in any of the following populations: racial minorities, Hispanics, Limited English Proficiency individuals, individuals with poverty status,

[3] Previous public involvement demographic analyses of the region have noted an unusually high percentage of disabled individuals. No explanation exists for this phenomenon presently, but it should be noted nonetheless. Please also note that disability defined here includes physical, mental, go-outside-home disability, self-care disability, sensory disability, and employment disability.

households without vehicle availability, the disabled, or the elderly. Map 8 shows the total EJ index value for the block groups within the MPO service area[4].

Review the foldout LRP Evaluation map for a spatial distribution of all constrained list projects overlaid on environmental justice data.

The tables on the following pages represent the constrained list of projects from the CLRTP with corresponding EJ index scores. Sensitive block groups, which are defined in this evaluation as block groups having more than 10 points in the EJ index, have been bolded. These projects should be further evaluated for possible disparate impacts upon low-income or minority populations in the environmental review stages of each project. Please note that at this scale and level of detail it is nearly impossible to assess the impacts upon low-income and/or minority populations. It is clear that many of these projects deserve a more detailed project-level analysis of impact. Most notably any project involving potential takings, such as road widening, reconstruction, and/or extension, should be reviewed carefully.

It should also be noted that many of the projects in the following table represent tremendous benefits to the sensitive areas in which they are located. Most notably, projects involving safety improvements at rail crossings, bicycle improvements, and pedestrian improvements represent benefits to the sensitive areas in which they are located and to the entire surrounding community. No significant burden can be foreseen in many of these projects.

As a part of the development of the next RVAMPO CLRTP update, a benefits/burdens framework will be developed to screen candidate projects resulting from the 4 step model evaluation. This framework will assist in project selection in future long-range transportation plan updates.

[4] EJ index component scores are based upon the percentage by which the block group exceeds the average of the demographic variables analyzed in this document. Component scores are then totaled for the total EJ index score.

RVAMPO - Primary System - Financially Constrained List

Map #	EJ Index Score	Jurisdiction Facility Route # and Name	From:	To:	Recommended Improvement	Projected Cost	Previous Funding	Additional Funding Required	Comments
#58	NA	Roanoke County - Route 11*	WCL Salem	0.10 mi West Route 830	4 Lane	$25,254,000	$5,533,000	$19,721,000	PE Underway
#59	0	Roanoke County - Route 460	Roanoke CL	Botetourt CL	6 Lane	$11,850,000	$0	$11,850,000	Proposed commercial development in this area. Section listed in FY2003 Freight Study Recommendations.
#60	10	Roanoke County - Route 11	Roanoke CL	Route 117	4 Lane	$14,018,000	$0	$14,018,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#61	3	Botetourt County - Route 11	0.21 mi N Rte 601	0.38 mi N. Rte 654	4 Lane	$13,294,000	$0	$13,294,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#62	14	City of Roanoke - US 220	Wonju Street	Elm Avenue	8 Lane	$20,880,000	$0	$20,880,000	
#63	5	Roanoke County - US 220	South Route 715***	Route 419	6 Lane	$11,907,000	$0	$11,907,000	
#64	0	Roanoke County - Route 115	Roanoke CL	Rte 11	4 Lane	$19,622,000	$0	$19,622,000	a lot of development in area - *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#65	0	Roanoke County - Route 116	Roanoke CL	Route 664	2 Lane	$4,101,000	$0	$4,101,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#66	0	Roanoke County - Route 116	Route 664	Franklin CL	2 Lane	$2,546,000		$2,546,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#67	6	Roanoke County - Route 221	1.05 mi West Route 694	0.35 mi South Route 897	4 Lane	$9,206,000	$0	$9,206,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#68		Miscellaneous spot, bridge and other improvements**				$10,751,900	$0	$10,751,900	
		* Denotes project obligated in current Six Year Plan					**Total Additional Funding Needs:**	$137,896,900	
		** Contains Funding for non-regionally significant spot, bridge, intersection and similar type improvements.					**Projected Funding Available:**	$137,896,900	
		*** Description of Project will have to be revised to reflect new constrained amount							

City of Roanoke Urban System - Financially Constrained List

Map #	EJ Index Score	Facility Route # and Name	From:	To:	Recommended Improvement	Projected Cost	Previous Funding	Additional Funding Required	Comments
#1	NA	* 10th Street	Gilmer Avenue	Andrews Road	Reconstruction	$7,565,000	$6,699,000	$866,000	PE underway. -*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#2	NA	* 10th Street	Andrews Road	Williamson Road	Reconstruction	$5,055,000	$5,055,000	$0	PE underway. -*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#3	NA	* Wonju Street Extension	Colonial Avenue	Brandon Avenue	4 lane	$20,676,000	$13,396,000	$7,280,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan. Pedestrian and Bicycle Accomodations Recommended in Regional Greenways Master Plan*
#4	7	13th Street Project 13th Street / Hollins Road	Dale Avenue	Orange Ave	U4D w/ Bike Lanes	$10,020,000	$0	$10,020,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan - Pedestrian and Bicycle Accomodations Recommended in Regional Greenways Master Plar*
#5	7	13th Street Project Campbell Ave., SE	Williamson Rd	Norfolk Ave	U3L	$4,013,000	$0	$4,013,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#6	7	13th Street Project Norfolk Ave	Campbell Ave.	Wise Ave.	U3L	$915,000	$0	$915,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#7	7	13th Street Project Wise	Norfolk Ave.	ECL Roanoke	U3L	$8,166,000	$0	$8,166,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#8	8	Colonial Ave	Wonju St.	Winding Way Road	U3L w/ Bike Lanes	$7,518,733	$0	$7,518,733	Reconstruct the existing roadway to a three-lane section from Wonju Street west through Virginia Western Community College to include sidewalk, curb and gutter, drainage, and bike lanes. These improvements are intended to tie into the Wonju Street extension project. - Pedestrian and Bicycle Accomodations Recommended in Regional Greenways Master Plan
#9	**19**	**I-581/Elm Ave Interchange**	**Jefferson St**	**Jamison Ave**	**U6L**	**$8,000,000**	**$0**	**$8,000,000**	**Interchange Improvements, $8,000,000 is the City Share from the Urban Allocation to be included with additional Interstate and Primary funds**
		* denotes project obligated in current Six-Year Plan							

3/25/2005

City of Roanoke Urban System - Financially Constrained List

Map #	EJ Index Score	Facility Route # and Name	From:	To:	Recommended Improvement	Projected Cost	Previous Funding	Additional Funding Required	Comments
#10	**19**	**Orange Ave. Network Improvements Planning**	**I-581**	**ECL Roanoke**	**Corridor Study**	**$300,000**	**$0**	**$300,000**	**Corridor study to evaluate alternate network connections to relieve congestion on Orange Avenue.**
#11	**13**	**Orange Avenue**	**11th St**	**Gus Nicks Blvd**	**U6L**	**$11,414,000**	**$0**	**$11,414,000**	***Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan***
#12	**20**	**Salem Turnpike/ Shenandoah Avenue Corridor**	**36th St.**	**24th St**	**U2L w/ bike lanes**	**$5,641,000**	**$0**	**$5,641,000**	**Turn lanes at selected locations - Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan - Pedestrian and Bicycle Accomodations Recommended in Regional Greenways Master Plan**
#13	7	Williamson Road	Orange Ave.	Angell Ave.	Corridor Improvement	$15,493,000	$0	$15,493,000	Corridor improvements to include curb, gutter, sidewalk, and other streetscape enhancement - *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#14	NA	Transit Improvements				$2,913,173	$0	$2,913,173	Surface Transportation funds will be flexed over to support bus shelters, bus pullouts, Downtown circulator, and other transit enhancements.
#15	NA	Mobility and Accessibility Improvements				$4,855,289	$0	$4,855,289	Bike lanes, shared-use paths (greenways), sidewalks, curb and gutter, other Pedestrian and Bicycle enhancements
#16	NA	Signal and ITS Improvements				$4,855,289	$0	$4,855,289	Interconnection and coordinated signal systems & miscellaneous ITS improvements
#17	NA	Intersection & Miscellaneous Spot Improvements				$4,855,289	$0	$4,855,289	Isolated improvements, additional turn lanes, geometric improvements, and other minor physical improvements
						Total Additional Funding Needs:		$97,105,773	
						Projected Funding Available:		$97,105,773	

City of Salem- Constrained List

Map #	EJ Index Score	Facility Route # and Name	From:	To:	Recommended Improvement	Projected Cost	Previous Funding	Additional Funding Required	Comments
#18	NA	Route 11 (Apperson Drive)	Apperson Drive at	Electric Road	Intersection Improvement	$2,337,000	$0	$2,337,000	PE Only
#19	NA	Route 460 (East Main Street)	Route 311	Parkdale Drive	3 Lane	$9,505,000	$5,749,000	$3,756,000	PE Underway - *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#20	NA	Route 460 (East Main Street)	Parkdale Drive	Route 419	4 to 5 Lane	$8,099,000	$7,342,000	$757,000	Under Construction - *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#21	6	Route 11 (Apperson Drive)	Colorado	WCL Roanoke	Urban 4 Lane	$17,114,000	$0	$17,114,000	
#22	3	Route 11 (Apperson Drive)	Apperson Drive at	Electric Road	Intersection Improvement	$6,485,323	$0	$6,485,323	Continuing Project Development. See corresponding item at top of list.
#23	NA	Miscellaneous spot, bridge and other improvements**				$3,380,000	$0	$3,380,000	May contain spot improvement items that are currently in 6 Year Plan/ TIP
							Total Additional Funding Needs:	$33,829,323	
							Projected Funding Available:	$33,829,323	

