Chapter 3: Transportation Challenges

Congestion and Roadway Capacity

There are different ways of measuring congestion and roadway capacity in long range planning efforts. Two common metrics include: 1) performing volume-to-capacity analyses on the region's roadway networks, and 2) looking at how key intersections handle traffic. Both of these analyses were performed for this LRTP update and are described below. The methodologies and findings are described in more detail in Appendix D.

Roadway Capacity Analysis

The Central Virginia Metropolitan Planning Organization (MPO) utilizes a TRANPLAN highway network model, originally derived from Virginia Department of Transportation (VDOT) resources. The future year (2035) trend scenario network model was used as the main resource for identifying deficiencies, in conjunction with the projects and deficiencies previously identified in the 2030 Central Virginia Long Range Transportation Plan (LRTP), and input from the public and stakeholders.

Model attributes for traffic volume and highway capacity were compared and categorized into one of three groups:

Approaching capacity (volume/capacity is less than 0.9) –Volumes along these network links are not within 10% of the maximum hourly capacity for the facility. There may be infrequent traffic congestion during am or pm peak hours, typically related to a vehicle collision.

At capacity (volume/capacity is between 0.9 and 1.1) – Volumes along these network links are within 10% of the maximum hourly capacity for the facility. There may be intermittent traffic congestion during am or pm peak hours.

Over capacity (volume/capacity is greater than 1.1) – Volumes along these network links exceed the maximum hourly capacity for the facility. There is routine traffic congestion during the am or pm peak hours.

An analysis of volume over capacity (v/c) describes the quality of traffic service for a particular highway facility, which can then be mapped using Geographic Information System (GIS) software to identify patterns of deficiencies across the region.

In general, low v/c values (indicated by green on the following figures) indicate the roadway has capacity to carry vehicles and therefore less likelihood of congestion. Higher v/c values (indicated by yellow and red on the figures) indicate less capacity and a higher potential for congestion.
*Table 3-1 summarizes the number of lane miles (segment length * number of lanes) for each v/c category*

of the trend development scenario (2035) for both the AM and PM peak hours in the network model. Figures 3-1 through 3-4 display these patterns across the region, comparing the base year (2007) to the future year (2035) scenario in both the AM and PM peak hours.

2035 -AM		
AM Volume/Capacity	Lane Miles	%
Approaching Capacity	1,013	83%
At Capacity	102	8%
Over Capacity	102	8%
TOTAL	1,217	

2035 -PM		
PM Volume/Capacity	Lane Miles	%
Approaching Capacity	1,038	85%
At Capacity	100	8%
Over Capacity	80	7%
TOTAL	1,218	

Table 3-1: Volume over Capacity Categories for the AM and PM Peak Periods (2035)

Intersection Capacity Analysis

As a part of the LRTP process, a traffic operational analysis was conducted for 18 selected intersections in the Central Virginia region under existing peak hour conditions.

Study Intersections

The selected study intersections were chosen because they were experiencing traffic operational or safety deficiencies. These study intersections are listed as follows:

- Richmond Hwy (US Rt 60) & US Rte 29 SB Ramp
- Richmond Hwy (US Rt 60) & US Rte 29 NB Ramp
- Richmond Hwy (US Rt 60) & Dulwich Dr
- Union Hill Rd (Rt 659) & Dulwich Dr
- Virginia Byway (Rt 130) & Johns Creek Rd (Rt 676)
- Virginia Byway (Rt 130) & River Rd (Rt 685)
- Forest Rd (Rt 221) & Perrowville Rd (Rt 663)/Ashwood Park Rd
- Thomas Jefferson Rd (Rt 811) & Waterlick Rd (Rt 622)/Omni Pl
- Lynchburg Salem Turnpike (US Rt 460) & Thomas Jefferson Rd (Rt 811)/New London Rd
- Forest Rd (Rt 221) & Enterprise Rd (Rt 1415)/Vista Center Dr (Rt 1427)
- Timberlake Rd (Rt 460B) & Laxton Rd (Rt 1520)/Lowe's
- Timberlake Rd (Rt 460B) & Greenview Dr (Rt 739)/Hardee's
- Timberlake Rd (Rt 460B) & Waterlick Rd (Rt 622)
- Wards Rd (Rt 163) & Candlers Mountain Rd (Rt 128)/Sheffield Dr
- Candlers Mountain Rd (Rt 128) & Ridge Field Mall/Murray Pl
- Candlers Mountain Rd (US Rt 501) & May Flower Dr (Rt 128)/Candlers Mountain Rd (Rt 670)
- Wards Rd (Rt 29) & Calohan Rd (Rt 685)/Commercial Entrance
- Richmond Hwy (US Rt 60) & Doss Rd (Rt 646)

