3 Future Conditions Assessment

The purpose of the future conditions assessment was to evaluate the potential effects of vehicular traffic growth in the study area over the future (year 2030) planning horizon. By understanding the potential effects of traffic growth on operations and mobility in the Route 6 Hop River corridor, local, regional, and state officials and policy-makers can make informed decisions about the future needs and priorities of the corridor relative to improving transportation systems and enacting land use policies that will help mitigate traffic growth over time.

There are two primary components of growth that will contribute to the overall traffic growth in the study corridor. One component is regional growth, which accounts for new traffic demand throughout the regional roadway network that is associated with projected changes in land use and demographics (such as population, employment, households, and other census-based data) in areas beyond the study corridor. A second component of growth is localized growth, which accounts for new traffic demand generated by planned or potential new developments within the immediate study corridor. Both components of growth were forecasted by the Capitol Region Council of Governments' travel demand model. For this study, the localized growth component of the travel demand model was tailored to reflect the anticipated future development potential of the Route 6 Hop River corridor assuming a proposed Corridor Zone has been implemented.

3.1 Future Development Potential

The study team worked closely with members of the Regional Economic Development Council (REDC) to develop and refine a future development model that was used to approximate the development potential of the Route 6 Hop River corridor. The future development model consisted of a database of existing parcels in the corridor with inputs for future development density, future land use, and percent-developed by 2030. The parcel database included attributes for total land area, existing development area, existing site constraints (such as wetland and steep slope areas), existing land use, existing zoning, and a proposed zoning district assigned to each parcel. The existing parcel data was determined from available GIS data, aerial mapping, and field reconnaissance. The proposed zoning district assigned to each parcel was based on its location within the proposed Corridor Zone developed and defined under the REDC's previous *Route 6 Hop River Corridor Economic Development Strategy and Master Plan Study* (see Section 1.2.2 for details about this study). The proposed zoning districts that comprise the proposed Corridor Zone and the limits of the Corridor Zone are illustrated in Figure A3-1 in Appendix 3.1. The limits of the future development model correspond to the limits of the proposed Corridor Zone. By assuming that future development will generally occur within the proposed Corridor Zone, the outputs of this model reflect the desire of the REDC to encourage future development within the limits of this zone.

The future development model was designed to calculate the area of development (reported in square feet, sf, of floor area) that could be realized in the Route 6 Hop River corridor by 2030, and the total area that could be realized at full build-out. The total area of development was calculated by multiplying the net buildable area[1] of each parcel within the Corridor Zone by an average expected floor area ratio (FAR)[2] for the parcel. The FAR for each parcel was assigned based on the proposed zoning district within which it will be located. A unique FAR value corresponding to each of the five zoning districts that comprise the proposed Corridor Zone was estimated based on the proposed bulk requirements and input from REDC members.

The future development model was also designed to calculate area of development in terms of the future land uses that could comprise this development. Because land use is a key variable in determining the traffic generation potential of future development, the future development model can readily demonstrate how adjusting the composition of land uses can affect potential traffic generation. Each of the five zoning districts within the proposed Corridor Zone was assigned an assumed composition of future land uses based on input from REDC members.

Table 3-1 summarizes the future development model inputs for FAR and composition of future land uses that were assigned to each of the five zoning districts.

Table 3-1. Future Development Model Inputs for FAR and Composition of Land Uses

Zoning District	FAR	Composition of Land Uses				
		Retail	Warehouse/ Lt. Industry	Gen. Office, Commercial	Corporate Office	Residential
Village Node	0.30	33%	0%	34%	0%	33%
Business/Corporate Park	0.23	0%	15%	35%	50%	0%
Transition Area	0.13	45%	0%	45%	0%	10%
Conservation Area	0.09	0%	0%	34%	33%	33%
Residential	0.08	0%	0%	0%	0%	100%

The total development potential for the Route 6 Hop River corridor that was calculated for the inputs shown in Table 3-1 is approximately 7.1 million sf. This total includes approximately:

- 1.6 million sf in Bolton
- 900,000 sf in Coventry
- 2.6 million sf in Andover
- 2.0 million sf in Columbia

[1] Net Buildable Area: Equal to the total land area of a parcel less areas occupied by wetlands and steep slopes (net usable area), and less areas required for future rights-of-way and open space set-asides (assumed to be 5% and 10% of net usable area, respectively).

[2] Floor Area Ratio (FAR): The ratio of gross square footage of floor space of a development to the square footage of a lot. For example, a one-story building with a building footprint of 10,000 square feet (sf) situated on a 40,000 sf lot has an FAR value of 0.25. A two-story building with the same footprint has an FAR value of 0.5 (20,000 sf of gross floor space divided by 40,000 sf of lot).

Based on recent and historic development trends in the corridor, the study team and REDC members estimated that approximately 5% of the total development potential of the Corridor Zone will be realized by 2030. The remaining 95% will be realized by some indeterminate future year. Table 3-2 summarizes the total development potential and 2030 development potential for the Route 6 Hop River corridor reported in terms of the potential future land uses in each town.