* Denotes project obligated in current Six Year Plan

** Contains Funding for non-regionally significant spot, bridge, intersection and similar type improvements.

Town of Vinton Urban System- Constrained List

Map #	EJ Index Score	Facility Route # and Name	From:	To:	Recommended Improvement	Projected Cost	Previous Funding	Additional Funding Required	Comments
#24	NA	*Route 634 Hardy Road	Niagara Road	ECL Vinton	5 Lane	$5,516,000	$4,440,000	$1,076,000	Contains bicycle lanes in both directions and curb/guttering with sidewalk.
#25	2	Route 24 Virginia Avenue	ECL City of Roanoke	Pollard	Urban 6 Lane	$4,608,000	$0	$4,608,000	Add or repair sidewalks where feasible
#26	4	Walnut	WCL Vinton	Lee	Upgrade to Urban 2 Lane with bicycle lanes, curb/guttering and sidewalks	$2,112,000	$0	$2,112,000	"Tinker Creek Greenway" trail head is just over WCL Vinton in the City of Roanoke. Bicycle Lanes and Sidewalks will help facilitate connections to the regional greenway system.
#27	4	Lee	Walnut	Pollard	Realign Intersection and upgrade to Urban 2L including sidewalks where necessary	$282,000	$0	$282,000	Connects to several activity centers including farmer's market, outdoor concert stage and post office. Pedestrian and Bicycle safety accommodations are integral to this project. - Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan
#28	4	Route 24 Washington Avenue	By Pass Road	Route 654 (Feather Road)	PE Only	$1,758,141	$0	$1,758,141	PE Only - See corresponding project in "Vision List" for additional stages of project. - *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan.*
#29	NA	Miscellaneous spot, bridge and other improvements				$1,100,000	$0	$1,100,000	May contain spot improvement items that are currently in 6 Year Plan/ TIP. - *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan.*
							Total Additional Funding Needs:	$10,936,141	
							Projected Funding Available:	$10,936,141	

* Denotes project obligated in current Six Year Plan

** Contains Funding for non-regionally significant spot, bridge, intersection and similar type improvements.

County of Roanoke Secondary System - Financially Constrained List

Map #	EJ Index Score	Facility Route # and Name	From:	To:	Recommended Improvement	Projected Cost	Previous Funding	Additional Funding Required	Comments
#30	NA	* 601 Hollins Road	Rte 115	0.59 mi S Rte 627	Add Lanes, Rebuild 2 Lanes	$8,793,000	$8,474,940	$318,060	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#31	NA	*613 Merriman Road	0.1 Mi. S Starkey Road (Rte 904)	Rte 1640	PE and RW	$3,677,300	$450,311	$3,226,989	PE Only - *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#32	NA	*688 Cotton Hill Road	0.09 mi S Rte 221	0.15 mi S Rte 934	Rebuild 2 lanes	$2,936,900	$1,162,180	$1,774,720	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan - Pedestrian and Bicycle Improvements Recommended in Regional Greenways Master Plan*
#33	NA	*720 Colonial Avenue	0.04 mi W Rte 687	Rte 419	Rebuild 2 lanes	$3,605,540	$2,092,767	$1,512,773	Design to accommodate paved shoulders - paved shoulders are not currently to be "offically" designated bicycle lanes. - Pedestrian and Bicycle Improvements Recommended in Regional Greenways Master Plan
#34	NA	*720 Colonial Avenue	Rte 419	Rte 681	PE Only	$950,000	$0	$950,000	PE Only - Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan - Pedestrian and Bicycle Improvements Recommended in Regional Greenways Master Plan
#35	NA	*634 (Hardy Road)	Vinton CL	0.01 Mi E Route 654	PE Only	$750,000	$0	$750,000	Vinton section has bicycle lanes; Industrial park in area; some ROW being acquired for industrial park; BR Parkway passes over section - Pedestrian and Bicycle Improvements Recommended in Regional Greenways Master Plan - Could connect into existing Wolf Creek Greenway
#36	NA	*679 Buck Mountain Road	0.15 Mi E. Rte 220	0.04 Mi E. Rte 678	Reconstruct 2 lanes and intersection with 220	$4,731,590	$1,482,000	$3,249,590	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#37	4	679 Buck Mountain Road	Starkey Road (Rte 904)	Route 220	Urban 2 Lane	$2,954,000	$0	$2,954,000	Proposed development in area; BR parkway in area; change to Urban designation on whole section
#38	1	613 Merriman Road	0.1 Mi. S. Rte 904	Rte 1640	Urban 2 Lane	$5,000,000**	$0	$5,000,000	PE and RW in 6-year plan see above
#39	1	634 Hardy Road	Vinton CL	0.01 Mi E Route 654	Urban 4 Lane with Bicycle Lanes	$7,566,000	$0	$7,566,000	Vinton section has bicycle lanes; Industrial park in area; some ROW being acquired for industrial park; BR Parkway passes over section - Pedestrian and Bicycle Improvements Recommended in Regional Greenways Master Plan - Could connect into existing Wolf Creek Greenway

#40	4	904 Starkey Road	Rte 613	Rt. 633	Urban 4 Lane	$11,676,000	$0	$11,676,000	Lots of industry and residential development in area - *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#41	**10**	**625 Hershberger**	**Roanoke CL**	**Rte 115**	**Urban 3L (2 lanes + TWTL or turn lanes as appropiate)**	**$4,838,000******	**$0**	**$4,838,000**	**Attemp to match possible City of Roanoke recommendation for their portion. - *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan***
#42	1	720 Colonial	Rte 419	Rte 681	Urban 3L (2 lanes + TWTL or turn lanes as appropiate)	$5,000,000	$0	$5,000,000	*PE in 6 Year Plan see above -Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan - Pedestrian and Bicycle Improvements Recommended in Regional Greenways Master Plan*
#43	4	682 Garst Mill	Brambleton	Grandin	Urban 3L (2 lanes + TWTL or turn lanes as appropiate)	$6,886,000****	$0	$6,886,000	Residential, rough terrain; 4L would not fit in corridor; decrease to 1 through lane in each direction with CTL. - Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan - Pedestrian and Bicycle Improvements Recommended in Regional Greenways Master Plan (Mudlick Greenway).
#44	NA	Miscellaneous Spot, Bridge and Intersection Improvements** *				$7,799,590	$0	$8,253,792	Miscelanous spot, bridge, intersection, ITS and/or other improvements. May also contain spot improvements that are listed in the current 6year Plan/ TIP

* Denotes project obligated in current secondary Six Year Plan	**Total Additional Funding Needs:**	$63,955,924
**Costs revised using Roanoke County Six Year Plan	**Projected Funding Available:**	$63,955,924

Project Estimate Minus PE Cited in 6-Year Plan

****Costs revised from 4 lane estimate to reflect reduced amount of ROW needed.

County of Botetourt Secondary System - Constrained List

Map #	EJ Index Score	Facility Route # and Name	From:	To:	Recommended Improvement	Projected Cost	Previous Funding	Additional Funding Required	Comments
#45	NA	Route 605*	Rte 654	0.15 mi W Alt 220	Rebuild 2 lanes	$3,091,877	$2,417,659	$674,218	
#46	NA	Route 779 (Catawba Road)*	0.19 Mi W. Rte 672 E.	0.21 Mi. E. Rte. 672 E	Add Turn Lanes, Rebuild 2 Lanes, New Bridge	$3,001,000	$1,319,000	$1,781,000	Project may have a positive impact on safety. *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#47	1	Route 779 (Valley Road)	Route 220	Route 11	Realign ROW Intersection Improvements	$2,100,000	0	$2,100,000	Project may have a positive impact on safety. *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#48	3	Route 779 (Catawba)	Route 220	Route 672 (Etzler Road)	Upgrade to Rural 2 Lanes	$2,461,000	0	$2,461,000	Project may have a positive impact on safety and freight movements. *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan.*
#49	1	Route 605 (Coaling Road)	Alternate 220	Route 652	Rural 2 Lane 20'	$1,134,000	0	$1,134,000	*Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan*
#50	1	Route 652 (Mountain Pass Road	Rte 658	Rte 11	Reconstruct to Rural 2L 24'	$5,513,000	0	$5,513,000	
#51	3	Route 654 (Read Mountain Road)	Alternate 220	Route 11	Upgrade to Rural 2 Lanes	$2,255,000	0	$2,255,000	Project may have a positive impact on safety and freight movements. *Bicycle Accomodations Recommended in 1997 Regional Bikeway Plan.*
#52	NA	Miscellaneous Spot, Bridge and Intersection Improvements** *			Miscellaneous spot improvements	$4,808,005	N/A	$4,606,351	May contain various bridge and other spot improvements that are listed in the current 6-Year Plan/ TIP
							Total Additional Funding Needs:	$20,524,569	
							Projected Funding Available:	$20,524,569	

* Denotes project obligated in current secondary Six Year Plan

** Contains Funding for non-regionally significant spot, bridge, intersection and similar type improvements.

County of Bedford Secondary System - Constrained List

Map #	EJ Index Score	Facility Route # and Name	From:	To:	Recommended Improvement	Projected Cost	Previous Funding	Additional Funding Required	Comments
#53	2	Route 634 (Hardy Road)	Roanoke Co. CL	East Study Area Boundary (Route 619)	Rural 4 Lane - PE and ROW ONLY	$2,825,146	$0	$2,825,146	Bicycle lanes could be added to match Roanoke County and Town of Vinton Recommendations. PE and ROW ONLY
							Total Additional Funding Needs:	$2,825,146	
							Projected Funding Available:	$2,825,146	

* Denotes project obligated in current secondary Six Year Plan

** Contains Funding for non-regionally significant spot, bridge, intersection and similar type improvements.

Concerns

It should be noted that this environmental justice evaluation does not consider impacts felt across a community by larger transportation projects. Indeed, a project could, and usually does, impact a larger area than the block group or Census tract that it borders or traverses. For instance, larger transportation projects, such as Interstate 81, will undoubtedly impact a region greater than is contained within the MPO's service boundary. Therefore, this document should be never be construed as saying that any project, regardless of its index score, will have no impact upon minority or low-income residents. Impacts cannot be fully determined until detailed, project-level analyses are conducted through the NEPA process. This document is useful in that it can serve as an early warning system prior to the detailed environmental analyses that will follow for all transportation projects.

