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## NRPC 2022 TURNPIKE EXIT 12 STUDY

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**Prepared by the  
Nashua Regional Planning Commission  
June 2022**

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## INTRODUCTION

In 2004 the Nashua Regional Planning Commission (NRPC) conducted an FEE Turnpike Exit 12 Study, to evaluate the need for and traffic impact of completing the Turnpike Exit 12 partial diamond interchange with ramps to and from the north. Since the completion of that study, regional growth has moderated resulting in flat traffic growth regionally. However, the opening of the Raymond Wieczorek Drive in November 2011, providing a direct connection to the Boston-Manchester Regional Airport with connections to US 3 and NH 3A, has resulted in greater utilization of US 3 to Merrimack locations. The observed increase in peak period congestion along this arterial prompted the Town of Merrimack to request an update of the original study, again looking to a twenty-year traffic planning horizon.

The NRPC prepared a scope of services to the New Hampshire Department Transportation (NHDOT) to conduct the study update utilizing its Unified Planning Work Program (UPWP) funding under the category Special Projects. The following work scope provides the format for this study and a summary of the 2004 study analysis is also provided for historical perspective.

### Existing Conditions Analysis

- Conduct automatic traffic recorder counts along US 3 Daniel Webster Highway and other key roadways included within the 2004 study area. Identify growth trends that have characterized these roadways since that time.
- Conduct intersection turning movement counts during the morning (7-9 AM) and afternoon (4-6 pm) peak periods at locations which might be impacted by new ramp construction. Compare with 2004 intersection counts.
- Identify arterial volume-to-capacity ratios and congestion levels on study area arterials as developed for the Congestion Management Process report (NRPC, March 2022). Conduct intersection analysis based on the Highway Capacity Manual (HCM) methodology using SYNCHRO software.
- Conduct intersection capacity analysis for the base year.
- Tabulation of congested speed data on key arterials, including US 3, Greeley Street and Continental Boulevard.
- Crash rate tabulation for Daniel Webster Highway, Greeley Street and Continental Boulevard.

### Future Conditions Analysis

- Update the 2045 Merrimack land use forecast in consultation with the Town. Incorporate the changes into the regional model future land use trip tables.
- Run the regional model for the 2045 Baseline scenario, i.e. the No-Build scenario for new ramp construction.
- Develop No-Build intersection volumes the AM and PM peak hours and conduct intersection capacity analysis.
- Code Exit 12 ramps to and from the north into the regional model and rerun the traffic assignment for 2045.
- Develop Build scenario intersection volumes and conduct capacity analysis.

## SUMMARY OF NRPC 2004 TURNPIKE EXIT 12 STUDY

### EXISTING CONDITIONS ANALYSIS

The 2004 F.E.E. Turnpike Study focused on thirteen intersections in the northern portion of Merrimack. Turning movement counts were conducted for the morning (7-9 am) and afternoon (4-6 pm) peak periods. For the highest hour of traffic volume for each peak period, intersection capacity analysis was conducted utilizing the methods of the *Highway Capacity Manual 2003* as replicated by the *Synchro Traffic Signal Timing Software*. For **signalized intersections**, level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (generally weekday AM or PM peak hours). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues.

For **unsignalized intersections**, LOS criteria can be further reduced into three intersection types: all-way stop, two-way stop, and roundabout control. All-way stop and roundabout control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way, stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements.

**Table 1 - Intersection Level of Service Ranges**

LOS	Signalized Intersection Delay	Stop Controlled Intersection Delay
A	≤10 sec	≤10 sec
B	10-20 sec	10-15 sec
C	20-35 sec	15-25 sec
D	35-55 sec	25-35 sec
E	55-80 sec	35-50 sec
F	≥80 sec	≥50 sec

Table 2 (pages 4, 5) presents the operational conditions for the counts that were taken in 2001 through 2003. The capacity analysis is conducted for each lane group, i.e. all turning movements that share lanes, as well as for each intersection as a whole. This enables the identification of operational deficiencies which may exist even though the intersection in its totality operates acceptably. All

intersections during that time frame were found to operate at LOS C or better. LOS below C occurred for the following specific movements:

- Bedford Road westbound through at the Turnpike Exit 12 off-ramp – LOS E for the PM
- Bedford Road eastbound left onto US 3 NB and through to a driveway – LOS D for AM and PM
- Baboosic Lake Road eastbound right to US 3 SB – LOS E in AM, LOS D in PM. (This seems incorrect, as the right turn volumes are only somewhat higher than left turns, but can occur outside of the protected signal phase.
- Continental Blvd. westbound through at the Camp Sargent Road intersection -LOS D in AM. Amherst Road southbound left turn at this intersection – LOS E AM, LOS D PM.
- US 3 at Greeley Street – Several northbound and southbound movements operate at LOS D during the PM peak.
- Turkey Hill road southbound left to Amherst Street – LOS F in AM, LOS E in PM.

It can be concluded that at the time of the 2004 study, there was no compelling need to construct north ramps at the Turnpike Exit 12 interchange to relieve severe traffic congestion.

## **FUTURE CONDITIONS ANALYSIS**

### Regional Traffic Modeling

The Nashua Regional Planning Commission maintains a regional travel demand model for the general purposes of transportation planning and air quality analysis. NRPC uses TransCAD, a leading traffic modeling and GIS software package produced by the Caliper Corporation. The main inputs of employment and household data are summarized by Traffic Analysis Zone (TAZ). There are 2,034 TAZs in the NRPC model, including roughly 50 external zones. Each TAZ contains totals of households, residents and employees. Residents and employees are both assigned an industry classification, based on Census data. Industry classes include retail, manufacturing, professional services, finance and real estate, and others. In addition, each household is coded with the number of vehicles available to it, also derived from Census data. The NRPC travel demand model is the most complex model maintained by MPO staff in the state. The base year of the model was calibrated to traffic counts conducted by NRPC along all arterials and other facilities. The model utilizes U.S. Census data and employment data from the State of New Hampshire.

NRPC's model network consists of all arterials, collectors and some local roads in the region (over 800 total miles of segments) and certain major routes outside of the region to account for external trips. Each road segment is coded with certain attributes needed to run the model which include direction, length, posted speed and roadway capacity.

The model uses a traditional three-step modeling process: trip generation, trip distribution, and traffic assignment. A fourth step, mode choice, is not used by the NRPC model because means of travel other than the automobile represent an extremely small fraction of the total traffic on the regional road network.

In step one, trip generation, the model uses Institute of Transportation Engineers trip generation rates and Census data to determine how many trips of various purposes will be produced by each TAZ, based on the associated socioeconomic data.