Figure 3-1: Base Year 2007 V/C - AM Peak Hour

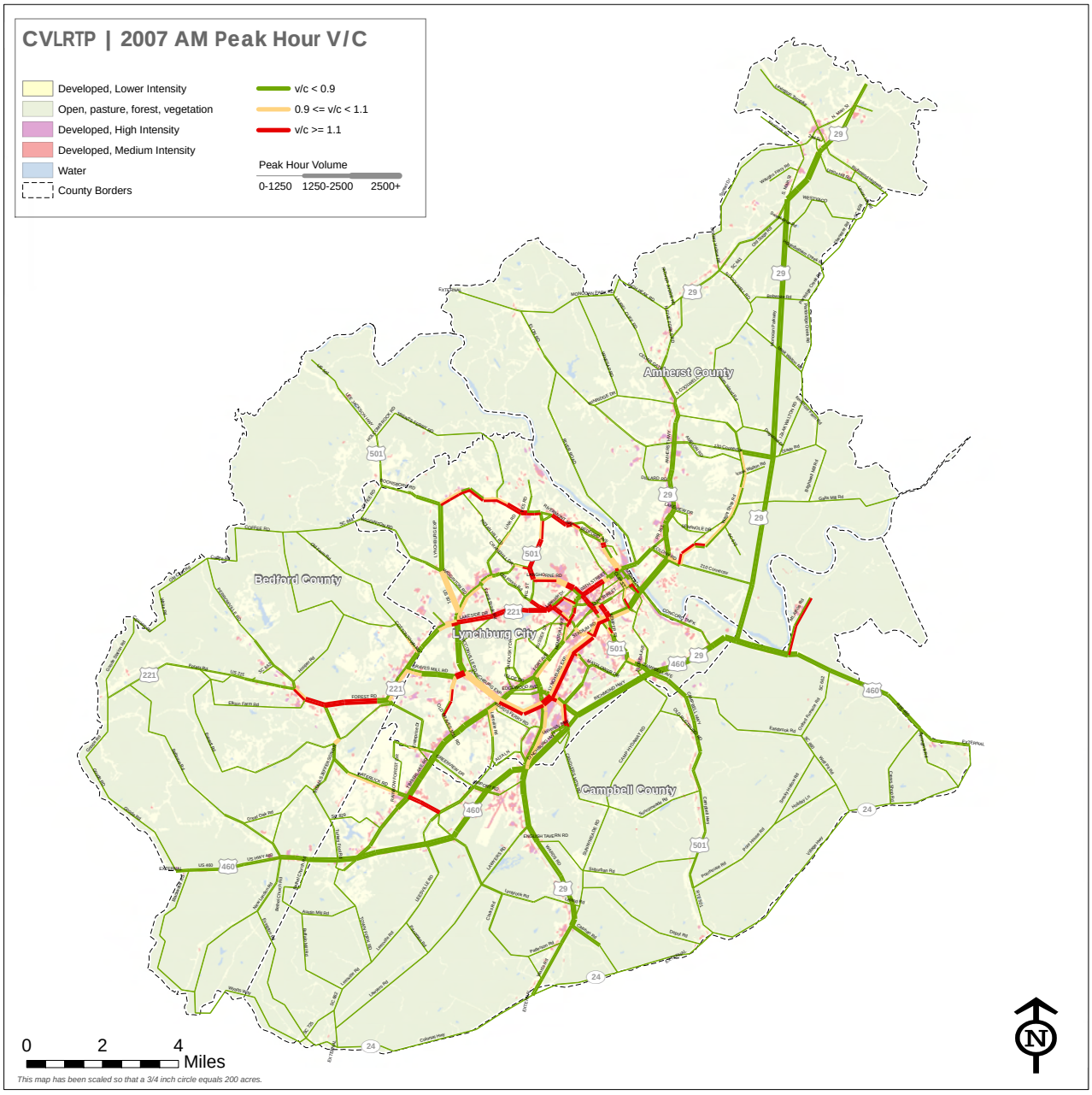