Future Directions/Recommendations

Environmental Justice evaluations performed at the regional scale for long range planning documents have a definite purpose in that they serve to warn of potential environmental justice issues before project-level environmental analysis begins.

Initial environmental justice evaluations performed in the long range planning process can set the stage for further work and analysis in the NEPA (National Environmental Policy Act) process of each individual project.

Staff will continually research the different methods for assessing compliance with environmental justice, specifically regarding the issues of identifying and weighing benefits versus burdens. Once this issue is resolved, an indication of a general benefit or burden can be considered for each project in addition to the sensitivity of its surrounding, immediate area.

Furthermore, it is expected that this methodology will evolve over time as comments are received from stakeholders, elected officials, administrative officials, the Community Advisory Committee (CAC), the Transportation Technical Committee (TTC), the MPO Policy Board, and other members of the RVAMPO community. The basic groundwork laid here in this document will be applied to future long range plans to assist VDOT personnel in prioritizing projects for the NEPA process.

The staff of the RVARC and RVAMPO will continue to abide by federal guidance regarding environmental justice and public involvement. Additionally, staff will strive to not only meet but exceed expectations to incorporate environmental justice concerns into long range planning documents, such as the Constrained Long Range Plan and the Transportation Improvement Program.

Chapter 10:

Next Steps

Goal 1: Document Assumptions and Decisions

Goal 2: Serve as a starting point for the next long-range plan update

Overview:

As the Federal Highway Administration is actively encouraging and supporting scenario planning, the RVAMPO will attempt to incorporate scenario planning in the next Long Range Transportation Plan Update. Scenario planning can help citizens, businesses, and government officials understand the impacts of transportation decisions on environmental and economic development issues throughout the Roanoke Valley.

Scenario planning is an augmentation of, not a replacement for, the traditional transportation planning process. This process enables communities and transportation agencies to better prepare for the future. Scenario Planning highlights the major forces that may shape the future and identifies how the various forces might interact, rather than attempting to predict one specific outlook. As a result, the RVAMPO is prepared to recognize various growth scenarios in order to make more informed decisions in the present and be better able to adjust and strategize to meet tomorrow's needs.

Background of Scenario Planning in the Transportation Planning Process

Transportation planning decisions are based on a strong, well-funded planning process that shapes decisions. Transportation planning first appeared in federal transportation legislation 43 years ago, with the Federal-Aid Highway Act of 1962. This legislation requires that all Metropolitan regions, including the RVAMPO, adopt long-range transportation plans for entire urban areas and for multiple modes of transportation in order to receive federal funding. The planning required under the Act is to be "continuing, comprehensive, and cooperative" and is commonly referred to as the 3-C planning process.

Over the years, the emphasis on effective transportation planning has been strengthened, through legislation, Federal funding, and guidance and technical assistance from FHWA and the Federal Transit Administration. This has led to the development of regional long-range transportation plans for each metropolitan region. Plans are based on projecting demographic, housing, employment and other conditions 20 years into the future. Public involvement, financial feasibility, conformity with air quality standards, consideration of the environment, and inter-modal coordination are all key requirements for transportation planning.

Scenario Planning will enhance RVAMPO's regional planning process by making stakeholders aware of changing factors such as population growth, immigration, economic indicators, and aging of the population. Scenario Planning also enables participants to consider alternative approaches to shaping their future, especially in regards to land use, environmental, and transportation policies. Public participation is essential to encourage collaborative assessments that predict the Roanoke Valley's future needs and desires. Scenario Planning allows the RVAMPO to realistically evaluate a wider variety of potential futures and determine what the community wants the future to look like.

Scenario Planning Steps

The basis of scenario planning is that it is better to predict the future vaguely right than to predict the future clearly wrong. Rather than planning for one definitive scenario of the future, scenario planning will allow the RVAMPO to consider various possibilities and identify policies that can adapt to changing circumstances.

The Federal Highway Administration provides the following outline for incorporating the scenario planning process into long-range transportation plans:

The first step is to identify the quality of life issues facing the region. This information provides the foundation for developing various scenarios. Planners, working in close coordination with community leaders, businesses, local officials, the public and other stakeholders, should develop scenarios thru the following process:

Research the driving forces. Define the major sources of change that impact the future. These forces can be either predictable or not predictable elements. Some of the relatively predictable elements are local demographics, trends in local land use consumption, levels of congestion, mode split, etc. Less predictable are macro elements such as the world economy, future availability of infrastructure funding, global environmental conditions and technological innovation. There are many other driving forces, which are uncertain. Narrowing down those driving forces will be helpful in advancing a scenario planning process.

Determine patterns of interaction. Consider how the driving forces could combine to determine future conditions. To determine the patterns of interaction between driving forces, a matrix can be developed. On a matrix these driving forces can be identified as either having a positive or negative outcome and their relationship to a dichotomy of potential future worlds can be further examined. For example, if we use economy as a driving force, we can label it as having either little or no growth or fast growth. In determining the interaction of each of the future conditions, scenarios can be created.

Create scenarios. In generating scenarios, planners should think through the implications of different strategies in different future environments. The goal is to bring life to the scenarios in a way that community stakeholders can easily recognize and connect the various components. Basic stories are created, based upon the interaction of drivers described in the previous step. In turn these drivers affect the development of new scenarios and new decisions or policies made to

address changing conditions based on local factors. Scenarios might challenge existing thought patterns.

Analyze their implications. Ultimately, scenario planning is a technique for better decision making, not only about transportation but also about land use, public investment, and environmental policies. The scenarios enable planners to explore the shape and nature of transportation within a variety of circumstances, using a range of tools. Scenario-planning software tools can be used to present scenarios visually. The visualization of the interaction among the forces in each scenario can provide the public and decision makers with information on the consequences of potential actions. The use of graphic visual information assists in helping the public understand the potential impacts of scenarios.

Evaluate Scenarios. The devised scenarios are measured against each other by comparing indicators relating to land use, transportation demographics, environment, economics, technology and other criteria. During large regional public meetings, graphical simulations of alternative scenarios can stimulate project understanding and decision-making among stakeholders, including the community, business representatives and local elected officials. Through this process the community can formulate reasoned responses and enhance its ability to respond to change.

Monitor indicators. Scenario Planning is an on-going process for a region. As the future unfolds, reality needs to be assessed compared to the selected scenarios.

Appendix - Chapter 6

Data Entry Spreadsheet

Data Entry														
Location	Geometric & Roadside Data					Traffic Operations Data					Parking Data		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	No. of Lanes (one direction)	Curb Lane Width (ft)	Bicycle Lane Width (ft)	Paved Shoulder Width (ft)	Residential Development (y/n)	Speed Limit (mi/h)	85th %tile Speed (mi/h)	AADT	Large Truck % (HV)	Right Turn % (R)	Parking Lane (y/n)	Occupancy (%)	Time Limit (minutes)

BCI & LOS Computations Spreadsheet

Bicycle Compatibility Index and Level of Service Computations												
Location	BCI Model Variables									Results		
Midblock Identifier (Route/Intersecting Streets, Segment Number, Link Number, Etc.)	BL	BLW	CLW	CLV	OLV	SPD	PKG	AREA	AF	BCI	Level of Service	Bicycle Compatibility Level
0	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
0	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
0	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
0	0	0.0	0.0	#DIV/0!	#DIV/0!	9	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!
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Regional Study Area Bicycling Network
Level of Service Grades and Scores, BCI and BLOS

Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
10th St. – Ferdinand to Campbell	D	B	3.49	2.16
10th St. - Campbell to Salem	D	C	4.15	3.47
10th St. - Salem to Loudon	D	D	4.21	3.51
10th St. - Loudon to Fairfax	E	D	4.65	3.86
10th St. - Fairfax to Orange	E	D	4.47	3.64
10th St. - Orange to Rugby	D	D	3.61	3.70
10th St. - Rugby to I-581 Overpass	D	D	3.61	3.70
10th St. - I-581 Overpass to Williamson Road	D	D	4.30	3.58
Route 24/Jamison Ave. - Elm to 6th	E	C	5.00	3.23
Route 24/Jamison Ave. - 6th to 13th	E	C	5.00	3.23
Route 24/Jamison Ave. - 13th to Dale	F	D	5.33	4.01
Route 24/Dale Ave. - Jamison to ECL Roanoke City	E	D	5.26	3.99
Route 24/Virginia Ave. - WCL Vinton to Pollard	F	D	5.46	3.98
Route 24/Virginia Ave. - Pollard to Clearview	E	D	5.13	3.86
Route 24/Hardy Road (634) - bike lane	C	C	3.41	3.25
Route 18/S. Carpenter Dr. - Edgemont Dr. to East Gordon St.	E	D	4.41	3.52
Route 18/S. Carpenter Dr. - East Gordon St. to S. Pitzer Ridge	D	C	4.27	3.41
Route 18/Indian Valley Rd. - S. Pitzer Ridge to SCL Covington	D	C	4.07	2.63
Route 18 - SCL Covington to 657	E	B	4.56	2.33
Route 18 - 657 to 614	E	B	4.53	1.74
Route 18 - 614 to 608	D	A	4.35	0.48
Route 18 - 608 to 607 Potts Creek	D	A	4.32	0.00
Route 18 - 608 Potts Creek to Craig County Line	D	A	4.07	0.00
Route 60 - US 220 to Covington ECL	D	C	3.54	3.16
Route 60 - Covington WCL to E I-64	D	F	3.71	5.99
US 220 - I-81 to 779 (Daleville)	D	D	4.39	3.70
311/Thompson Memorial - E. Main St. I-81	D	D	4.30	3.98
311/Thompson Memorial - I-81 to Catawba Valley Rd.	D	D	3.63	3.53
311/Catawba Valley Dr. - 419 to Catawba Creek Rd.	E	D	4.45	3.68
Route 311/Catawba Valley Dr. - Catawba Creek Rd. to Blacksburg Road	D	C	3.92	3.45
Route 311/Catawba Valley Dr. - Blacksburg Road to Craig County line	D	C	3.77	3.45
Route 311 - Craig County line	E	D	4.98	3.93
Route 419/Electric - Franklin Rd. to Ronaoke County line	F	D	7.42	4.45
Route 419/Electric - Roanoke County line to Starkey Road	F	D	7.42	4.45
Route 419/Electric - Starkey Rd. to Brambleton/US 221	D	B	4.41	1.63
Route 419/Electric - Brambleton to Salem City line	E	B	4.87	1.74
Route 419/Electric - Salem City line to Apperson/US 11	F	D	6.51	4.36
Route 419/Electric - Apperson/US 11 to Roanoke Blvd.	F	D	6.25	4.15
Route 419/Electric - Roanoke Blvd. to Alt US 60/Texas Street	E	D	5.31	4.35
Route 419/Electric - Alt US 60/Texas St. to US 460/E.Main	E	E	5.24	4.54
Route 419/Electric - US 460/E.Main to RCL	E	E	5.26	4.61
Route 419/Electric - RCL to I-81	E	E	5.26	4.61

Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
Route 419/Electric - I-81 to 311/Catawba Valley Dr.	E	D	4.90	4.44
US 460 - Wildwood Road to 4th Street	E	D	4.25	3.89
Route 629 - 1408 to Douthat State Park entrance	D	C	3.93	2.60
Route 629 - Douthat State Park entrance to Bath County Line	D	A	3.71	1.34
Route 779 - 311 to 600	D	C	3.50	2.63
Route 779 - 600 to Botetourt County Line	D	B	3.45	2.02
Route 779 - Botetourt County Line to 600	D	F	4.33	6.13
Route 779 - 600 to 672	E	F	4.65	6.94
Route 779 - 672 to 675	E	F	4.90	7.28
Route 779 - 675 to US 220	E	F	5.04	7.28
Apperson/11 - Salem ECL to 419/Electric Rd. (westbound)	E	D	4.80	4.80
Apperson/11 - Salem ECL to 419/Electric Rd. (eastbound)	E	D	5.18	5.18
Apperson/11 - 419/Electric Rd. to Colorado St. (westbound)	F	D	5.65	5.65
Apperson/11 - 419/Electric Rd. to Colorado St. (eastbound)	E	D	4.69	4.69
Apperson/11 - Colorado St. to College Ave. (westbound)	D	C	3.46	3.46
Apperson/11 - Colorado St. to College Ave. (eastbound)	D	C	3.95	3.95
Apperson/11 - College Ave. - Colorado St. to 4th St. (westbound)	C	A	2.54	2.54
Apperson/11 - College Ave. - 4th St. to Thompson Memorial (westbound)	C	A	2.77	2.77
Apperson/11 - Thompson Memorial to US 460/Main St.	D	B	3.68	3.68
Blue Ridge Parkway - Floyd County Line to US 220	D	B	3.59	1.56
Blue Ridge Parkway - US 220 to SR 24	D	B	3.59	1.56
Blue Ridge Parkway - SR 24 to Botetourt County Line	D	B	3.62	1.77
Blue Ridge Parkway - Botetourt County Line to US 221, US 460	D	B	3.62	1.77
Blue Ridge Parkway - US 221, US 460 to Bedford County Line	D	B	3.62	1.77
Brambleton - Ran Lyn to Crystal Dr.	F	F	5.54	6.00
Brambleton - Crystal Dr. to 419/Electric Rd.	F	F	5.79	5.84
Brambleton - 419/Electric Rd. to WCL/Wedgewood Dr. (northbound)	E	E	4.92	4.93
Brambleton - 419/Electric Rd. to WCL/Wedgewood Dr. (southbound)	E	E	4.77	4.81
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr.(northbound)	D	E	3.52	4.64
Brambleton - WCL/Wedgewood Dr. to Woodlawn Dr.(southbound)	D	D	3.45	4.30
Brambleton - Woodlawn Dr.to Montgomery Dr. (northbound)	D	C	3.49	2.80
Brambleton - Woodlawn Dr. to Montgomery Dr.(southbound)	C	A	2.80	0.58
Brambleton - Montgomery to Overland Dr. (northbound)	E	D	4.53	3.78
Brambleton - Montgomery to Overland Dr. (southbound)	D	D	4.37	3.66
Brambleton - Overland Dr. to Brandon Dr.	E	D	4.73	3.78
Buck Mountain Rd. - Starkey Rd. to 1960	E	E	4.66	4.59
Buck Mountain Rd. - 1960 to 917	E	E	4.58	4.62
Buck Mountain Rd. - 917 to Blue Ridge Parkway	E	E	4.88	4.58
Buck Mountain Rd. - Starkey Rd. to 1963	E	E	4.89	4.59
Colonial Ave. - Brandon to Wonju	D	C	3.61	3.25
Colonial Ave. - Wonju to Broadway	E	D	4.53	3.71
Colonial Ave. - Broadway to Persinger	C	B	2.63	1.74
Colonial Ave. - Persinger to Overland Dr. (westbound)	E	A	4.52	1.49
Colonial Ave. - Persinger to Overland Dr. (eastbound)	C	D	2.72	3.76
Colonial Ave. - Overland Dr. to Dogwood (westbound)	E	C	4.96	3.25

Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
Colonial Ave. - Overland Dr. to Dogwood (eastbound)	D	D	4.27	3.85
Colonial Ave. - Dogwood to to WCL	E	D	4.77	3.90
Colonial Ave. - WCL to 419/Electric Rd.	E	D	4.58	3.96
Colonial Ave. - 419/Electric Rd. to Penn Forest	D	D	4.14	3.60
Cotton Hill Rd. - Merriman Rd. to Shingle Ridge Rd. (northbound)	D	B	3.99	1.97
Cotton Hill Rd. - Merriman Rd. to Shingle Ridge Rd. (southbound)	D	B	4.14	2.26
Cotton Hill Rd. - Shingle Ridge Rd. to 889 (northbound)	D	B	4.09	2.30
Cotton Hill Rd. - Shingle Ridge Rd. to 889 (southbound)	D	B	4.16	2.44
Cotton Hill Rd. - 888 to US 221	E	C	4.43	3.15
Franklin Rd. - US 220 to Penarth Rd. (northbound)	D	C	4.21	2.60
Franklin Rd. - US 220 to Penarth Rd. (southbound)	D	D	3.57	3.94
Franklin Rd. - Penarth Rd. to US 220/Roy Weber Expressway	E	D	4.82	3.54
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (northbound)	E	C	5.21	3.37
Franklin Rd. - US 220/Roy Weber Expressway to Elm Ave. (southbound)	E	C	5.29	3.30
Garst Mill Rd. - US 221 S to Crest Hill Dr.	E	D	5.08	4.15
Garst Mill Rd.- Crest Hill Dr.to 1361	E	D	4.77	4.00
Garst Mill Rd. - SCL Roanoke City	E	D	4.61	3.91
Grandin Rd. - 419/Electric Rd. to Mudlick (northbound)	D	D	4.27	3.63
Grandin Rd. - 419/Electric Rd. to Mudlick (southbound)	D	D	4.12	3.53
Grandin Rd. - Mudlick to Beverly	D	D	4.37	3.62
Grandin Rd. – Beverly to Guilford (northbound)	C	B	2.93	2.05
Grandin Rd. – Beverly to Guilford (southbound)	D	C	3.53	2.77
Grandin Rd. - Guilford to Brandon (northbound)	C	C	3.38	2.61
Grandin Rd. - Guilford to Brandon(southbound)	C	C	3.38	2.61
Grandin Rd. - Brandon to Memorial (northbound)	E	C	4.49	2.93
Grandin Rd. - Brandon to Memorial (southbound)	D	C	4.04	3.21
Hardy Rd. (bike lane portion)	C	A	3.41	0.51
Hersheberger Rd. - Peters Creek to Cove Rd. (eastbound)	D	D	3.81	3.75
Hersheberger Rd. - Peters Creek to Cove Rd. (westbound)	D	D	4.22	3.87
Hersheberger Rd. - Cove Rd. to I-581 (eastbound)	F	D	5.40	3.83
Hersheberger Rd. - Cove Rd. to I-581 (westbound)	F	D	5.48	3.89
Hersheberger Rd. - I-581 to Rutgers (eastbound)	F	D	6.06	3.83
Hersheberger Rd. - I-581 to Rutgers (westbound)	F	D	6.06	3.83
Hersheberger Rd. - Rutgers to Williamson Rd. (eastbound)	F	D	5.89	3.91
Hersheberger Rd. - Rutgers to Williamson Rd. (westbound)	F	D	5.81	3.85
Hollins Rd. - NCL Roanoke SR 115 to Beaumont Rd. (northbound)	F	E	5.61	4.55
Hollins Rd. - NCL Roanoke SR 115 to Beaumont Rd. (southbound)	F	E	5.53	4.51
Hollins Rd. - Beaumont Rd. to Shadwell Dr. (northbound)	E	D	4.47	4.24
Hollins Rd. - Beaumont Rd. to Shadwell Dr. (southbound)	E	D	4.62	4.34
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (northbound)	D	D	3.86	3.74
Kessler Mill Rd. - E. Main St. to Forest Lawn Dr. (southbound)	C	C	3.02	2.76
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr.(norththbound)	D	D	4.05	4.14
Kessler Mill Rd. - Forest Lawn Dr. to Garst Dr.(southbound)	D	D	4.36	4.36
Kessler Mill Rd. - Garst Dr. to 311	D	D	4.36	4.36
King St. - Gus Nicks Blvd. To US 460	E	D	4.71	3.92