**Table 2 - Existing Conditions (2002) Analysis, 2004 Exit 12 Study**

Signalized Intersections	AM Pk		PM Pk	
	Delay	AM LOS	Delay	PM LOS
<b>FEET SB On/Bedford Rd/Back River Rd</b>	<b>17.2</b>	<b>B</b>	<b>23.5</b>	<b>C</b>
Bedford Rd EB Left Turn	21.3	C	21.6	C
Bedford Rd EB Through	20.6	C	18.5	B
Bedford Rd EB Right Turn	0.1	A	0.0	A
Bedford Rd WB Left Turn	26.8	C	23.5	C
Bedford Rd WB Through	18.1	B	27.1	C
Back River Rd SB All Moves	23.0	C	22.4	C
<b>FEET NB Off/Bedford Rd</b>	<b>10.4</b>	<b>B</b>	<b>28.1</b>	<b>C</b>
Bedford Rd EB Through	9.3	A	0.1	A
Bedford Rd WB Through	9.6	A	64.3	E
Exit 12 Off-Ramp Left Turn	13.7	B	25.0	C
Exit 12 Off-Ramp Right Turn	14.8	B	17.0	B
<b>US 3/Bedford Rd</b>	<b>22.5</b>	<b>C</b>	<b>26.3</b>	<b>C</b>
Bedford Rd EB Left Turn/Through	43.4	D	41.5	D
Bedford Rd EB Right Turn	7.1	A	8.3	A
Bedford Rd WB All Moves	15.9	B	18.9	B
US 3 NB Left Turn	23.1	C	27.7	C
US 3 NB Through/Right Turn	8.6	A	6.9	A
US 3 SB Left Turn/Through	25.7	C	45.9	B
US 3 SB Right Turn	20.9	C	19.2	B
<b>US 3/Baboosic Lake Rd</b>	<b>29.5</b>	<b>C</b>	<b>23.0</b>	<b>C</b>
Baboosic Lake Rd EB Left Turn	26.4	C	26.8	C
Baboosic Lake Rd EB Right Turn	59.2	E	35.3	D
US 3 NB Left Turn	13.6	B	32.7	C
US 3 NB Through	7.7	A	17.6	B
US 3 SB Through	33.9	C	23.0	C
US 3 SB Right Turn	26.8	C	13.5	B
<b>Greeley St/ FEE Tnpk Exit 11 Ramps</b>	<b>17.0</b>	<b>B</b>	<b>28.8</b>	<b>C</b>
Greeley St EB Left Turn	23.3	C	49.2	D
Greeley St EB Through	5.1	A	9.5	A
Greeley St WB Through	26.0	C	28.2	C
FEE Turnpike Ramps NB Left Turn	32.2	C	33.4	C
FEE Turnpike Ramps NB Right Turn	10.8	B	37.6	D
<b>Continental Blvd/Amherst Rd/Camp S</b>	<b>32.4</b>	<b>C</b>	<b>28.9</b>	<b>C</b>
Continental Blvd EB Left Turn	32.5	C	43.1	D
Continental Blvd EB Through	34.8	C	43.8	D
Continental Blvd WB Through	39.1	D	33.0	C
Continental Blvd WB Right Turn	9.2	A	12.4	B
Camp Sargent Rd NB Left Turn	33.2	C	42.4	D
Camp Sargent Rd NB Through	30.8	C	46.9	D
Camp Sargent Rd NB Right Turn	19.2	B	17.6	B
Amherst Rd SB Left Turn	56.3	E	38.9	D
Amherst Rd SB Throught	23.6	C	33.1	C
Amherst Rd SB Right Turn	3.1	A	2.4	A

**Table 2, continued**

<b>Signalized Intersections</b>	<b>AM Pk</b>		<b>PM Pk</b>	
	<b>Delay</b>	<b>AM LOS</b>	<b>Delay</b>	<b>PM LOS</b>
<b>US 3/Greeley St</b>	<b>17.7</b>	<b>B</b>	<b>24.1</b>	<b>C</b>
Greeley St EB Left Turn	32.2	C	22.4	C
Greeley St EB Through	19.2	B	6.8	A
Greeley St EB Right Turn	4.5	A	1.6	A
Greeley St WB All Moves	19.4	B	7.0	A
US 3 NB Left Turn	21.4	C	41.9	D
US 3 NB Through/Right Turn	10.9	B	31.3	C
US 3 SB Left	28.2	C	36.6	D
US 3 SB Through	35.8	D	43.6	D
US 3 SB Right Turn	0.1	A	0.1	A
<b>Unsignalized Intersections</b>				
<b>Turkey Hill Rd/Amherst Rd</b>				
Amherst Rd EB Left Turn	2.5	A	7.7	B
Turkey Hill Rd SB Left/Right Turns	171.4	F	40.4	E
<b>US 3/Wire Road</b>				
US 3 NB Left Turn	9.0	A	9.8	A
Wire Rd EB Left/Right Turns	17.3	C	17.1	C
<b>Bedford Rd/Wire Rd</b>				
Bedford Rd EB All	9.8	A	9.0	A
Bedford Rd WB All	8.4	A	9.9	A
Wire Rd NB All	8.4	A	9.2	A
Wire Rd SB All	9.9	A	8.8	A

In step two, trip distribution, the model takes the expected number of trips produced and attracted by each zone and matches them with destinations. NRPC uses a “gravity model” to distribute the trips, meaning that a trip is more likely to travel to a nearby zone that matches the trip purpose. The model uses average journey to work time to determine the appropriate percentage of trips distributed between the zones. For example, if survey and census data show that 60% of all work trips take between 20 and 30 minutes, the model will attempt to match that ratio.

Once the model determines the origins and destinations of the trips, it finds the paths on which to assign them. The model begins by sending every trip via the shortest path possible (in terms of time). Then, because of capacity constraints, it uses an iterative process to reassign certain trips along alternate routes. The three step process results in future traffic forecasts are based on anticipated future land use patterns, population projections, projected housing units, employment, and school enrollment. The projected growth in land use was made in consultation with local planners from the Nashua Region, and through a review of present and proposed zoning, physical constraints, and assumptions made regarding future area-wide growth rates.

Future Traffic Forecast: No-Build and Build Scenarios

There exists no record of the land use forecast files that were used nearly twenty years ago to develop study area traffic projections to the future analysis year – 2025 at that time. As Table 3 shows, traffic growth forecasts along the Merrimack roadways was uneven. For the future No-Build (or Baseline) scenario, Bedford Road was projected to increase by 2,600 vehicles per day (vpd) over Baboosic Brook (+43%) but only by 700 (+6%) at the higher volume segment over the Turnpike. US 3 (Daniel Webster Hwy.) was forecasted to increase by nearly 25% north of Bedford Road and north of Greeley Street, but much lower growth was predicted for the middle segments. Back River Road, Greeley Street and Turkey Hill Road were forecasted at extremely high growth rates.