Table 3-2. Future Development Potential

Town	Development Area (sf)		2030 Development Area by Land Use (sf)				
	Total	By 2030	Retail	Warehouse/ Lt. Industry	Gen. Office, Commercial	Corporate Office	Residential
Bolton	1,600,000	82,000	20,000	3,500	28,000	11,500	19,000
Coventry	900,000	43,000	14,300	0	14,400	0	14,300
Andover	2,600,000	130,000	3,000	10,000	32,500	39,500	45,000
Columbia	2,000,000	99,000	5,000	10,000	33,500	38,500	12,000
Total	**7,100,000**	**354,000**	**42,300**	**23,500**	**108,400**	**89,500**	**90,300**

As shown in Table 3-2, the overall composition of new development by 2030 in the Route 6 Hop River corridor is expected to be approximately:

- 31% general office and commercial
- 25% corporate office
- 25% residential
- 12% retail
- 7% warehouse and light industry

In terms of future traffic generation potential, general commercial and office uses generate approximately half the number of afternoon peak hour traffic trips that retail uses generate for the same amount of floor space. Warehouse and light industry uses generate approximately half the number of traffic trips that general commercial and office uses generate, though a relatively high proportion of these trips can be heavy vehicle and truck trips. Residential uses also generate significantly fewer traffic trips than both retail and general commercial and office uses for comparable floor space (note – residential trip generation is based on dwelling units, not floor space, so a conversion factor is required to compare trip generation values). Consequently, providing a mix of land uses that favor residential, and general office and commercial uses, while moderating retail and industrial uses, will help mitigate overall traffic generation and will help limit the volume of new truck traffic in the corridor. Additionally, providing a mix of land uses that are within close proximity of each other and that are conveniently accessible via other modes of travel (walking, bicycling, and transit) will help mitigate overall traffic generation by increasing park-once-and-walk opportunities within new development areas; facilitating non-motorized trips to, from, and within developments; and better accommodating transit riders.

3.2 Future Traffic Analysis

The future (2030) traffic analysis for this study used traffic volume forecasts developed by CRCOG to determine how traffic operations at key intersections in the corridor could be affected by future traffic growth. This section of the report provides a summary of the anticipated future traffic growth in the Route 6 Hop River corridor and an analysis of the resultant traffic operations.