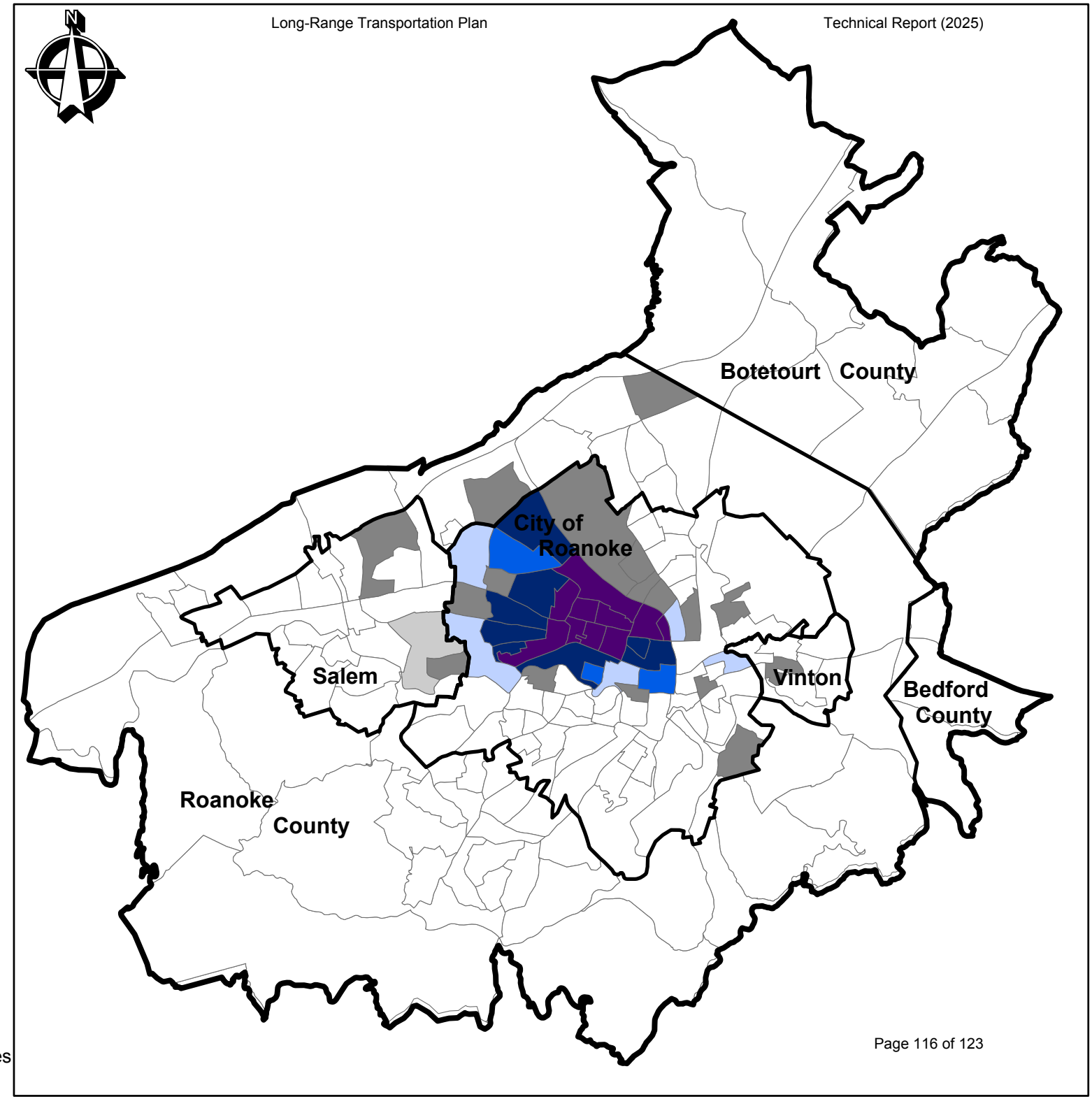
Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
Memorial Dr. - Grandin Rd. to Campbell Ave. (northbound)	C	B	3.28	2.05
Memorial Dr. - Grandin Rd. to Campbell Ave. (southbound)	C	C	2.78	3.09
Merriman Rd. - Franklin to Cotton Hill Rd.	C	B	3.06	1.95
Merriman Rd. - Cotton Hill Rd. to Blue Ridge PW	C	C	3.15	2.69
Merriman Rd. - Blue Ridge PW to Star Light	D	C	3.53	3.27
Merriman Rd. - Star Light to Starkey (northbound)	D	C	3.43	3.45
Merriman Rd. - Star Light to Starkey (southbound)	D	D	3.73	3.83
Merriman Rd. - Starkey Rd. to Chapparal	E	D	4.50	4.17
Merriman Rd. - Chapparal to 907	D	D	4.18	3.92
Merriman Rd. - 907 to Colonial Ave.	C	B	3.39	1.56
Old Cave Spring Rd. - Brambleton to McVitty (northbound)	E	D	4.54	3.66
Old Cave Spring Rd. - Brambleton to McVitty (southbound)	E	D	4.69	3.78
McVitty Rd. - Old Cave Spring to stream (northbound)	E	D	4.50	3.83
McVitty Rd. - Old Cave Spring to stream (northbound)	E	D	4.50	3.83
McVitty Rd. - stream to 419 (northbound)	E	D	4.58	3.89
McVitty Rd. - stream to 419 – (southbound)	E	D	4.58	3.89
Plantation Rd. - Liberty Rd. to Whiteside	E	D	4.60	4.18
Plantation Rd. - Whiteside to Hollins (northbound)	E	E	4.42	4.51
Plantation Rd. - Whiteside to Hollins (southbound)	D	D	4.04	4.07
Plantation Rd. - Hollins to NCL Roanoke	D	C	4.02	3.35
Plantation Rd. - NCL Roanoke Hershberger Rd.	D	D	3.69	3.66
Plantation Rd. - Hershberger Rd. to 1855	C	C	3.01	3.03
Plantation Rd. - 1855 to 834	C	C	3.07	3.07
Plantation Rd. - 834 to US 11	D	C	3.69	2.65
Plantation Rd. - US 11 to 1801 (northbound)	C	A	3.37	0.35
Plantation Rd. - US 11 to 180 (soutbound)	E	B	5.05	2.41
Riverland Rd. - Mt. Pleasant to 9th St.	E	E	4.93	4.56
Riverland Rd. - 9th St. to Whitman (westbound)	E	D	4.67	4.38
Riverland Rd. - 9th St. to Whitman (eastbound)	E	D	4.48	4.44
Riverland Rd. - Whitman to Piedmont St. (westbound)	D	C	3.80	3.25
Riverland Rd. - Whitman to Piedmont St. (eastbound)	E	D	4.87	4.05
Salem Ave. - 13th St. to 9th St. (eastbound)	D	B	4.21	2.03
Salem Ave. - 13th St. to 9th St. (westbound)	E	C	4.82	3.48
Salem Ave. - 9th St. to 5th St.(eastbound)	D	C	3.44	2.66
Salem Ave. - 9th St. to 5th St.(westbound)	E	C	4.71	3.29
Salem Ave. - 5th St. to 2nd St.(eastbound)	E	B	4.56	2.13
Salem Ave. - 5th St. to 2nd St.(westbound)	E	B	4.56	2.13
Salem Ave. - 2nd St. to Jefferson St.(eastbound)	E	B	4.62	2.07
Salem Ave. - 2nd St. to Jefferson St.(westbound)	E	B	4.93	2.07
Shenandoah Ave. - Williamson Rd. to 5th St. (westbound)	D	C	3.45	2.74
Shenandoah Ave. - Williamson Rd. to 5th St. (eastbound)	C	B	3.22	2.49
Shenandoah Ave. - 5th St. to 15th St. (westbound)	D	B	4.17	2.18
Shenandoah Ave. - 5th St. to 15th St. (eastbound)	D	C	3.94	2.99
Shenandoah Ave. -15th St. to 24th St. (westbound)	D	B	4.14	2.32
Shenandoah Ave. -15th St. to 24th St. (eastbound)	D	C	3.99	2.95

Road/Segment	BCI Grade	BLOS Grade	BCI Score	BLOS Score
Shenandoah Ave. - 24th St. to 30th St.	D	C	4.28	3.14
Shenandoah Ave. - 30th St. to Peters Creek (westbound)	D	D	4.29	4.02
Shenandoah Ave. - 30th St. to Peters Creek (eastbound)	D	D	4.37	4.09
Shenandoah Ave. - Peters Creek to ECL Salem (westbound)	D	D	4.12	3.75
Shenandoah Ave. - Peters Creek to ECL Salem (eastbound)	D	D	4.28	3.89
Shenandoah Ave. - ECL Salem to Easton Rd. (westbound)	E	D	5.19	3.93
Shenandoah Ave. - ECL Salem to Easton Rd. (eastbound)	F	D	5.34	4.06
Shenandoah Ave. - Easton Rd. to 419/Electric Rd.	F	D	5.72	4.00
Shenandoah Ave. - 419/Electric Rd. to Pearl St.	F	D	5.34	3.84
Shenandoah Ave. - Pearl St. to Texas St. (westbound)	E	C	4.77	3.41
Shenandoah Ave. - Pearl St. to Texas St. (eastbound)	E	C	4.69	3.41
Washington Ave. - ECL Vinton to Bypass Road	F	D	5.49	4.02
Washington Ave - Bypass Road to Pollard St.	F	D	5.49	4.02
Walnut Ave. - First St. to to Wise Ave.	D	C	4.39	3.28
Wise Ave. - Wise to Indian Village Ln.	D	D	4.26	3.53
Wise Ave. - Indian Village Ln. to 18th	D	D	4.26	3.81
Wise Ave. - 18th St. to Norfolk Ave.	D	D	4.34	3.85