For the Build scenario the new north ramps at Exit 12 were predicted to carry about 17,000 vpd in each direction. In light of traffic volumes on FEE Turnpike ramps in Merrimack in 2004 and in 2021 (as will be seen later), this is an extraordinarily high traffic projection for the new facility. It also resulted in an exaggerated impact on other roadways. US 3 north of Baboosic Lake Road was forecasted to increase by 55% over the No-Build, Bedford Road west of U.S. 3 by 95% and Back River Road showed a decline of 70%. It appeared the expectation was that under the current interchange configuration, Back River Road would function more like an arterial, absorbing future growth that was diverted from a congested US 3 north of Bedford Road (predicted to increase by 23% between 2004 and 2025).

**Table 3 - 2004 Turnpike Exit 12 Study Weekday Traffic – 2002, 2025 No-Build & Build**

		2002	2025	% Δ	2025	% Δ
		AWDT	No-Build	2002-25	Build	NB to BD
Bedford Rd.	Over Baboosic Brook	6,000	8,600	43%	6,700	-22%
Bedford Rd.	West of FEE Turnpike	11,400	12,100	6%	17,000	40%
Bedford Rd.	West of US 3, DW Hwy	NA	12,400	NA	24,200	95%
Tnpk Exit 12 So. Ramps		9,600	10,700	11%	10,600	-1%
Tnpk Exit 2 No. Ramps		--	--	--	33,900	--
Back River Rd.	Bedford Town Line	3,000	9,400	213%	2,800	-70%
US 3 DW Hwy.	North of Bedford Rd	14,030	17,200	23%	13,100	-24%
US 3 DW Hwy.	South of Bedford Rd	16,500	18,400	12%	21,100	15%
US 3 DW Hwy.	North of Baboosic Lake Rd	14,500	15,500	7%	24,000	55%
US 3 DW Hwy.	South of Baboosic Lake Rd	19,400	20,600	6%	15,800	-23%
US 3 DW Hwy.	North of Greeley St	20,200	25,000	24%	20,400	-18%
Baboosic Lake Rd	East of FEE Turnpike	11,200	13,400	20%	13,600	1%
Greeley St.	West of FEE Turnpike	19,900	30,300	52%	28,700	-5%
Turkey Hill Rd	North of Amherst Rd.	7,500	12,100	61%	10,100	-17%

The baseline growth in daily roadway volumes translate to the forecasted changes in intersection turning movements shown in Table 4, which aggregates all approaches for each intersection for both peak hours. Growth rates of +/- 2% per year were forecasted for US3/Bedford Rd, Continental

Blvd/Amherst Rd and FEET Exit 11 NB/Greeley St and an incredible 4.6% per year growth was forecasted for the FEET SB on/Bedford Rd/Back River Rd intersection.

**Table 4 - Projected Growth in Intersection Approaches, 2004 Exit 12 Study**

	<u>2002 AM</u>	<u>2025 Proj</u>	<u>% Diff</u>	<u>2002 PM</u>	<u>2025 Proj</u>	<u>% Diff</u>
FEET SB On/Bedford Rd/Back River Rd	1,256	3,085	146%	1,342	3,419	155%
FEET NB Off/Bedford Rd	954	1,350	42%	1,686	2,285	36%
US 3/Bedford Rd	1,546	2,193	42%	1,702	2,335	37%
Bedford Rd/Wire Rd	597	660	11%	658	727	10%
US 3/Wire Rd	1,296	1,459	13%	1,683	1,916	14%
US 3/Baboosic Lake Rd	2,037	2,223	9%	2,311	2,451	6%
US 3/Greeley St	1,998	2,319	16%	2,343	2,791	19%
Continental Blvd/Camp Sgt/Amhr Rd	1,807	2,472	37%	2,351	3,273	39%
FEET NB Ramps/Greeley St	1,729	2,407	39%	2,257	3,350	48%
Amherst Rd/Turkey Hill Rd	1,099	1,537	40%	1,359	1,794	32%

The substantial change in volumes along roadways for both future scenarios, resulted in dramatic changes in intersection operational conditions for both future scenarios, as shown in Table 5.



**Table 5 - 2025 Intersection Analysis, No-Build & Build Scenarios, NRPC 2004 Study**

Signalized Intersections	2025 No-Build Scenario				2025 Build Scenario			
	AM Pk	AM	PM Pk	PM	AM Pk	AM	PM Pk	PM
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
<b>FEET SB On/Bedford Rd/Back R. Rd</b>	<b>170.4</b>	<b>F</b>	<b>186.9</b>	<b>F</b>	<b>18.5</b>	<b>B</b>	<b>63.4</b>	<b>E</b>
Bedford Rd EB Left Turn	17.7	B	27.7	C	31.6	C	26.6	C
Bedford Rd EB Through	49.2	D	12.2	B	0.4	A	0.1	A
Bedford Rd EB Right Turn	0.4	A	0.0	A	47.5	D	36.6	D
Bedford Rd WB Left Turn	28.1	C	38.1	D	12.6	B	16.2	B
Bedford Rd WB Through	23.4	C	205.8	F	20.8	C	92.1	F
Back River Rd SB All Moves	314.9	F	241.0	F	0.6	A	63.0	E
<b>FEET NB Off/Bedford Rd</b>	<b>13.1</b>	<b>B</b>	<b>166.6</b>	<b>F</b>	<b>127.2</b>	<b>F</b>	<b>30.2</b>	<b>C</b>
Bedford RD EB Left Turn	--	--	--	--	153.1	F	97.4	F
Bedford Rd EB Through	12.4	B	15.3	B	21.8	C	13.7	B
Bedford Rd WB Through	13.1	B	281.6	F	28.9	C	41.9	D
Bedford Rd WB Right Turn	--	--	--	--	195.1	F	1.8	A
Exit 12 Off-Ramp Left Turn	13.8	B	24.9	C	35.4	D	39.5	D
Exit 12 Off-Ramp Right Turn	15.2	B	21.4	C	51.5	D	32.4	C
<b>FEET SB Off/Bedford Rd</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>18.5</b>	<b>B</b>	<b>63.4</b>	<b>E</b>
Bedford Rd EB Through	--	--	--	--	31.6	C	26.6	C
Bedford Rd EB Right Turn	--	--	--	--	0.4	A	0.1	A
Bedford Rd WB Left Turn	--	--	--	--	47.5	D	36.6	D
Bedford Rd WB Through	--	--	--	--	12.6	B	16.2	B
Exit 12 Off-Ramp Left Turn	--	--	--	--	20.8	C	92.1	F
Exit 12 Off-Ramp Right Turn	--	--	--	--	0.6	A	63.0	E
<b>US 3/Bedford Rd</b>	<b>46.8</b>	<b>D</b>	<b>51.2</b>	<b>D</b>	<b>123.1</b>	<b>F</b>	<b>327.0</b>	<b>F</b>
Bedford Rd EB Left Turn/Through	101.7	F	160.0	F	92.0	F	81.0	F
Bedford Rd EB Right Turn	9.6	A	0.0	A	1.7	A	1.7	A
Bedford Rd WB All Moves	17.6	C	27.6	C	24.6	C	29.1	C
US 3 NB Left Turn	39.3	C	30.6	C	388.2	F	788.6	F
US 3 NB Through/Right Turn	21.7	B	10.6	B	10.3	B	7.0	A
US 3 SB Left Turn/Through	42.8	E	74.4	E	31.3	C	36.1	D
US 3 SB Right Turn	37.3	A	0.1	A	123.9	F	0.1	A
<b>US 3/Baboosic Lake Rd</b>	<b>44.3</b>	<b>D</b>	<b>40.5</b>	<b>D</b>	<b>145.9</b>	<b>F</b>	<b>133.2</b>	<b>F</b>
Baboosic Lake Rd EB Left Turn	35.1	D	28.9	C	99.2	F	63.1	E
Baboosic Lake Rd EB Right Turn	77.3	E	30.1	C	15.2	B	22.5	C
US 3 NB Left Turn	19.8	B	56.6	E	17.4	B	25.5	C
US 3 NB Through	8.2	A	29.9	C	15.5	B	260.5	F
US 3 SB Through	27.7	C	57.2	E	41.0	D	30.2	C
US 3 SB Right Turn	76.0	E	39.8	D	382.7	F	62.4	E
<b>Greeley St/ FEE Tpk Exit 11 Ramps</b>	<b>21.3</b>	<b>C</b>	<b>33.9</b>	<b>C</b>	<b>19.4</b>	<b>B</b>	<b>27.8</b>	<b>C</b>
Greeley St EB Left Turn	37.4	D	49.0	D	28.0	C	37.8	D
Greeley St EB Through	3.5	A	6.9	A	3.4	A	7.9	A
Greeley St WB Through	26.6	C	53.4	D	25.9	C	39.5	D
FEE Turnpike Ramps NB Left Turn	37.7	D	42.0	D	38.2	D	40.8	D
FEE Turnpike Ramps NB Right Turn	15.5	B	0.2	A	15.5	B	0.2	A