Figure 3-2: Base Year 2007 V/C - PM Peak Hour

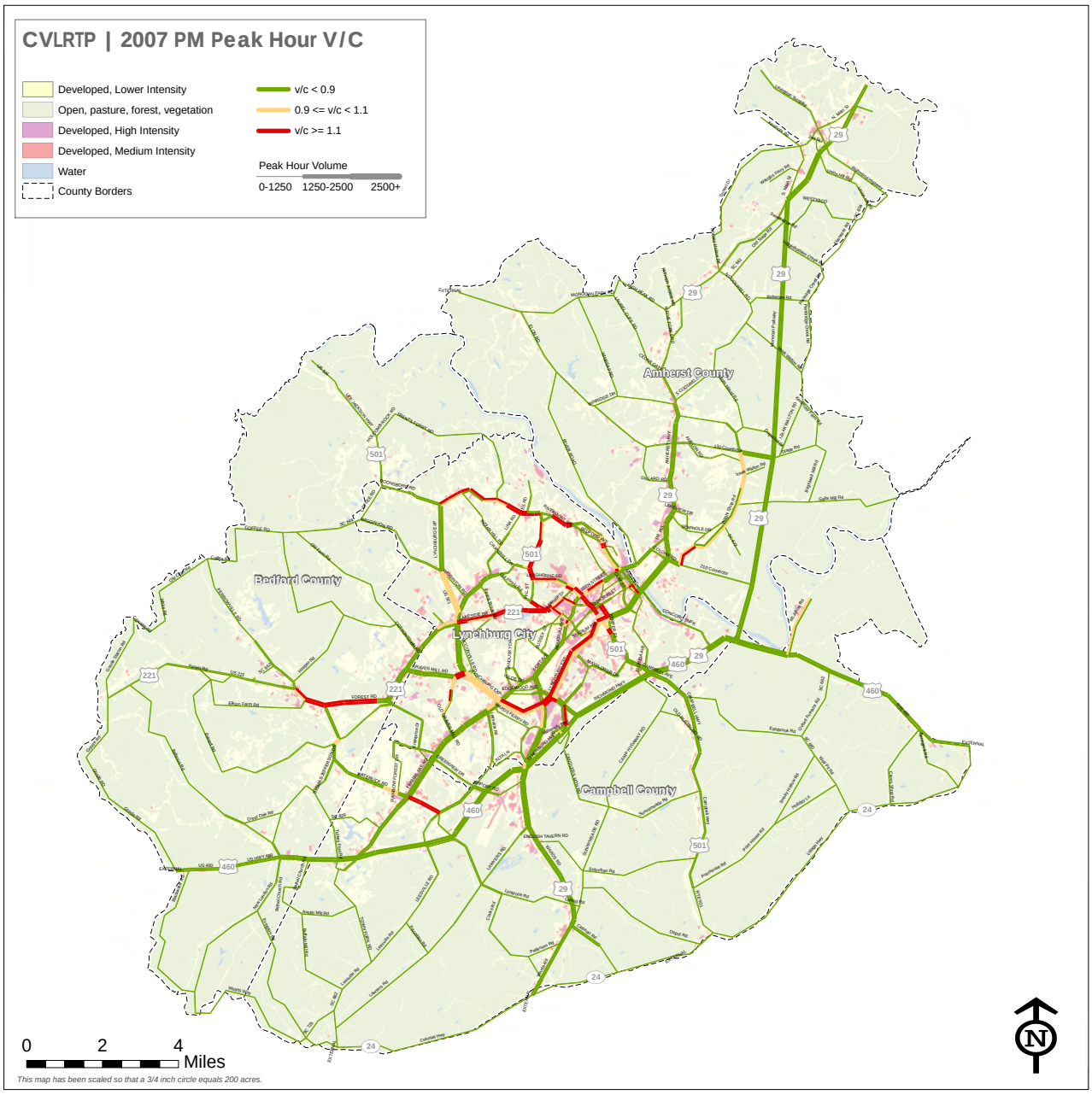


Figure 3-3: Base Year 2035 