Appendix - Chapter 9

2025 Long Range Transportation Plan

Map 1
Minority Concentrations (Non-Hispanic) By Block Group Within MPO 2025 Study Area



Legend

Race Component of EJ Index Score

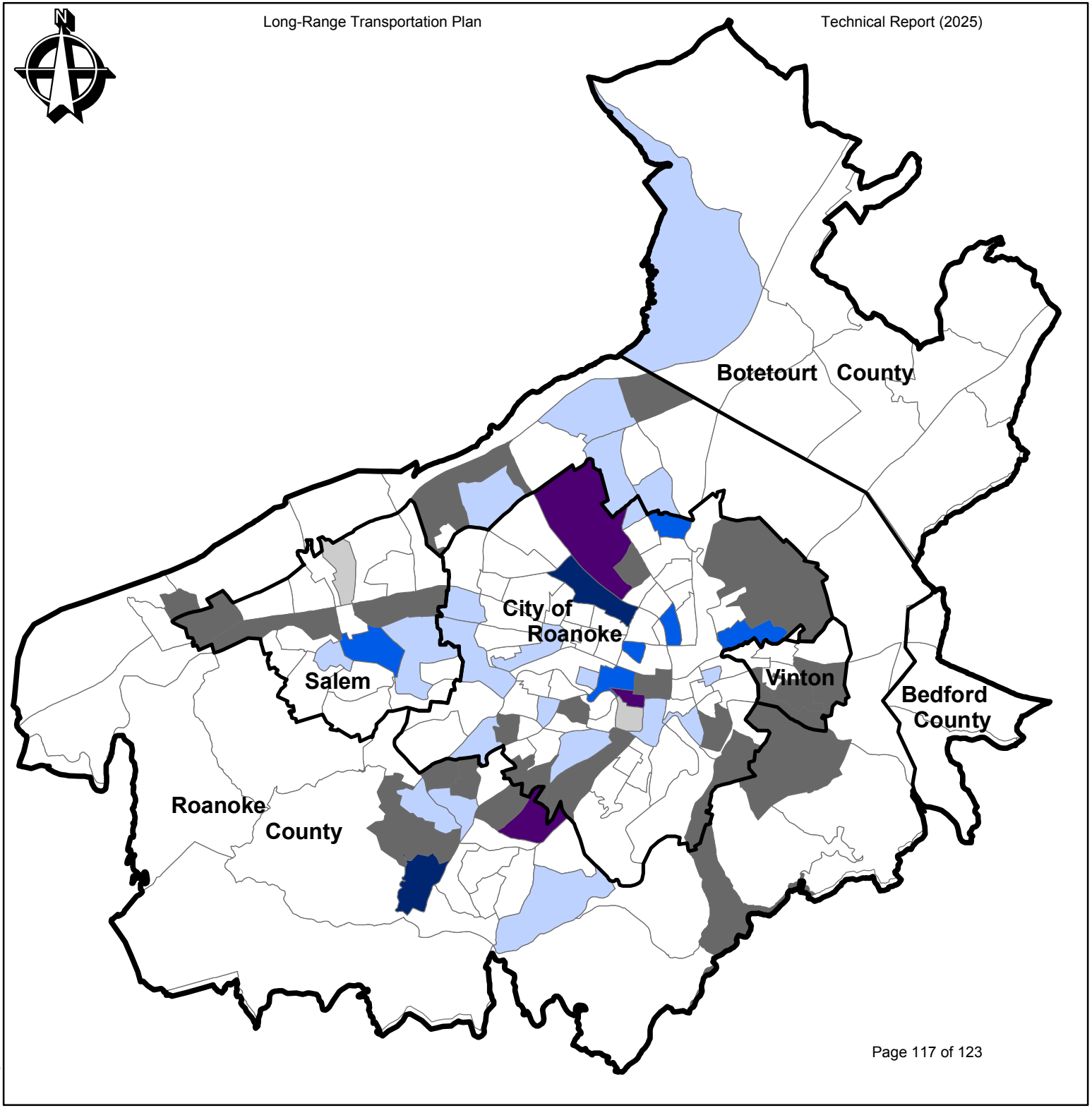
- 0
- 0.1 - 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.0 - 5.0
- Above 5

January 2006

0 1 2 4 6 Miles

2025 Long Range Transportation Plan

Map 2
Minority Concentrations (Hispanic) By Block Group Within MPO 2025 Study Area



Legend

Hispanic Component of EJ Index Score

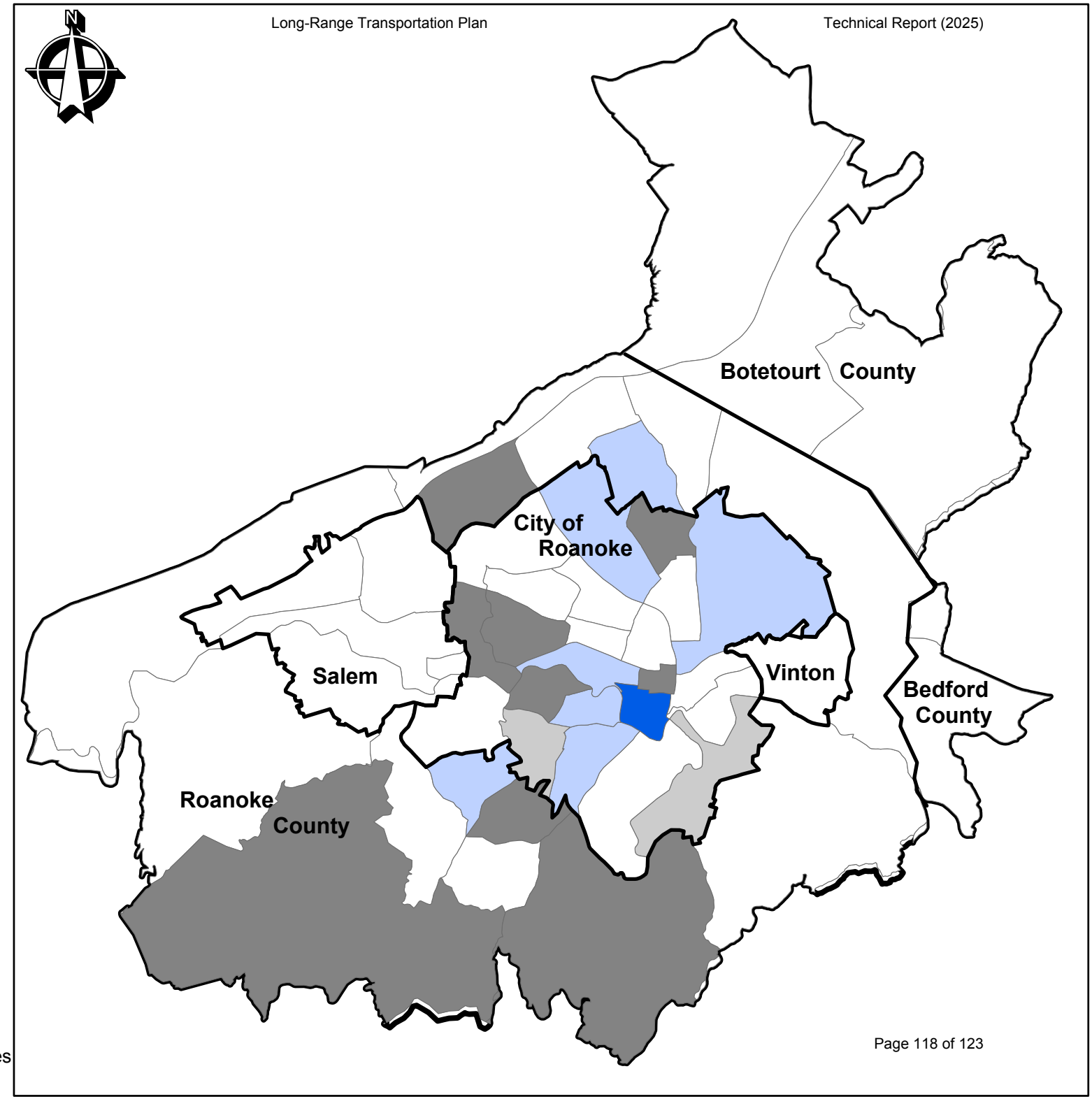
- 0
- 0.1 - 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- Above 5

January 2006

0 1 2 4 6 Miles

2025 Long Range Transportation Plan

Map 3
Limited English Proficiency Concentrations By Census Tract Within MPO 2025 Study Area