Table 5, continued

Signalized Intersections	2025 No-Build Scenario				2025 Build Scenario			
	AM Pk	AM	PM Pk	PM	AM Pk	AM	PM Pk	PM
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
<b>Cntl Blvd/Amhr Rd/Camp Sgt Rd</b>	<b>41.2</b>	<b>D</b>	<b>44.2</b>	<b>D</b>	<b>42.9</b>	<b>D</b>	<b>40.0</b>	<b>D</b>
Continental Blvd EB Left Turn	42.6	D	37.2	D	37.5	D	33.6	C
Continental Blvd EB Through	53.4	D	75.8	E	44.5	D	47.3	D
Continental Blvd WB Through	57.9	E	61.7	E	69.4	E	61.7	E
Continental Blvd WB Right Turn	5.2	A	14.2	B	5.7	A	17.2	B
Camp Sargent Rd NB Left Turn	66.9	E	47.2	D	53.7	D	47.2	D
Camp Sargent Rd NB Through	48.0	D	65.9	E	42.7	D	65.9	E
Camp Sargent Rd NB Right Turn	25.9	C	20.6	C	24.5	C	20.6	C
Amherst Rd SB Left Turn	53.0	D	46.8	D	59.9	E	66.5	E
Amherst Rd SB Throught	24.3	C	35.5	C	23.2	C	37.8	D
Amherst Rd SB Right Turn	1.2	A	1.5	A	1.4	A	1.5	A
<b>US 3/Greeley St</b>	<b>14.6</b>	<b>B</b>	<b>23.4</b>	<b>C</b>	<b>15.1</b>	<b>B</b>	<b>21.8</b>	<b>C</b>
Greeley St EB Left Turn	11.4	B	24.4	C	10.5	B	10.8	B
Greeley St EB Through	12.4	B	9.3	A	12.4	B	7.3	A
Greeley St EB Right Turn	4.0	A	2.2	A	4.1	A	2.2	A
Greeley St WB All Moves	12.5	B	9.6	A	12.5	B	7.5	A
US 3 NB Left Turn	30.2	C	45.3	D	30.2	C	66.8	E
US 3 NB Through/Right Turn	17.6	B	29.7	C	17.5	B	33.2	C
US 3 SB Left	30.1	D	41.7	D	30.0	C	41.6	D
US 3 SB Through	37.3	D	45.1	D	36.2	D	44.7	D
US 3 SB Right Turn	0.2	A	0.2	A	0.1	A	0.1	A
<b>Unsignalized Intersections</b>								
<b>Turkey Hill Rd/Amherst Rd</b>								
Amherst Rd EB Left Turn	7.6	A	12.2	B	7.6	A	11.9	B
Turkey Hill Rd SB Left/Right Turns	423.4	F	106.6	F	354.0	F	89.1	F
<b>US 3/Wire Road</b>								
US 3 NB Left Turn	9.3	A	10.5	B	8.8	A	9.6	A
Wire Rd EB Left/Right Turns	20.0	C	22.0	C	19.4	C	150.9	F
<b>Bedford Rd/Wire Rd</b>								
Bedford Rd EB All	10.6	B	9.6	A	16.9	C	13.5	B
Bedford Rd WB All	8.6	A	10.6	B	12.1	B	73.6	F
Wire Rd NB All	8.6	A	9.6	A	10.3	B	13.0	B
Wire Rd SB All	10.0	B	9.0	A	16.5	C	11.8	B
<b>Bedford Rd/Back River Rd</b>								
Bedford Rd. EB Left/Through	--	--	--	--	8.7	A	18.5	C
Back River Rd SB Left/Right Turns	--	--	--	--	188.2	F	425.5	F

The FEET SB on/Bedford Rd/Back River Rd intersection was predicted to decline from LOS B (AM) and C (PM) in 2004 to F in 2025 for both peak periods under the No-Build. The construction of north ramps was predicted to improve the AM LOS to B but the PM would only improve a notch to E. At the FEET NB off/Bedford Rd. intersection AM LOS showed a decline from No-Build to Build from B to F but improved from F to C in the PM.

At the intersection of FEET SB off/Bedford Rd, separated from the junction of Back River Road in the Build scenario, LOS was calculated at B for the AM period and E for the PM.