V/C - AM Peak Hour

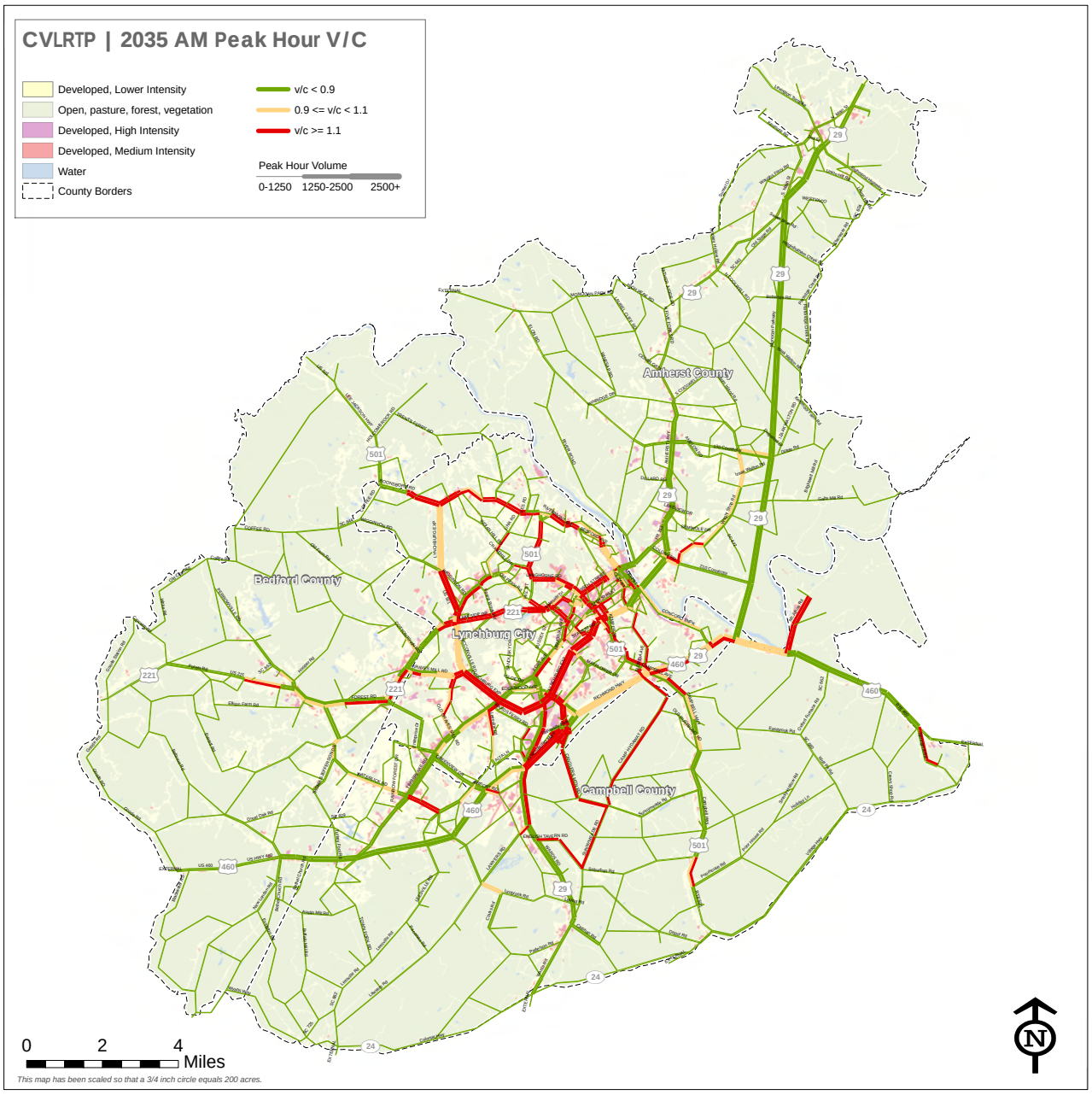
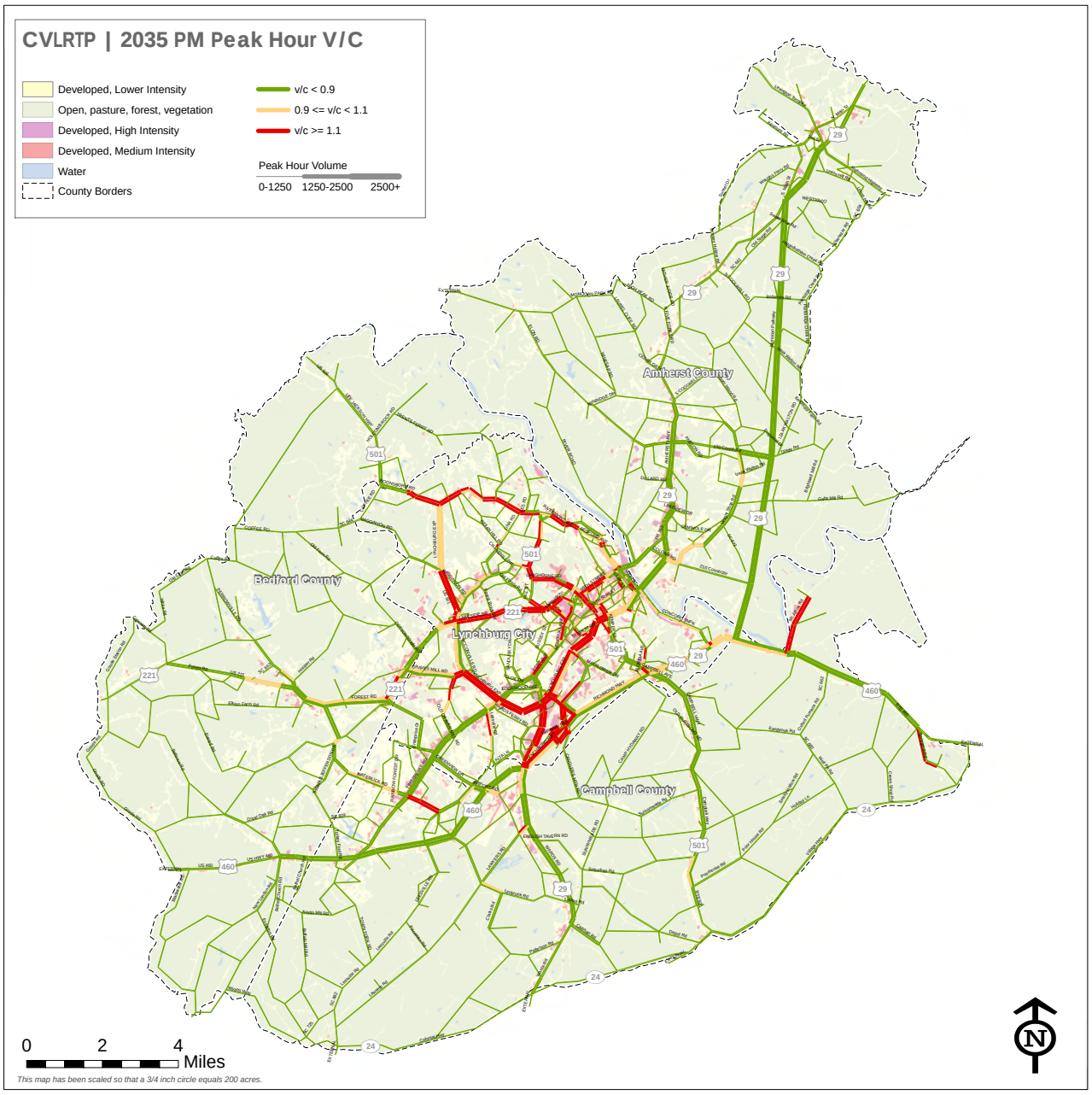