Legend

LEP Component of EJ Index Score

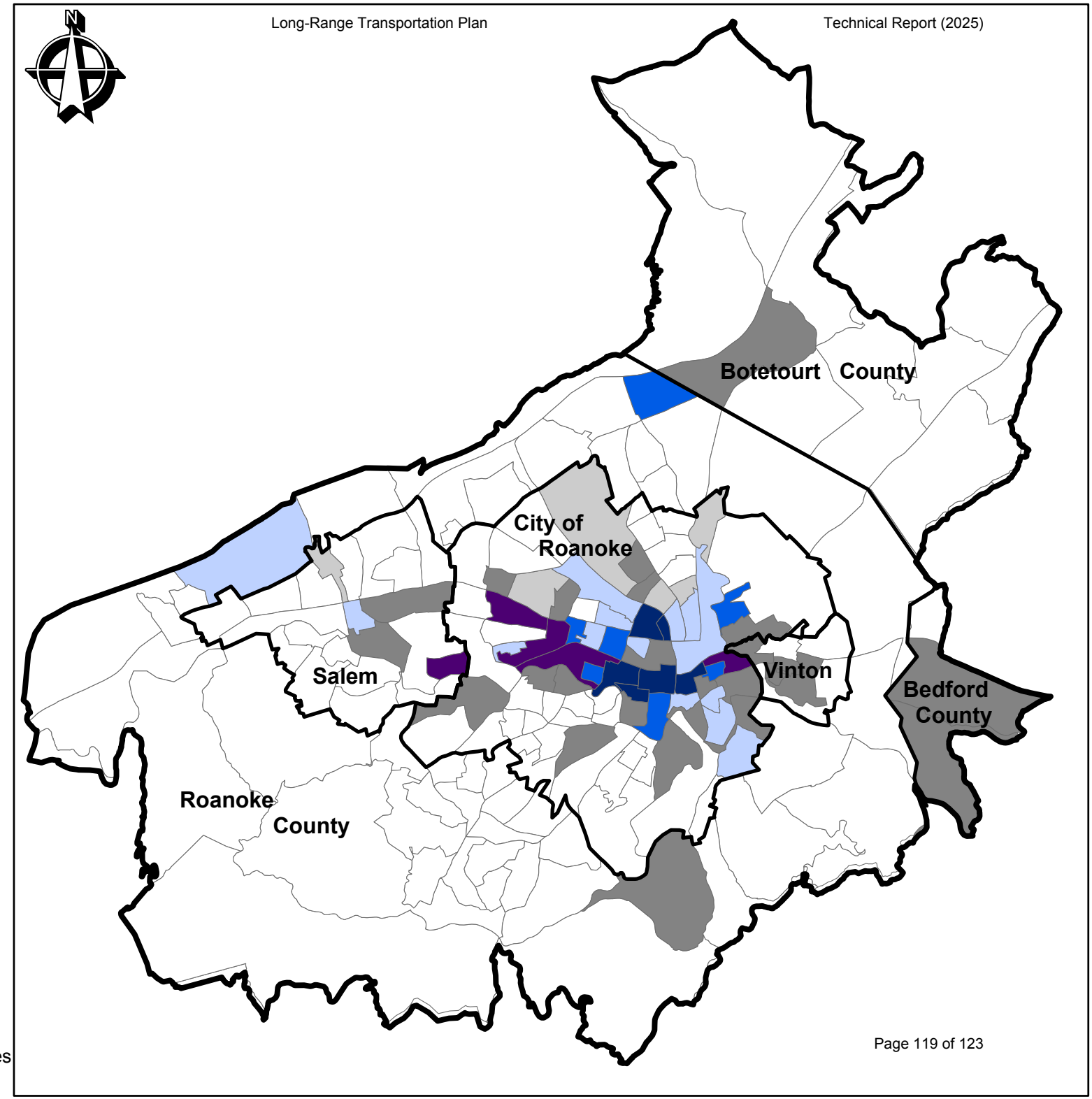
- 0
- 0.1 - 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- 5.1 - 6.0

January 2006

0 1 2 4 6 Miles

2025 Long Range Transportation Plan

Map 4
Poverty Concentrations By Block Group Within MPO 2025 Study Area



Legend

Poverty Component of EJ Index Score

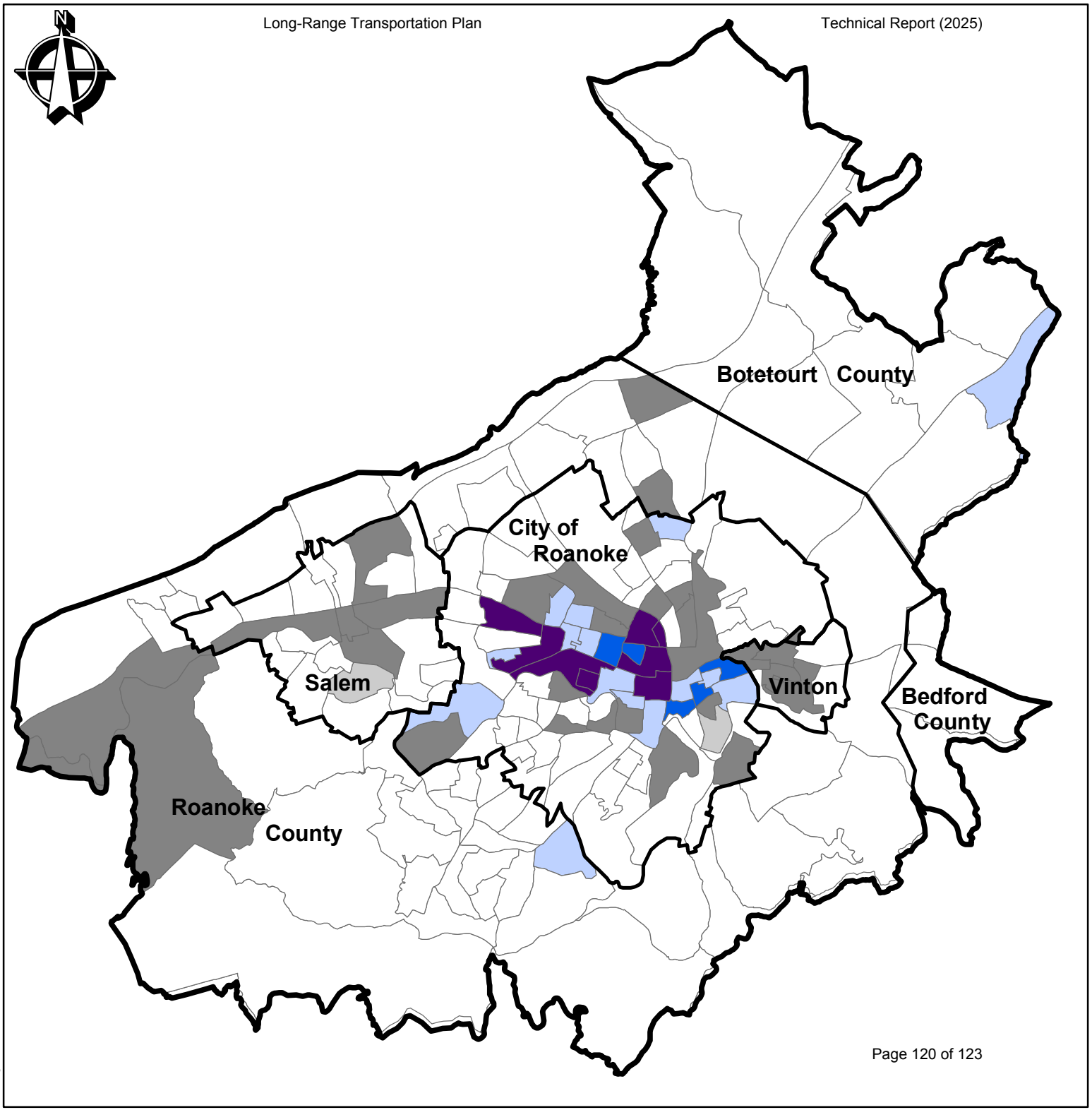
- 0
- 0.1 - 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- Above 5

January 2006

0 1 2 4 6 Miles

2025 Long Range Transportation Plan

Map 5
Concentrations of Households Without Vehicle Availability By Block Group Within MPO 2025 Study Area



Legend

Limited Mobility Component of EJ Index Score

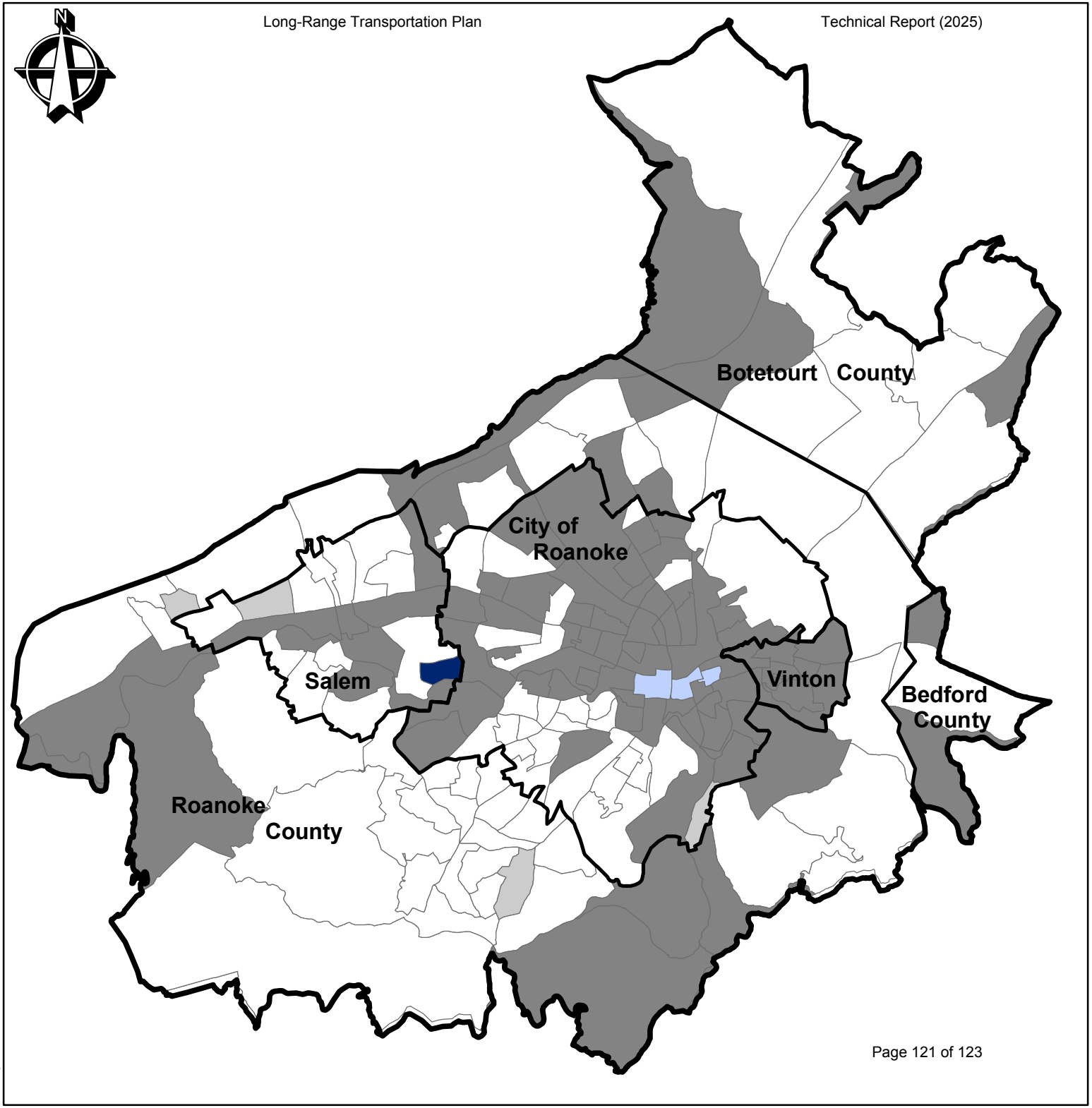
- 0
- 0 - 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- Above 5