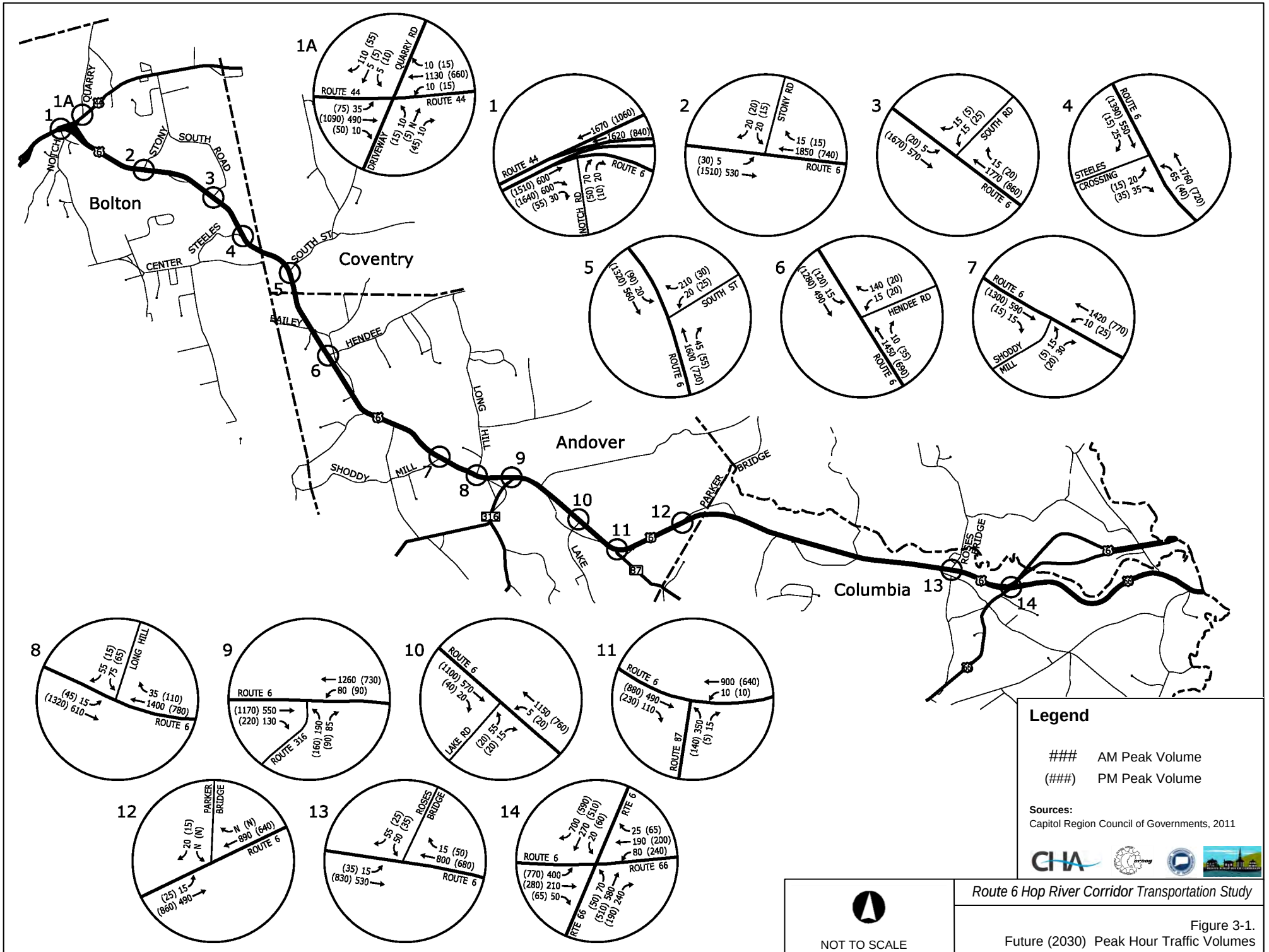
3.2.1 Traffic Volume Forecasts

The Capitol Region Council of Governments (CRCOG) developed the traffic forecast for the Route 6 Hop River study corridor using their CRCOG-maintained travel demand model. The travel demand model is a complex planning tool used to understand travel behavior and trips. It consists of a series of mathematical equations that represent travel choices within the regional transportation network. Trips are assigned to the network based on the shortest calculated travel times between trip origins and destinations. As traffic volumes increase and cause decreasing speeds on roadways in the network, the travel demand model reassigns trips to the network according to the shortest travel time for each trip. The number of trips on the network changes as demographic and land use factors (such as population, employment, and number of households) change over time with development in the region.

For this study, CRCOG forecasted traffic for a future condition that reflects regional growth – associated with projected changes in land use and demographics in the region and state – and localized growth – associated with the potential new development area in the study corridor of 354,000 sf (see Section 3.1, Table 3-2 for details). The morning (AM) and afternoon (PM) peak hour volumes forecasted by CRCOG's travel demand model are shown in a traffic volume diagram in Figure 3-1. Tables 3-3 and 3-4 summarize the forecasted traffic growth along key segments of the study corridor for the AM and PM future conditions, respectively. This forecasted traffic growth is also illustrated in Figures 3-2 and 3-3.

As shown in Tables 3-3 and 3-4, both the AM and PM peak hour traffic volumes on Route 6 are expected to grow between 21% and 36% by 2030. In general, growth is highest at the western end of the study corridor and decreases moving easterly. On Route 66 East, growth is expected to be approximately 14% by 2030. The overall traffic growth by 2030 translates to annual traffic increases of approximately:

- 1.5% between Notch Road and South Street
- 1.0% to 1.5% between South Street and Roses Bridge Road
- 0.5% to 1.0% between Roses Bridge Road and Windham Town Line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LONG HILL
SHODDY MILL
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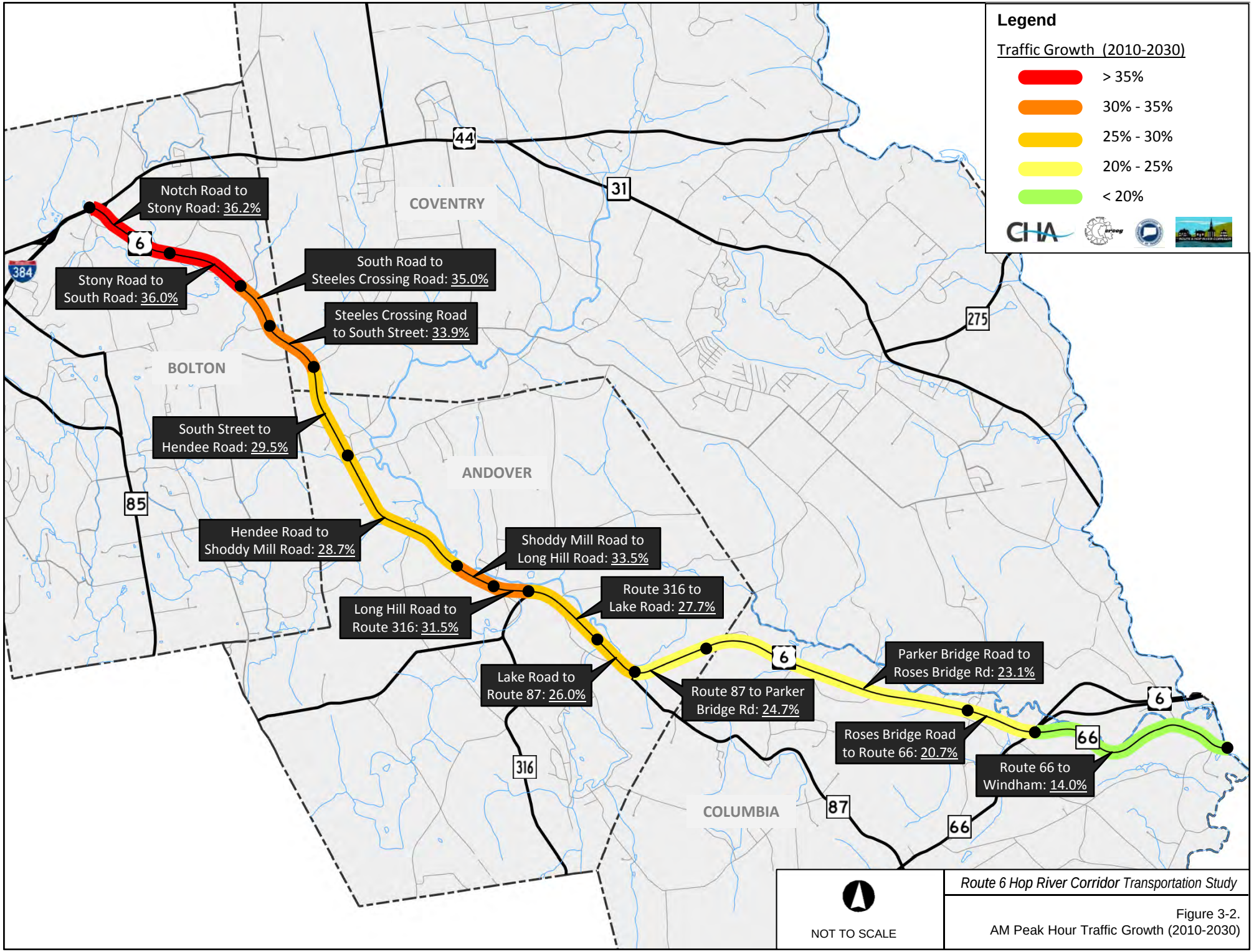
ROSES BRIDGE
ROUTE 44
ROUTE 6
ROUTE 316
ROUTE 87
ROUTE 66
RTE 6
DRIVEWAY
OLD HOTEL RD
STONY RD
SOUTH RD
HENDEE RD
STEELES CROSSING
SHODDY MILL
LAKE RD
Legend
AM Peak Volume
(###) PM Peak Volume
Sources:
Capitol Region Council of Governments, 2011
NOT TO SCALE
Route 6 Hop River Corridor Transportation Study
Figure 3-1.
Future (2030) Peak Hour Traffic Volumes