Figure 3-4: Base Year 2035 V/C - PM Peak Hour



Intersection Operational Analysis

Traffic operational analysis for the existing roadway geometrics and traffic volumes were performed for both morning and afternoon peak hour periods using Synchro plus SimTraffic (Version 7) and Highway Capacity Software (HCS+) software packages.

Peak hour level of service (LOS) measures the adequacy of the intersection geometrics and traffic controls of a particular intersection or approach for the given turning movement volumes. Levels of service range from A through F, based on the average control delay experienced by vehicles traveling through the intersection during the peak hour. Control delay represents the portion of total delay attributed to traffic control devices (e.g., signals or stop signs). The engineering profession generally accepts level of service D as an acceptable operating condition for signalized intersections in urban areas and level of service C for rural areas.

At unsignalized intersections, a level of service E is generally considered acceptable only when it is the side street that is encountering the delay, and when queuing is not excessive. Nevertheless, side streets sometimes function at level of service F during peak traffic periods, because the traffic volumes often do not warrant a traffic signal to assist side street traffic. Table 3-4 below provides a general description of the various LOS categories and delay ranges.

Table 3-4: Level of Service Descriptions for Intersections

Level of Service	Description	Signalized Intersection	Unsignalized Intersection
A	Little or no delay	<= 10 sec.	<= 10 sec.
B	Short traffic delay	10-20 sec.	10-15 sec.
C	Average traffic delay	20-35 sec.	15-25 sec.
D	Long traffic delay	35-55 sec.	25-35 sec.
E	Very long traffic delay	55-80 sec.	35-50 sec.
F	Unacceptable delay	> 80 sec.	> 50 sec.

Intersection Level of Service Analysis Results and Findings

Table 3-5 summarizes the existing intersection levels of service. In Table 3-5, the overall intersection level of service and worst movement level of service are provided.

Table 3-5 shows that the overall intersection levels of service for the majority of the study area intersections are LOS D or better, while some signalized intersections are suffering longer delays (worse than LOS D).