For two other intersections, US 3/Bedford Rd and US 3/Baboosic Lake Rd, operational conditions were predicted to worsen for both peak periods from D to F for the Build scenario. At the intersection of Greeley St/Turnpike Exit 11 ramps, LOS for the Build improved to B from C for the AM and was unchanged for the PM hour. At the two remaining signalized intersections, Continental Blvd/Amherst Rd and US 3/Greeley St, operational conditions were little changed from No-Build to Build and LOS did not improve.

For the unsignalized intersections, the left turn approach from Turkey Hill Rd. to Amherst Rd. was determined to operate at somewhat less delay under the Build for both time period but still remain at LOS F. Curiously, at the intersection of Bedford Rd/Wire Rd, the westbound Bedford Rd. approach was purported to drop from B to F for the Build scenario during the PM peak, even though this is the through movement. The intersection of Bedford Rd. and Back River Rd., separated from the Exit 12 ramps for the Build, is projected at LOS F for Back River Rd. approaches. It was evaluated as an unsignalized intersection, even though its proximity to the nearby signalized ramp intersection would likely necessitate it being tied-in as a signalized intersection.

While the 2004 study provided a comprehensive summary of traffic impacts on the study area intersections for the two scenarios, it did not state a conclusion as to whether the north ramps should be added to the regional Metropolitan Transportation Plan as a recommended long-range project. This is likely because the analysis resulted in some intersections benefitting from the project while others would deteriorate in operational conditions.

## RESULTS OF TURNPIKE EXIT 12 STUDY 2022 UPDATE

### EXISTING CONDITIONS ANALYSIS

#### Traffic Count Trends

Nearly twenty years have passed since the conduct of the 2004 Turnpike Exit 12 Study and the update analysis conducted in 2021. During that time there has been a slowdown of regional growth, which has manifested in low traffic volume growth along most regional highways. However, there have been two notable exceptions which directly impact the Exit 12 study area. Two permanent count stations are located in close proximity to the Turnpike Interchange 12 and provide data that reveal the impetus for conducting a study update at this time. At the FEE Turnpike count station at the Bedford toll (close to the Merrimack town line), traffic has only increased by 3.3% between 2009 and 2019 (the last full year before onset of the COVID-19 pandemic, which brought about significant reductions in traffic volume). However, on US 3 (Daniel Webster Hwy.) north of Bedford Rd., the volume increased by over 27.6% during this period, representing a 2.5% growth rate annually. This is more characteristic of the annual increase on regional highways during the 1980's and 1990's, rather than the typical growth rates of 1% since 2000

**Table 6 - Traffic Count Trends at Study Area Permanent Count Stations**

Year	US 3, N of Bedford Rd		FEET @ Bedford Toll	
	AWDT	% Change	AWDT	% Change
2019	17,100	-2.3%	53,050	0.3%
2018	17,500	7.1%	52,900	1.6%
2017	16,340	-1.0%	52,050	1.4%
2016	16,500	3.8%	51,300	2.9%
2015	15,900	6.7%	49,800	2.6%
2014	14,900	4.9%	48,200	-2.5%
2013	14,200	3.6%	46,150	-4.0%
2012	13,700	-0.7%	46,050	-3.6%
2011	13,800	1.5%	51,950	-0.4%
2010	13,600	1.9%	52,150	1.5%
2009	13,350	--	51,350	--
<b>2009-2019</b>	<b>3,750</b>	<b>27.6%</b>	<b>1,700</b>	<b>3.3%</b>

Table 7 shows that the Turnpike permanent count station traffic growth has been significantly lower than those experienced for Merrimack segments between interchanges 13 and 10. Annual growth along these segments averaged between 2.6% and 2.8% for the ten year period, in contrast to the flat to moderate growth that prevailed though the remaining turnpike segments south to the Massachusetts border.

**Table 7 - FEE Turnpike Average Weekday Traffic by Segment, 2009 - 2017**

Year	Bedford Toll		Int 12-13		Int 11-12		Int 10-11		Int 8-10		Int 7-8		
	AWDT	% Δ	AWDT	% Δ	AWDT	% Δ	AWDT	% Δ	AWDT	% Δ	AWDT	% Δ	
2019	53,050	0.3%	71,150	-0.4%	82,350	1.2%	80,500	1.2%	77,200	1.2%	101,750	1.2%	
2018	52,900	1.6%	71,400	6.5%	81,350	5.5%	79,550	4.8%	76,300	-10.9%	100,550	-0.8%	
2017	52,050	1.4%	66,750	1.9%	76,850	2.0%	75,700	2.0%	84,600	2.0%	101,350	2.0%	
2016	51,300	2.9%	65,500	2.1%	75,350	2.1%	74,200	2.0%	82,900	2.0%	99,300	2.0%	
2015	49,800	2.6%	64,150	3.9%	73,750	4.4%	72,700	3.9%	81,250	6.7%	97,300	4.0%	
2014	48,200	-2.5%											
2013	46,150	-4.0%											
2012	46,050	-3.6%	57,250		64,800	2.9%	64,800	1.6%	66,950	4.5%	86,400	3.5%	
2011	51,950	-0.4%											
2010	52,150	1.5%											
2009	51,350				59,550		61,750		58,700		77,900		
4-yr Rate/Yr.		1.6%			2.6%			2.8%			2.6%		
10-yr Rate/Yr.		0.3%			NA			3.3%			2.7%		

Year	Int 6-7		Int 5-6		Int 4-5		Int 2-3		Mass SL	
	AWDT	% Δ	AWDT	% Δ	AWDT	% Δ	AWDT	% Δ	AWDT	% Δ
2019	121,350	1.2%	134,350	0.4%	121,820	1.2%	117,200	1.2%	101,100	1.1%
2018	119,900	-3.1%	133,750	0.0%	120,375	2.0%	115,850	2.0%	99,950	2.0%
2017	123,600	2.0%	133,700	0.9%	118,021	2.0%	113,550	1.9%	97,950	1.9%
2016	121,100	2.0%	132,550	-0.2%	115,667	2.0%	111,350	2.1%	96,050	2.0%
2015	118,650	2.5%	132,850	1.9%	113,314	1.6%	109,050	2.1%	94,100	2.5%
2014			128,850	1.4%	0		0		0	
2013			126,000	0.3%	0		0		0	
2012	110,150	-0.6%	125,700	0.9%	108,000	-0.6%	102,600	-1.3%	87,500	-2.9%
2011			123,600	-1.0%	0		0		0	
2010			124,850	1.9%	0		0		0	
2009	112,300		122,500		109,900		106,650		95,700	
4-yr Rate/Yr.			0.3%		1.8%		1.8%		1.8%	
10-yr Rate/Yr.			0.9%		1.0%		0.9%		0.6%	

COVID-19 Traffic Impacts

The COVID-19 pandemic had major impacts on reducing vehicular traffic on all roadways, at first in a very dramatic manner, followed by a period of varying degrees of traffic recovery. The pandemic resulted in more than a one year delay in the conduct of this study, as data collection was scheduled to begin in Spring 2020, just after the onset of the lockdown period. As Table 8 shows, traffic on the FEE Turnpike at the Bedford toll station remains about 12% below the March 2019 level and has recovered to within 5% of 2019 weekday traffic on US 3 north of Bedford Road. These trends indicate that there has likely been some degree of permanent traffic reduction due to increased use of telecommuting.