Table 3-3. AM Peak Hour Growth Summary – Future Condition

Location	AM Peak Hour Vol.		Approx. Change	
	Existing	Future	Net Volume	%
Route 6				
Between Notch Road & Stony Road	1690	2410	+ 640	+ 36.2%
Between Stony Road & South Road	1880	2360	+ 625	+ 36.0%
Between South Road & Steeles Crossing Road	1580	2355	+ 610	+ 35.0%
Between Steeles Crossing Road & South Street	1610	2390	+ 605	+ 33.9%
Between South Street & Hendee Road	1620	2085	+ 475	+ 29.5%
Between Hendee Road & Shoddy Mill Road	1640	2040	+ 455	+ 28.7%
Between Shoddy Mill Road & Long Hill Road	1680	2090	+ 525	+ 33.5%
Between Long Hill Road & Route 316	1750	2150	+ 515	+ 31.5%
Between Route 316 & Lake Road	1505	1800	+ 390	+ 27.7%
Between Lake Road & Route 87	1490	1840	+ 380	+ 26.0%
Between Route 87 & Parker Bridge Road	1240	1415	+ 280	+ 24.7%
Between Parker Bridge Road & Roses Bridge Road	1290	1410	+ 265	+ 23.1%
Between Roses Bridge Road & Route 66	1630	1630	+ 280	+ 20.7%
Route 66 East				
Between Route 6 & Windham Town Line	680	775	+ 95	+ 14.0%

Table 3-4. PM Peak Hour Growth Summary – Future Condition

Location	PM Peak Hour Vol.		Approx. Change	
	Existing	Future	Net Volume	%
Route 6				
Between Notch Road & Stony Road	1690	2305	+ 615	+ 36.4%
Between Stony Road & South Road	1880	2560	+ 680	+ 36.2%
Between South Road & Steeles Crossing Road	1580	2140	+ 560	+ 35.4%
Between Steeles Crossing Road & South Street	1610	2150	+ 540	+ 33.5%
Between South Street & Hendee Road	1620	2100	+ 480	+ 29.6%
Between Hendee Road & Shoddy Mill Road	1640	2110	+ 470	+ 28.7%
Between Shoddy Mill Road & Long Hill Road	1680	2160	+ 480	+ 28.6%
Between Long Hill Road & Route 316	1750	2290	+ 540	+ 30.9%
Between Route 316 & Lake Road	1505	1920	+ 415	+ 27.6%
Between Lake Road & Route 87	1490	1880	+ 390	+ 26.2%
Between Route 87 & Parker Bridge Road	1240	1550	+ 310	+ 25.0%
Between Parker Bridge Road & Roses Bridge Road	1290	1580	+ 290	+ 22.5%
Between Roses Bridge Road & Route 66	1630	1975	+ 345	+ 21.2%
Route 66 East				
Between Route 6 & Windham Town Line	925	1055	+ 130	+ 14.1%