Table 3-5: Existing Level of Service at the Study Intersections

Intersection	Control	AM LOS	PM LOS
1. Richmond Hwy (US Rt 60) & US Rte 29 SB Ramp	Unsignalized	A (SB-B)	A (SB-B)
2. Richmond Hwy (US Rt 60) & US Rte 29 NB Ramp	Unsignalized	A (SB-B)	A (SB-B)
3. Richmond Hwy (US Rt 60) & Dulwich Dr	Unsignalized	A (NB-B)	A (NB-B)
4. Union Hill Rd (Rt 659) & Dulwich Dr	Unsignalized	A (SB-A)	A (SB-A)
5. Virginia Byway (Rt 130) & Johns Creek Rd (Rt 676)	Unsignalized	B (EB-B)	B (WB-B)
6. Virginia Byway (Rt 130) & River Rd (Rt 685)	Signalized	A (NB-B)	A (NB-B)
7. Forest Rd (Rt 221) & Perrowville Rd (Rt 663)/ Ashwood Park Rd	Signalized	B (WB-C)	B (WB-C)
8. Thomas Jefferson Rd (Rt 811) & Waterlick Rd (Rt 622)/Omni Pl	Signalized	B (SB-B)	A (SB-B)
9. Lynchburg Salem Turnpike (US Rt 460) & Thomas Jefferson Rd (Rt 811)/New London Rd	Signalized	B (SB-B)	B (SB-B)
10. Forest Rd (Rt 221) & Enterprise Rd (Rt 1415)/Vista Center Dr (Rt 1427)	Signalized	C (EB-D)	D (EB-D)
11. Timberlake Rd (Rt 460B) & Laxton Rd (Rt 1520)/Lowe's	Signalized	F (SB-F)	F (SB-F)
12. Timberlake Rd (Rt 460B) & Greenview Dr (Rt 739)/Hardee's	Signalized	F (SB-F)	F (SB-F)
13. Timberlake Rd (Rt 460B) & Waterlick Rd (Rt 622)	Signalized	F (SB-F)	F (WB-F)
14. Wards Rd (Rt 163) & Candlers Mountain Rd (Rt 128)/Sheffield Dr	Signalized	C (NB-C)	D (EB-E)
15. Candlers Mountain Rd (Rt 128) & Ridge Field Mall/Murray Pl	Signalized	F (SB-F)	F (SB-F)
16. Candlers Mountain Rd (US Rt 501) & May Flower Dr (Rt 128)/Candlers Mountain Rd (Rt 670)	Signalized	C (WB-F)	F (NB-F)
17. Wards Rd (Rt 29) & Calohan Rd (Rt 685)/ Commercial Entrance	Signalized	F (WB-F)	F (WB-F)
18. Richmond Hwy (US Rt 60) & Doss Rd (Rt 646)	Unsignalized	A (NB-D)	A (NB-D)

Major findings of this study include:

- Seven out of the 18 intersections (Intersections 1 – 6, 18) are stop-controlled intersections. Analysis shows all these intersections are operating with satisfactory levels of services. The worst approach is northbound Doss Road at Richmond Highway, which is operating at LOS D during both AM and PM peak hours under stop control; all other stop-controlled approaches are operating at LOS C or better.
- Five signalized intersections (Intersections 7, 8, 9, 10, and 14) are operating at acceptable levels of services (i.e., LOS D or better) during both the AM and PM peak hours.
- Five signalized intersections (Intersections 11, 12, 13, 15, and 17) are operating at failing LOS during both the AM and PM peak hours.
- Intersection 16, Candlers Mountain Road & Mayflower Drive, is operating acceptable in the AM peak hour but failing with a LOS F in the PM peak hour.
- Among the failing intersections, three intersections (11, 12, and 13) are located along a 1.5-mile stretch of Timberlake Road (Business Route 460), with intersection 13, Timberlake Road & Waterlick Road, experiencing extremely heavy delay during both the AM and PM peak hours.
- Intersection 15 is failing and has very heavy turning volumes due to its role as one of the two exclusive accesses points to a large shopping mall located between two major urban interchanges.
- Intersection 17 is failing due to extremely heavy through volume along Route 29, as well as heavy traversing volume between the north leg of Route 29 (Wards Road) and Route 685 (Calohan Road).

Roadway Safety

As a part of the LRTP process to identify roadway safety issues in the region, an analysis of traffic collisions between 2006 and 2009 was conducted for the MPO area.