**Table 8 - COVID Era Study Area Permanent Station Count Trends**

**F.E. Everett Turnpike AWDT at Bedford Toll**

	% Change			% Change		% Change	
	2019	2020	2019-20	2021	2019-21	2022	2019-22
Jan	48,703	50,759	4.2%	36,955	-24.1%	40,377	-17.1%
Feb	49,853	50,019	0.3%	36,655	-26.5%	42,840	-14.1%
Mar	51,219	37,868	-26.1%	40,048	-21.8%	44,971	-12.2%
Apr	51,134	23,661	-53.7%	41,591	-18.7%		
May	53,981	31,533	-41.6%	44,945	-16.7%		
Jun	55,980	39,631	-29.2%	48,269	-13.8%		
Jul	56,643	43,826	-22.6%	50,888	-10.2%		
Aug	58,446	45,750	-21.7%	50,771	-13.1%		
Sep	55,016	44,671	-18.8%	48,625	-11.6%		
Oct	54,775	43,354	-20.9%	48,940	-10.7%		
Nov	52,255	39,107	-25.2%	45,985	-12.0%		
Dec	47,526	37,219	-21.7%	44,701	-5.9%		

**US 3 AWDT, North of Bedford Rd, Merrimack**

	Average Weekday			% Change		% Change	
	2019	2020	Change	2021	2019-21	2022	2019-22
Jan	16,273	16,247	-0.2%	13,606	-16.4%	NA	NA
Feb	15,972	15,743	-1.4%	13,232	-17.2%	15,174	-5.0%
Mar	16,687	13,257	-20.6%	14,835	-11.1%		
Apr	17,054	9,882	-42.1%	15,512	-9.0%		
May	17,472	12,678	-27.4%	16,648	-4.7%		
Jun	17,949	14,398	-19.8%	16,947	-5.6%		
Jul	17,104	14,801	-13.5%	16,313	-4.6%		
Aug	17,550	14,980	-14.6%	16,205	-7.7%		
Sep	17,494	15,421	-11.8%	16,443	-6.0%		
Oct	17,103	14,770	-13.6%	16,282	-4.8%		
Nov	16,728	14,368	-14.1%	15,774	-5.7%		
Dec	15,470	13,853	-10.5%	15,519	0.3%		

The premise behind the 2004 Turnpike Exit 12 study was that by the future analysis year 2025, traffic growth would be such that study area facilities would be overloaded with vehicle activity. We are now within several years of that forecast year, so a comparison of existing traffic with 2025 forecasted volumes provides a reality check on the previous study's findings.

Table 9 provides the comparison of existing peak hour intersection approaches with the 2025 forecasts. Most significantly, the intersection of the Turnpike southbound on/Bedford Road/Back River Road, shows a level of volume over 50% below the original future forecast. The expected decline of operational conditions at this location was a key component of projected need for the completion of the interchange. Only the Bedford Road/Wire Road intersection has exceeded the 2025 forecast at this point in time, and as it is an uncongested location, does not have bearing on project need.

**Table 9 - 2004 Exit 12 Study Projected 2025 Compared with 2021 Weekday Counts**

	2004 Study			2004 Study		
	Projected 2025 AM	2021 Existing	% Diff	Projected 2025 PM	2021 Existing	% Diff
FEET SB On/Bedford Rd/Back River Rd	3,085	1,380	-55%	3,419	1,624	-53%
FEET NB Off/Bedford Rd	1,350	1,048	-22%	2,285	1,486	-35%
US 3/Bedford Rd	2,193	1,682	-23%	2,335	2,080	-11%
Bedford Rd/Wire Rd	660	685	4%	727	880	21%
Bedford Rd/Joppa Rd	619	464	-25%	478	592	24%
US 3/Wire Rd	1,459	1,101	-25%	1,916	1,532	-20%
US 3/Baboosic Lake Rd	2,223	NA	NA	2,451	NA	NA
US 3/Greeley St	2,319	1,700	-27%	2,791	2,136	-23%
Continental Blvd/Camp Sgt/Amhr Rd	2,472	1,973	-20%	3,273	2,846	-13%
FEET NB Ramps/Greeley St	2,407	1,766	-27%	3,350	2,506	-25%
Amherst Rd/Turkey Hill Rd	1,537	NA	NA	1,794	1,203	NA

## Speed Data Tabulation and Analysis

NRC monitors congested period speeds on regional arterials for its Congestion Management Process utilizing the National Performance Management Research Data Set (NPMRDS). In addition to average peak period speeds, a Travel Time Index (TTI) is also calculated, which is the ratio of average travel time in peak hours to free-flow travel time. The NRPC region analysis uses 7:00-9:00 AM for the morning peak period and 4:00-6:00 PM for the afternoon peak. The Travel Time Index represents the average additional time required for a trip during peak times in comparison with that trip duration in no-traffic condition. The calculation is as follows:

$$TTI = \frac{\textit{Average Travel Time}}{\textit{Free Flow Travel Time}}$$

For instance, if the average and free-flow travel time are 5 and 4 minutes, respectively, TTI would be 1.25. This value means that your trip will take 25% longer than during a free-flow time of day. TTI can be calculated for different temporal grouping schemes such as X-minute intervals, by time-of-the-day, day-of-the-week, month, and for the entire year. Also, for each of these groups, TTI can be calculated for weekdays and weekends separately. The NRPC CMP focuses specifically on weekday peak period travel.

Five ranges of congestion are defined by TTI range, as shown in the table below. For the turnpike, TTI is associated with the speed ranges shown. For non-expressway roads, free-flow speed is determined by calculating the mean travel time for the uncongested 9:00-10:00 PM night period. In many cases this will be less than posted speed limits since stoppages at traffic lights prevent continuous travel at the allowable speed. For example, the posted speed limit on Main Street in Nashua is 25 mph but the data indicate that the free-flow speed at night is 18 mph for both directions of traffic.

The NPMRDS data set purports to provide data back to September 2011. As this precedes the opening of the Wieczorek Drive to the Manchester Airport, NRPC intended to provide a comparison of travel time speeds prior to the new link with US 3 providing convenient access to I-293 and the Airport with present day speeds. However, running the data set prior to November 2011 did not result in data for US 3 in Merrimack. Therefore, we can only provide current data, which were developed for the CMP update of 2022.