Legend
Traffic Growth (2010-2030)
> 35%
30% - 35%
25% - 30%
20% - 25%
< 20%
Notch Road to Stony Road: 36.2%
Stony Road to South Road: 36.0%
South Road to Steeles Crossing Road: 35.0%
Steeles Crossing Road to South Street: 33.9%
South Street to Hendee Road: 29.5%
Hendee Road to Shoddy Mill Road: 28.7%
Shoddy Mill Road to Long Hill Road: 33.5%
Long Hill Road to Route 316: 31.5%
Route 316 to Lake Road: 27.7%
Lake Road to Route 87: 26.0%
Route 87 to Parker Bridge Rd: 24.7%
Parker Bridge Road to Roses Bridge Rd: 23.1%
Roses Bridge Road to Route 66: 20.7%
Route 66 to Windham: 14.0%
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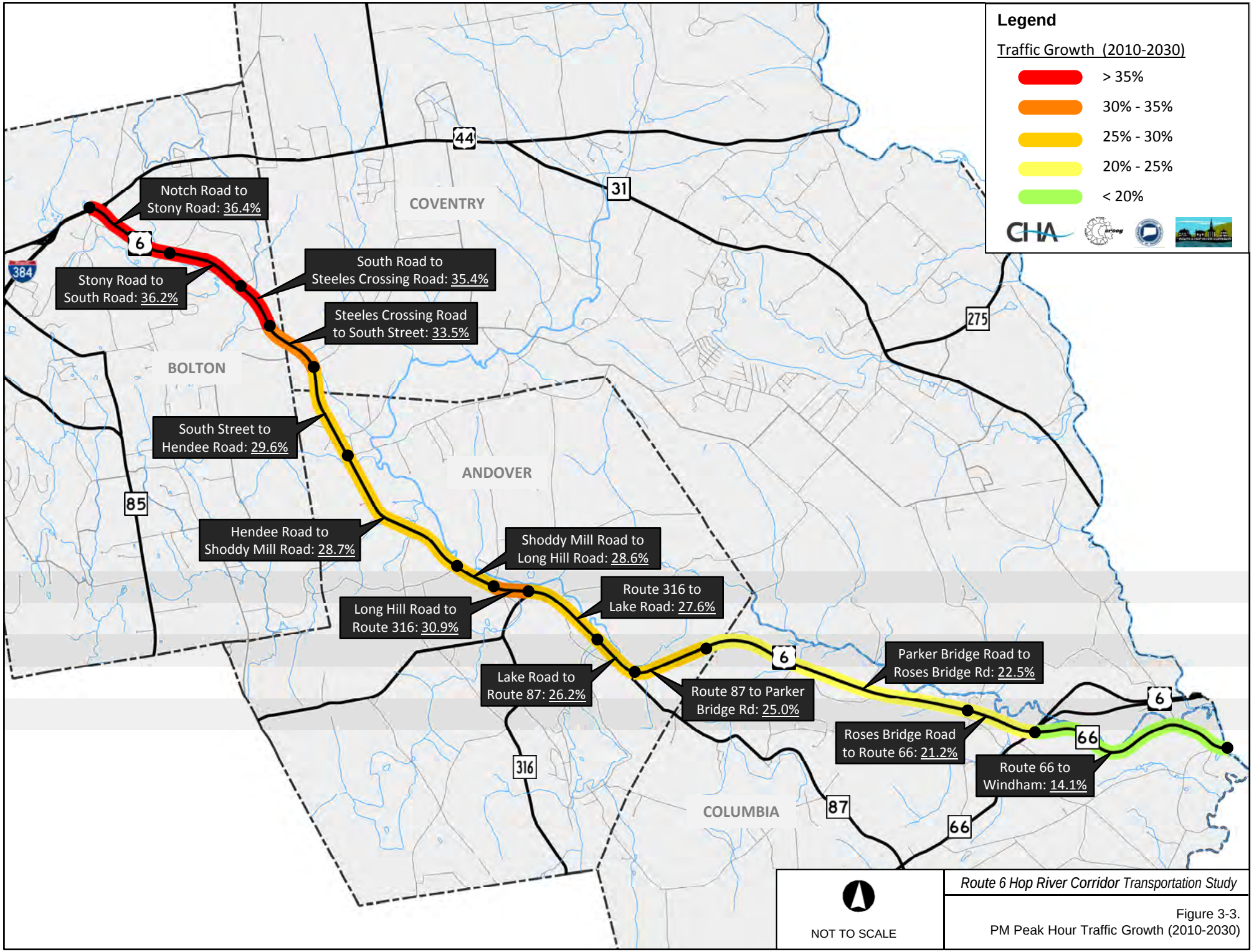
NOT TO SCALE
Route 6 Hop River Corridor Transportation Study
Figure 3-2.
AM Peak Hour Traffic Growth (2010-2030)


Legend
Traffic Growth (2010-2030)
> 35%
30% - 35%
25% - 30%
20% - 25%
< 20%
Notch Road to Stony Road: 36.4%
Stony Road to South Road: 36.2%
South Road to Steeles Crossing Road: 35.4%
Steeles Crossing Road to South Street: 33.5%
South Street to Hendee Road: 29.6%
Hendee Road to Shoddy Mill Road: 28.7%
Shoddy Mill Road to Long Hill Road: 28.6%
Long Hill Road to Route 316: 30.9%
Route 316 to Lake Road: 27.6%
Lake Road to Route 87: 26.2%
Route 87 to Parker Bridge Rd: 25.0%
Parker Bridge Road to Roses Bridge Rd: 22.5%
Roses Bridge Road to Route 66: 21.2%
Route 66 to Windham: 14.1%
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Route 6 Hop River Corridor Transportation Study
Figure 3-3.
PM Peak Hour Traffic Growth (2010-2030)

3.2.2 Traffic Operations

LOS values for intersections and roadway segments can range from A to F with LOS A representing the best operational conditions. LOS F represents generally congested, un-acceptable conditions.

The study team evaluated future traffic operations in the Route 6 Hop River corridor by determining levels of service (LOS) at the study intersections. LOS is based on the average delay (in seconds per vehicle, sec/veh) that motorists experience while traveling through the intersection. LOS can be determined for individual movements at signalized and unsignalized intersections, and for each signalized intersection as a whole. For this study, intersection operations of LOS D or better are considered acceptable.

The study team determined the LOS for each of the 14 study intersections to provide a measure of the future traffic operations at these intersections. The LOS for each intersection was determined by completing capacity analyses using the future AM and PM peak hour turning movement volumes forecasted by CRCOG and SYNCHRO software. The AM and PM peak hour traffic operations are summarized in Table 3-5 and illustrated in Figure 3-4 (AM) and Figure 3-5 (PM).