Collision Data Collection

Collision data was requested from the Virginia Department of Transportation (VDOT) Traffic Engineering Division, Highway Safety Branch, as well as the City of Lynchburg, Police Department (LPD). This analysis was conducted based on available datasets, which include a different number of study years and reporting statistics. Two sets of data were received from VDOT, and one set from the City of Lynchburg:

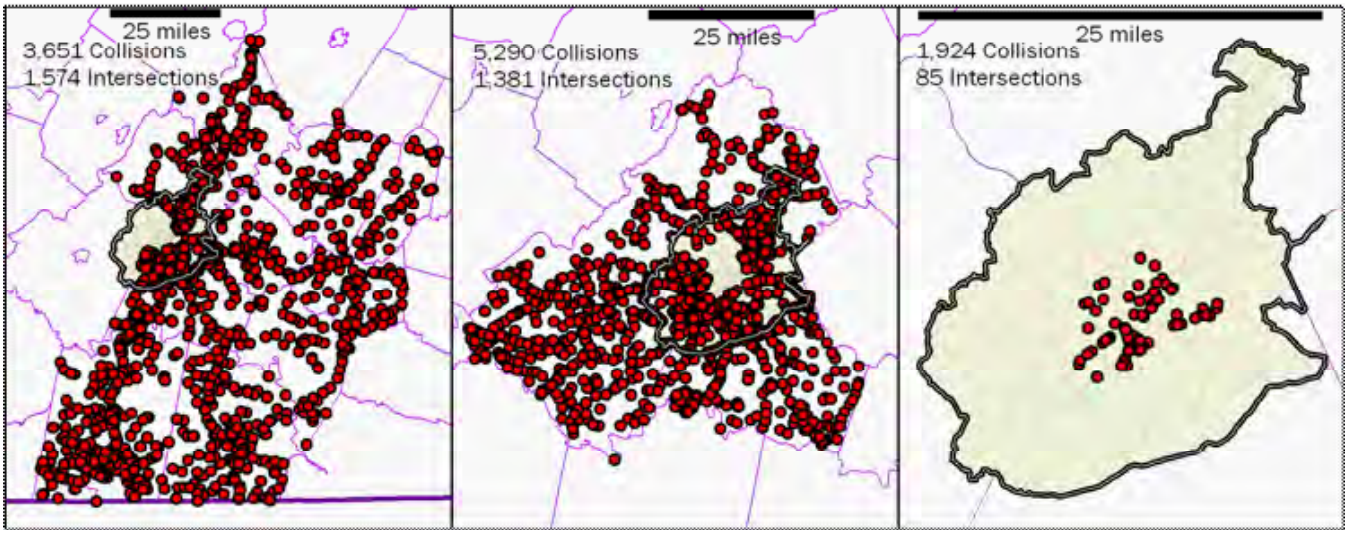
- Collisions summarized by intersection for the VDOT Lynchburg District (excluding city jurisdiction) between the study years 2006-7;
- Detailed collision data by incident for three counties within the study area (excluding city jurisdiction) for the study years 2006-7;
- Top 20 intersections per year summarized by number and severity of collisions for the City of Lynchburg between January 2006 and September 2009.

These datasets were analyzed by intersection, by type, and by geographical pattern.

Collisions by Intersection

Traffic collisions summarized by jurisdiction for the VDOT Lynchburg district are displayed in Table X. There were 1,574 intersections identified with at least one accident. A total of 3,651 accidents with 3,363 injuries and fatalities occurred between 2006 and 2007. Among the 10 county jurisdictions, Pittsylvania County has the most intersections identified with a traffic accident (23% of division total), while Campbell County is

Figure 3-5: Collision Datasets Analyzed level of Service Descriptions for Intersections



identified with the highest number of accidents (25% of division total) and the highest number of injuries/ fatalities (17% of division total). It should be noted that this regional-scale dataset (VDOT Lynchburg district) does not include Bedford County, or the (entire) City of Lynchburg. This traffic collision dataset provides regional context for the MPO study area.

Jurisdictions that fall within the study area are highlighted in yellow in Table 3-6. Amherst (1.5) and Campbell (1.6) counties show a greater number of collisions per intersection per study year than the district average (1.2) for this dataset.