On US 3 Daniel Webster Highway, two segments stand out as heavily congested: 1) from Greeley Street to Baboosic Lake Road northbound in the morning peak period and from the Bedford line to Bedford Road southbound in the afternoon peak. If speed data were available for even shorter roadway segments, the speed along US 3 just north of Bedford Road would be much lower, pushing the travel time index into the red zone (extreme congestion).



**Table 10 - US 3 Peak Period Speed and Travel Time Index**

	Northbound				Southbound			
	AM Peak (7-9)		PM Peak (4-6)		AM Peak (7-9)		PM Peak (4-6)	
	Speed	TT Ind	Speed	TT Ind	Speed	TT Ind	Speed	TT Ind
Bedford Rd to Bedford Line	33.0	1.21	32.8	1.22	30.2	1.33	26.4	1.52
Baboosic Lake Rd to Bedford Rd	28.8	1.22	25.7	1.36	26.5	1.32	25.0	1.40
Greeley St to Baboosic Lake Rd	31.1	1.16	22.6	1.60	28.9	1.28	27.5	1.34
Industrial Dr to Greeley St	37.6	1.04	34.9	1.12	34.4	1.08	32.0	1.16
HB Hwy int. to Industrial Dr	36.3	1.02	34.5	1.07	36.4	1.05	37.1	1.03

Speed	TTI	Level of Congestion
60+	TTI < 1.00	None
50 - 60	1.00 <= TTI < 1.25	Minor
40 - 50	1.25 <= TTI < 1.50	Moderate
30 - 40	1.50 <= TTI < 2.00	Heavy
< 30	TTI > 2.00	Severe

### Arterial Highway Capacity Analysis

A volume-to-capacity ratio (V/C) represents the amount of traffic relative to the total lane capacity of a roadway for a time period. V/C ranges are closely associated with arterial Level of Service (LOS), which are defined in the same A to F scale as for intersection analysis. Capacity limits for each LOS are calculated by multiplying the number of lanes per direction by the vehicles per lane (VPL) upper bound for that service level.

"Level of Service" is a term which denotes the type of operating conditions which occur along a roadway or at a particular intersection for a given period of time, generally a one-hour peak period. It is a qualitative measure of the effect of a number of operational factors including roadway geometrics, travel delay, freedom to maneuver and safety. Level of service categories for roadway segments and descriptions are explained below.

Level of Service "A" represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream.

Level of Service "B" is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is still relatively unaffected.

Level of Service "C" is in the range of stable flow but marks the beginning of the range of flow in which the operation of individual users becomes significantly affected by interactions with others in the traffic stream. Occasional backups occur behind turning vehicles.

Level of Service "D" represents high-density, but stable, flow. Speed and freedom to maneuver are restricted, and the driver experiences a below average level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

Level of Service "E" represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform level. Freedom to maneuver within the traffic stream is extremely difficult and is generally accomplished by forcing other vehicles to give way. Congestion levels and delay are very high. After full roadway capacity has been exceeded ( $V/C > 1$ ), bottlenecks and stop-and-go traffic conditions are present, which constitutes Level of Service "F".

**Table 11 – Highway Segment Level of Service Ranges and Volume-to-Capacity Ratios**

<b>FREEWAYS &amp; CONTROLLED ACCESS</b>				
LOS	Limited Access 60-70 MPH		Controlled Access 50-59 MPH	
	V/C	VPL/Hr	V/C	VPL/Hr
	A	0.40	920	0.40
B	0.50	1150	0.50	1000
C	0.70	1610	0.70	1400
D	0.85	1950	0.85	1700
E	1.00	2300	1.00	2000
F	>1	>2300	>1	>2000

<b>SINGLE-LANE ARTERIALS UNINTERRUPTED FLOW</b>						
LOS	Ave Speed = 50		Ave Speed = 40		Ave Speed = 30	
	V/C	VPL/Hr	V/C	VPL/Hr	V/C	VPL/Hr
A	0.30	480	0.30	420	0.30	360
B	0.40	640	0.40	560	0.40	480
C	0.60	960	0.60	840	0.60	720
D	0.80	1280	0.80	1120	0.80	960
E	1.00	1600	1.00	1400	1.00	1200
F	>1	>1600	>1	>1400	>1	>1200

<b>SIGNALIZED ARTERIALS</b>						
LOS	<2 signal int/mi.		2-4 signal int/mi.		>4 signal int/mi.	
	V/C	VPL/Hr	V/C	VPL/Hr	V/C	VPL/Hr
A	--	--	--	--	--	--
B	0.40	420	0.40	360	--	--
C	0.60	630	0.60	540	0.60	450
D	0.80	840	0.80	720	0.80	600
E	1.00	1050	1.00	900	1.00	750
F	>1	>1050	>1	>900	>1	>750

On US 3 there are several segments at or near full capacity (LOS E to F) for both peak periods. Greeley Street also experience near full capacity utilization during the PM peak period.

**Table 12 – Arterial Level of Service, Study Area Arterial Highways**

Location	2019 AWDT	2019 AM Pk	AM V/C	AM LOS	2019 PM Pk	PM V/C	PM LOS
<b>US 3, DW Highway</b>							
N. of Bedford R	17,150	772	0.86	D	746	0.83	E
S. of Bedford Rd	14,850	668	0.74	D	646	0.72	D
Over Souhegan River	16,250	813	0.90	E	991	1.10	F
S. of Columbia Cir	15,450	773	0.86	E	927	1.03	F
N. of Industrial Dr.	13,900	591	0.28	B	973	0.46	C
<b>Greeley Street</b>	23,650	851	0.57	C	1,265	0.84	E
<b>Continental Blvd</b>							
West of Amherst Rd	13,940	502	0.33	C	746	0.50	C
North of Contra Way	18,140	653	0.31	B	970	0.46	C
East of Naticook Rd	17,990	648	0.46	C	962	0.69	D
North of NH 101A	21,690	781	0.59	C	1,160	0.74	D

Intersection Turning Movements

NRPC conducted turning movement counts for the AM (7 to 9) and PM (4 to 6) peak periods at study area intersections. The highest one hour volumes for each intersection are presented in Figures 1 to 3. As previously noted, the 2021 existing counts are significantly less than the 2004 study forecasted 2025 volumes for all but intersection.