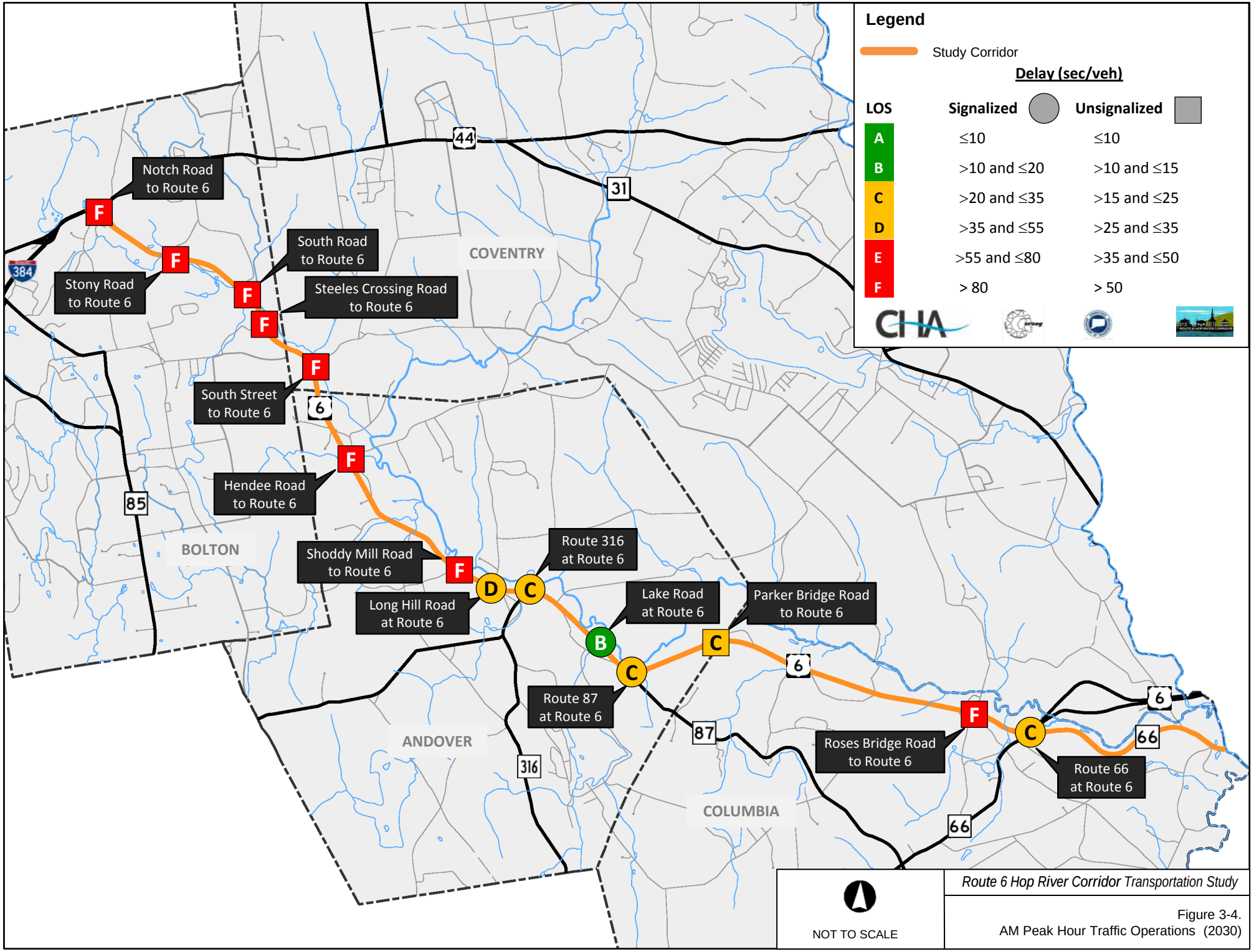
Table 3-5. AM and PM Peak Hour Traffic Operations – Future Condition

Intersection/Direction	AM Peak Hour		PM Peak Hour	
	LOS	Avg. Delay (sec/veh)	LOS	Avg. Delay (sec/veh)
Route 6/44 at Notch Road, Bolton (unsignalized)				
Northbound Right – Notch Road	F	-[1]	F	-[1]
Route 6 at Stony Road, Bolton (unsignalized)				
Eastbound Left – Route 6	C	24.2	B	10.2
Southbound – Stony Road	F	-[1]	F	377.3
Route 6 at South Road, Bolton (unsignalized)				
Eastbound Left – Route 6	C	18.0	B	10.3
Southbound – South Road	F	527.2	F	1194.9
Route 6 at Steeles Crossing Road, Bolton (unsignalized)				
Westbound Left – Route 6	A	9.6	B	14.3
Northbound – Steeles Crossing Road	F	618.9	F	344.7
Route 6 at South Street, Coventry (unsignalized)				
Eastbound Left – Route 6	C	17.5	B	13.1
Southbound – South Street	F	-[1]	F	-[1]
Route 6 at Hendee Road, Andover (unsignalized)				
Eastbound Left – Route 6	C	15.2	B	10.9
Southbound – Hendee Road	F	352.1	F	283.1
Route 6 at Shoddy Mill Road, Andover (unsignalized)				
Westbound Left – Route 6	A	9.0	B	13.3
Northbound – Shoddy Mill Road	F	112.2	F	79.3

[1]Long Delay, SYNCHRO software outputs error message.