Table 3-6: Collisions by Intersection for the VDOT Lynchburg District (2006-7)

County Code	County Name	Identified Intersections	Collisions	Collisions/ Int/Year	Rank	Injuries & Fatalities	Injuries & Fatalities/ Int./Year	Rank
05	Amherst County	182	550	1.5	4	286	0.8	6
06	Appomattox County	97	210	1.1	6	133	0.7	8
09	Bedford	N/A - only	partial	dataset		provided		
14	Buckingham	95	150	0.8	10	101	0.5	11
15	Campbell	282	923	1.6	3	562	1.0	4
19	Charlotte	68	105	0.8	11	84	0.6	10
118	City of Lynchburg	3	4	0.7		N/A		
24	Cumberland	50	72	0.7	12	47	0.5	12
41	Halifax	189	357	0.9	8	291	0.8	7
62	Nelson	121	306	1.3	5	260	1.1	3
71	Pittsylvania	367	691	0.9	9	490	0.7	9
73	Prince Edward	111	233	1.0	7	188	0.8	5
162	Town of Altavista	4	31	3.9	1	12	1.5	2
130	Town of South Boston	5	19	1.9	2	19	1.9	1
	TOTAL/ AVERAGE	1,574	3,651	1.2	-	2,473	0.8	-

Summary of Critical Intersections

The following tables identify intersections with the highest number of collisions and injuries per sample year for both the county and city portions of the MPO study area. These areas represent potential collision "hot spots" that could be the focus of future traffic safety studies.

Table 3-10: Normalized Collisions within the MPO Study Area (varying years)

County Code	Jurisdiction	Identified Intersections	Collisions	# of Study Years	Collisions/ Int/Year	Injuries & Fatalities/ Year	Injuries & Fatalities/Int./ Year
05	Amherst County	205	620	2	1.5	286	0.7
09	Bedford County	148	534	2	1.8	307	1.0
15	Campbell County	221	895	2	2	478	1.1
118	City of Lynchburg	85	1,924	3.75	6	900	2.8
	TOTAL/ AVERAGE	659	3,973	2.4	2.5	1,971	1.2

Table 3-11: Rank of County Intersections with Highest Collisions per Sample Year (2006-7)

Rank	Road 1 Number	Road 1 Name	Road 2 Number	Road 2 Name	Jurisdiction	Collisions per Sample Year
1	SR 1425	Graves Mill Rd	US 221	Colonial Trail	Bedford County	22.5
2	US 460 BUS	Timberlake Rd		Greenview Dr	Campbell County	18.5
3	US 29 BUS	Amherst Hwy	SR 682	Woody's Lake Rd	Amherst County	16.5
4	US 460 BUS	Timberlake Rd	SR 622	Waterlick Rd	Campbell County	14.5
5	US 29 BUS	Amherst Hwy	SR 130	Elon Rd	Amherst County	13.0

Table 3-12: Rank of County Intersections with Highest Injuries per Sample Year (2006-7)

Rank	Road 1 Number	Road 1 Name	Road 2 Number	Road 2 Name	Jurisdiction	Injuries (All Types) per Sample Year
1	US 460 BUS	Timberlake Rd		Greenview Dr	Campbell County	13.5
2	US 29 BUS	Amherst Hwy	SR 130	Elon Rd	Amherst County	12.5
3	SR 1425	Graves Mill Rd	US 221	Colonial Trail	Bedford County	11.5
4	US 29 BUS	Amherst Hwy	SR 682	Woody's Lake Rd	Amherst County	8.0
5	US 221	Colonial Trail		Enterprise Dr	Bedford County	6.5

Table 3-13: Rank of City Intersections with Highest Collisions per Sample Year (2006-9)

Rank	Road 1 Number	Road 1 Name	Road 2 Number	Road 2 Name	Jurisdiction	Collisions per Sample Year
1	US 29	Wards Rd		Atlanta Ave	City of Lynchburg	74.5
2	US 501	Candlers Mountain Rd		River Ridge Mall	City of Lynchburg	34.3
3	US 501	Candlers Mountain Rd		Murray Pl	City of Lynchburg	30.2
4	US 29	Wards Rd	SR 927	Harvard St	City of Lynchburg	28.0
5	US 460	Richmond Hwy		Glass Ave	City of Lynchburg	22.5

Table 3-14: Rank of City Intersections with Highest Injuries per Sample Year (2006-9)

Rank	Road 1 Number	Road 1 Name	Road 2 Number	Road 2 Name	Jurisdiction	Injuries (All Types) per Sample Year
1	US 29	Wards Rd		Atlanta Ave	City of Lynchburg	25.3
2	US 460 BUS	Timberlake Rd		Roundelay Rd	City of Lynchburg	14.0
3	US 460 BUS	Timberlake Rd EB	US 501	Lynchburg Exp	City of Lynchburg	12.0
3	US 460 BUS	Timberlake Rd		Leesville Rd	City of Lynchburg	12.0
5	US 29	Wards Rd	SR 927	Harvard St	City of Lynchburg	11.5
5	US 460	Richmond Hwy		Glass Ave	City of Lynchburg	11.5