January 2006

0 1 2 4 6 Miles

2025 Long Range Transportation Plan

Map 6
Concentrations of Disabled Individuals By Block Group Within MPO 2025 Study Area



Legend

Disabled Component of EJ Index Score

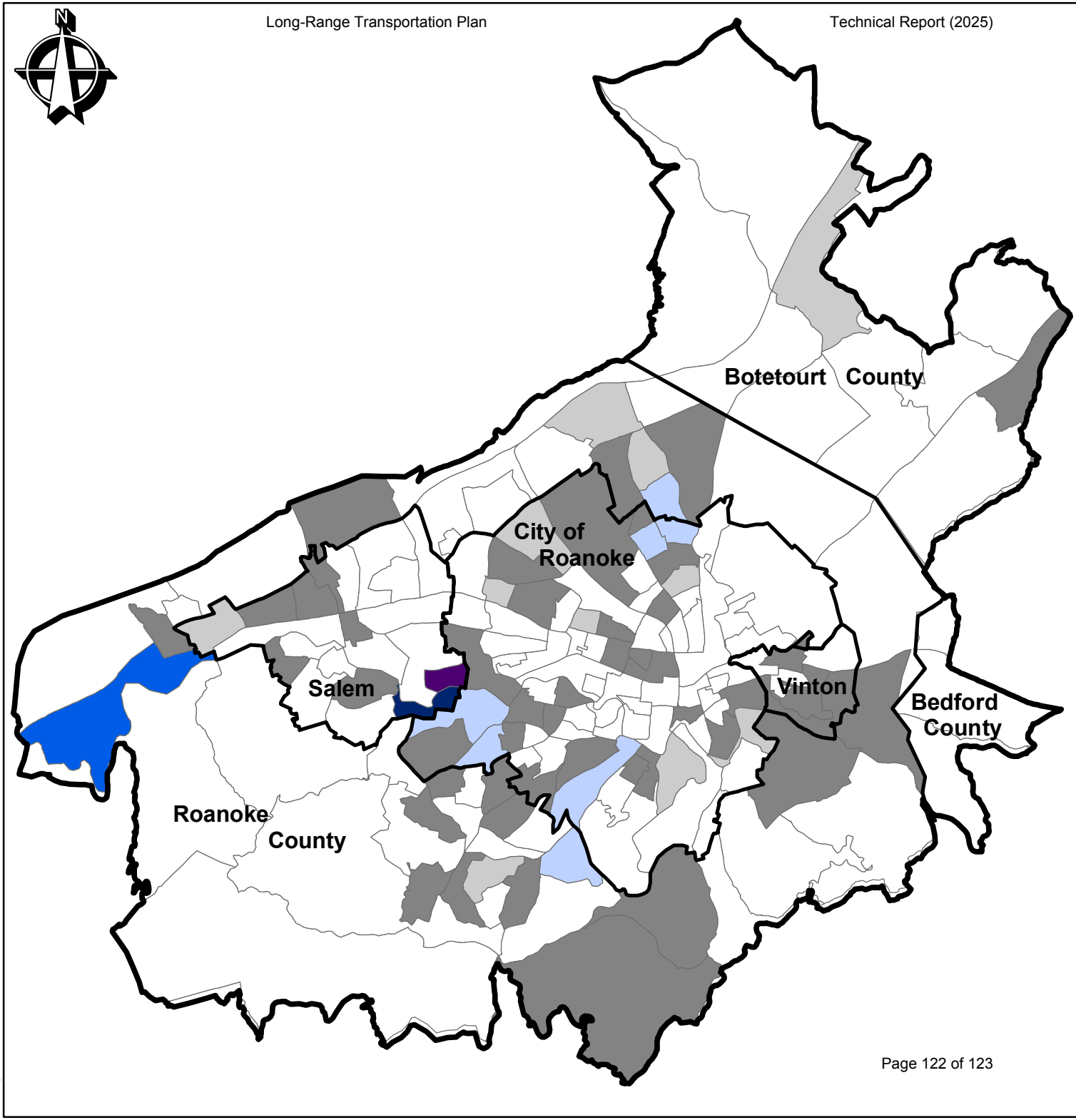
- 0
- 0.1 - 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- Above 5

January 2006

0 1 2 4 6 Miles

2025 Long Range Transportation Plan

Map 7
Concentrations of Elderly Individuals (Over 65) By Block Group Within MPO 2025 Study Area



Legend

Age Component of EJ Index Score

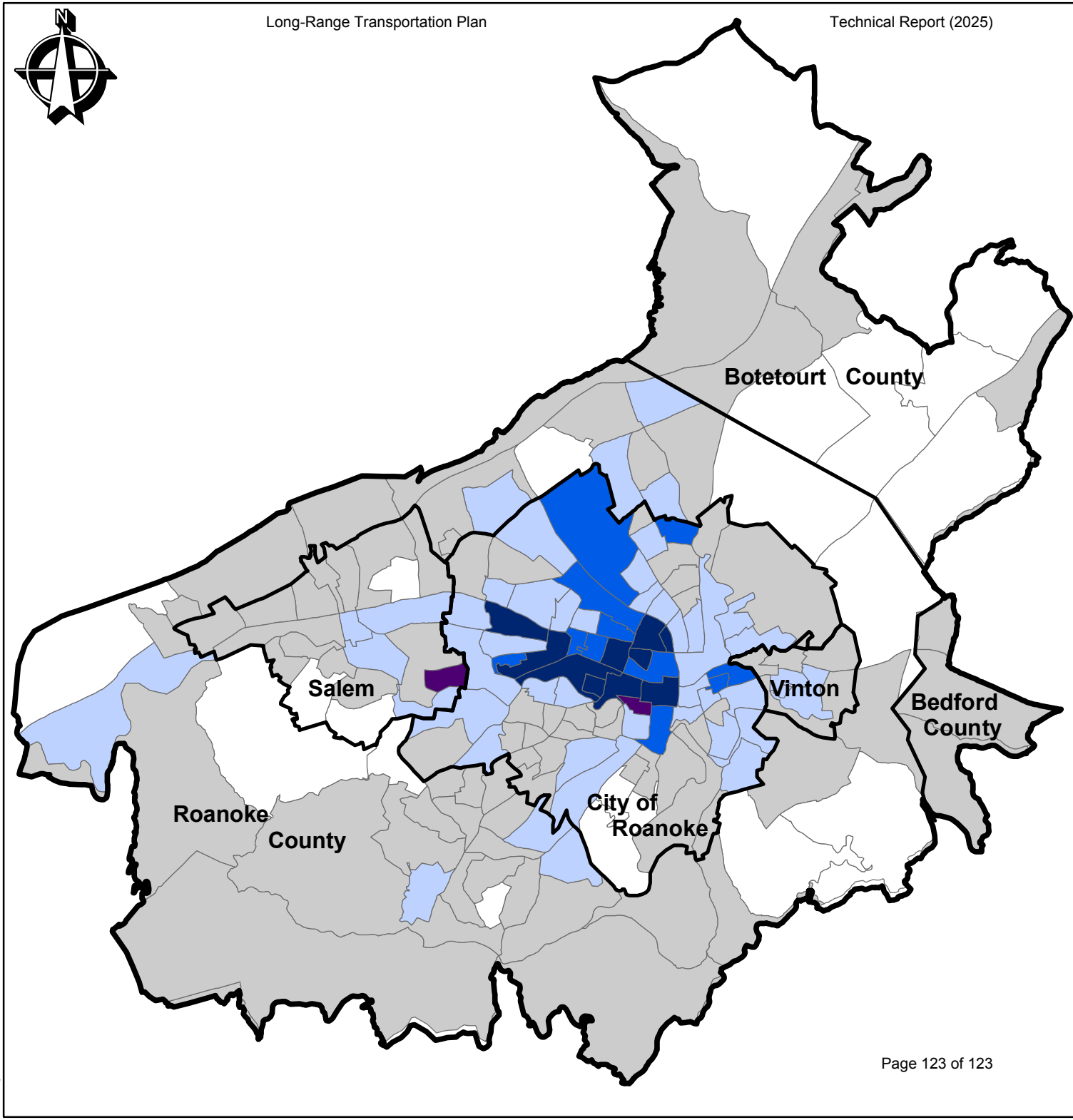
- 0
- 0 - 1.0
- 1.1 - 2.0
- 2.1 - 3.0
- 3.1 - 4.0
- 4.1 - 5.0
- Above 5

January 2006

0 1 2 4 6 Miles

2025 Long Range Transportation Plan

Map 8
EJ Index Score
By Block Group
Within MPO
2025 Study Area



Legend

EJ Index Score

- 0
- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25

January 2006

0 1 2 4 6 Miles