Table 3-5. AM and PM Peak Hour Traffic Operations – Future Condition

Intersection/Direction	AM Peak Hour		PM Peak Hour	
	LOS	Avg. Delay (sec/veh)	LOS	Avg. Delay (sec/veh)
Route 6 at Long Hill Road, Andover				
Eastbound – Route 6	A	4.6	C	25.7
Westbound – Route 6	E	70.1	B	12.1
Southbound – Long Hill Road	E	60.8	D	48.4
Overall	**D**	**50.8**	**C**	**21.5**
Route 6 at Route 316 (Hebron Road), Andover				
Eastbound – Route 6	A	8.0	D	38.6
Westbound – Route 6	D	39.4	B	10.0
Northbound – Route 316	D	38.7	D	37.4
Overall	**C**	**30.3**	**C**	**29.2**
Route 6 at Lake Road, Andover				
Eastbound – Route 6	A	4.9	B	14.3
Westbound – Route 6	B	15.5	A	3.7
Northbound – Lake Road	D	35.3	C	26.7
Overall	**B**	**13.1**	**B**	**10.7**
Route 6 at Route 87 (Jonathan Trumbull Highway), Andover				
Eastbound – Route 6	A	9.3	A	9.9
Westbound – Route 6	C	29.2	A	5.8
Northbound – Route 87	D	46.7	C	28.7
Overall	**C**	**26.4**	**B**	**10.0**
Route 6 at Parker Bridge Road, Andover (unsignalized)				
Eastbound Left – Route 6	B	11.3	A	9.2
Southbound – Parker Bridge Road	C	21.0	B	14.2
Route 6 at Roses Bridge Road, Columbia (unsignalized)				
Eastbound Left – Route 6	B	10.6	A	9.8
Southbound – Roses Bridge Road	F	93.5	F	99.3
Route 6 at Route 66 (Middletown Road), Columbia				
Eastbound – Route 6	D	51.9	F	116.1
Westbound – Route 66 East	E	68.6	F	172.3
Northbound – Route 66	C	21.7	E	60.7
Southbound Right – Route 6	A	9.0	C	24.7
Overall	**C**	**29.3**	**F**	**82.3**


Legend
Study Corridor
Delay (sec/veh)
LOS
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A ≤10 ≤10
B >10 and ≤20 >10 and ≤15
C >20 and ≤35 >15 and ≤25
D >35 and ≤55 >25 and ≤35
E >55 and ≤80 >35 and ≤50
F > 80 > 50
Notch Road to Route 6
Stony Road to Route 6
South Road to Route 6
Steeles Crossing Road to Route 6
South Street to Route 6
Hendee Road to Route 6
Shoddy Mill Road to Route 6
Long Hill Road at Route 6
Route 316 at Route 6
Lake Road at Route 6
Parker Bridge Road to Route 6
Route 87 at Route 6
Roses Bridge Road to Route 6
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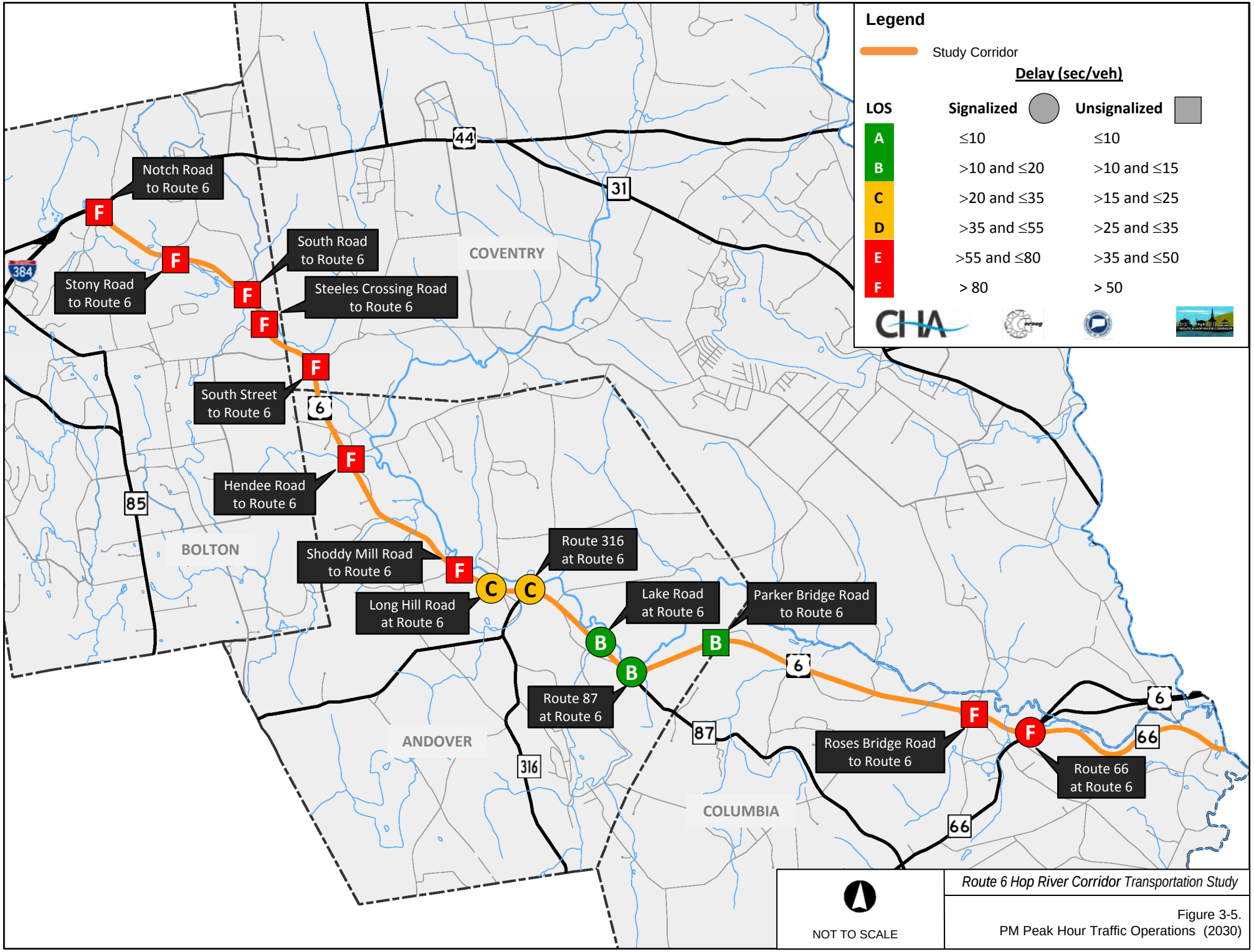
NOT TO SCALE
Route 6 Hop River Corridor Transportation Study
Figure 3-4.
AM Peak Hour Traffic Operations (2030)


Legend
Study Corridor
Delay (sec/veh)
LOS
Signalized
Unsignalized
A ≤10 ≤10
B >10 and ≤20 >10 and ≤15
C >20 and ≤35 >15 and ≤25
D >35 and ≤55 >25 and ≤35
E >55 and ≤80 >35 and ≤50
F > 80 > 50
Notch Road to Route 6
Stony Road to Route 6
South Road to Route 6
Steeles Crossing Road to Route 6
South Street to Route 6
Hendee Road to Route 6
Shoddy Mill Road to Route 6
Long Hill Road at Route 6
Route 316 at Route 6
Lake Road at Route 6
Parker Bridge Road to Route 6
Route 87 at Route 6
Roses Bridge Road to Route 6
Route 66 at Route 6
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Route 6 Hop River Corridor Transportation Study
Figure 3-5.
PM Peak Hour Traffic Operations (2030)

As shown in Table 3-5, overall operations are generally expected to be acceptable at each of the signalized intersections with the exception of the Route 6 and Route 66 intersection, which is expected to operate at LOS F during the PM peak hour. Operations at the unsignalized intersection approaches to Route 6 are generally expected to be unacceptable, operating at LOS F with significant delays at all but one location.

The following intersections and intersection approaches are expected to operate at LOS E or F during the AM or PM peak hour:

Signalized Intersections

- Route 6 at Long Hill Road, Andover
  - Westbound Route 6 – LOS E during the AM peak hour. The 95th percentile queue length is approximately 1600 ft, which extends to a point immediately west of the intersection of Route 6 and Route 316.
  - Southbound Long Hill road – LOS E during the AM peak hour. The 95th percentile queue length is approximately 135 ft.
- Route 6 at Route 66 (Middletown Road), Columbia
  - Eastbound Route 6 – LOS F during the PM peak hour. The eastbound left turn movement from Route 6 to the Route 6 expressway experiences significant delay and long traffic queues (approximately 1000 ft for the 95th percentile queue) which results in the overall eastbound approach movement being LOS F. The left turn queue extends beyond the beginning of the through lane and right turn lane tapers and can impede the progression of through and right-turning vehicles.
  - Westbound Route 66 East – LOS E during the AM peak hour, LOS F during the PM peak hour. The westbound through/right turn lane experiences significant delay and long queues (approximately 300 ft for the 95th percentile queue) during the AM peak hour. Both the westbound left turn and through/right turn lanes experience significant delays and long queues (approximately 400 ft and 430 ft, respectively) during the PM peak hour. None of the queues that occur during the AM or PM peak period are long enough to block or impede the progression of vehicles in adjacent lanes.
  - Northbound Route 66 – LOS E during the PM peak hour. Both the through/left turn and through/right turn lanes experience significant delays and long queues (approximately 440 ft per lane for the 95th percentile queue). The queues extend past the driveway for the Columbia Park and Ride located in the southwest corner of the intersection and can make egress for left-turning vehicles more difficult during the peak.
  - Because of the skew of the intersection, the eastbound Route 6 and westbound Route 66 movements require their own phase to prevent conflicts between the opposing left turn movements, resulting in longer traffic delays.

Unsignalized Intersections

- Route 6 at Notch Road, Bolton
  - Northbound Notch Road – LOS F during the AM and PM peak hours
- Route 6 at Stony Road, Bolton
  - Southbound Stony Road – LOS F during the AM and PM peak hours
- Route 6 at South Road, Bolton
  - Southbound South Road – LOS F during the AM and PM peak hours
- Route 6 at Steeles Crossing Road, Bolton
  - Northbound Steeles Crossing Road– LOS F during the AM and PM peak hours
- Route 6 at South Street, Coventry
  - Southbound South Street – LOS F during the AM and PM peak hours
- Route 6 at Hendee Road, Andover
  - Southbound Hendee Road – LOS F during the AM and PM peak hours
- Route 6 at Shoddy Mill Road, Andover
  - Northbound Shoddy Mill Road – LOS F during the AM and PM peak hours
- Route 6 at Roses Bridge Road, Columbia
  - Southbound Roses Bridge Road – LOS F during AM and PM peak hours

Based upon the results of the future traffic operations analyses, traffic capacity improvements might be required to accommodate forecasted traffic demands at the Long Hill Road intersection and Route 6 and Route 66 intersection.

Additionally, it is important to note that despite the relatively low volumes of traffic on the unsignalized side road approaches to Route 6, long delays and unacceptable levels of service result from the relatively high volumes of through traffic on Route 6 that limit the availability and size of gaps in traffic for vehicles entering Route 6 from side roads. These long delays present safety issues when drivers become inpatient and attempt to enter traffic before it is safe to do so.