Figure 1 - Existing Peak Hour Turning Movements, Bedford Street Corridor

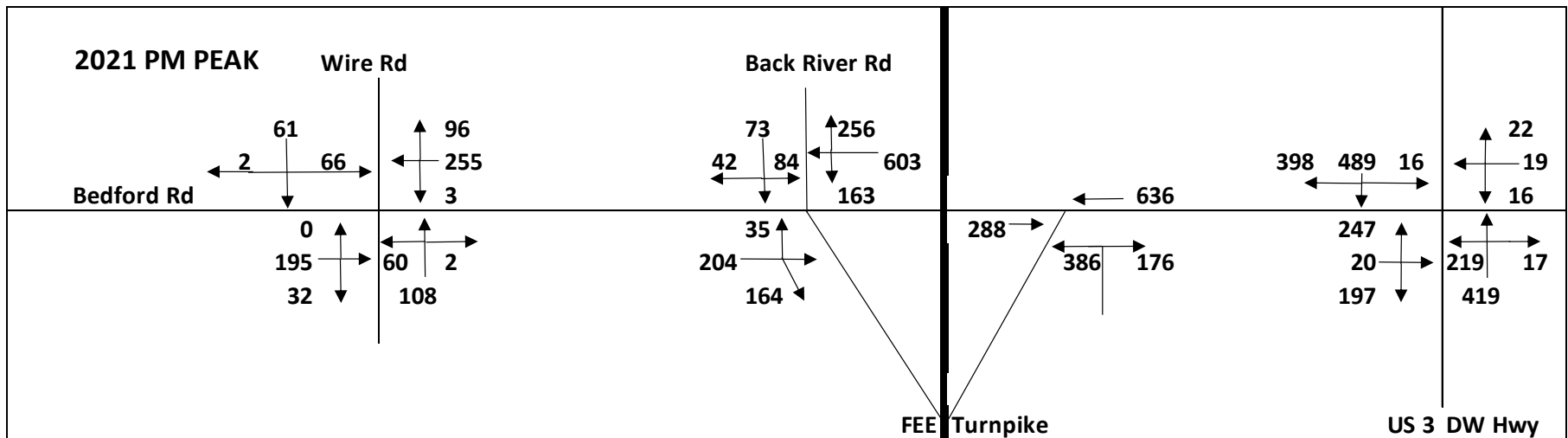
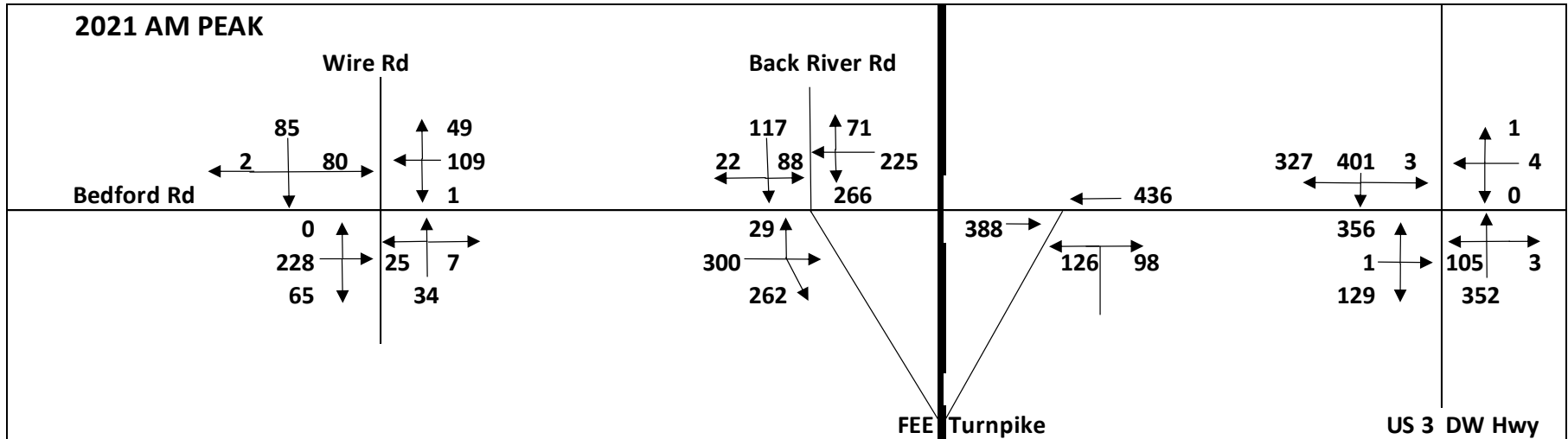


Figure 2 - Existing Peak Hour Turning Movements, US 3 from Wire Rd to Baboosic Lake Road Corridor

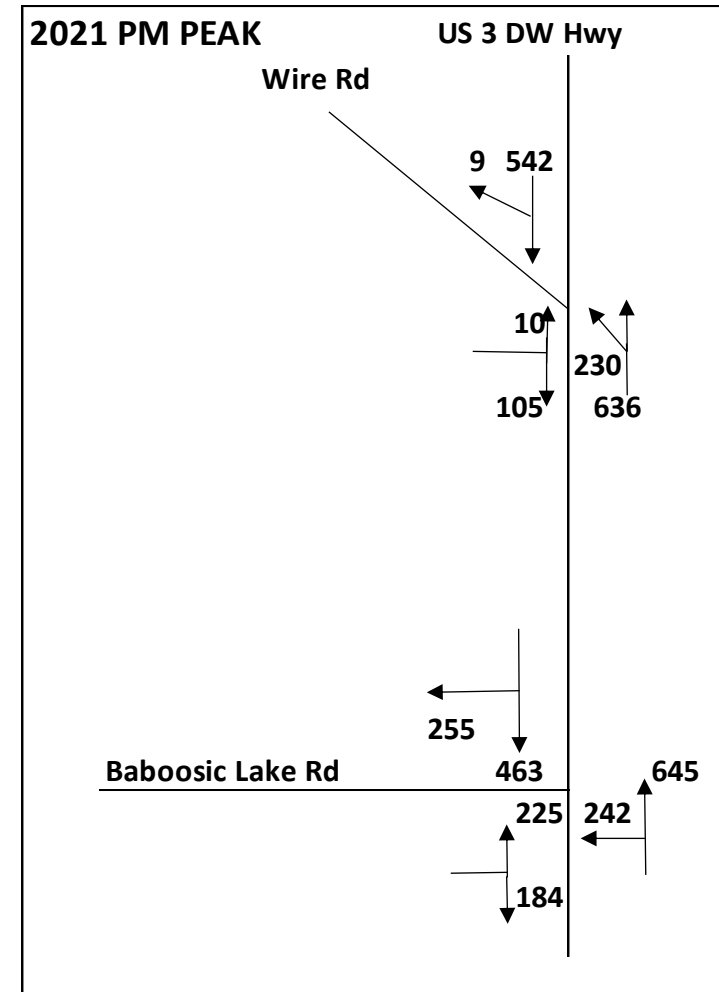
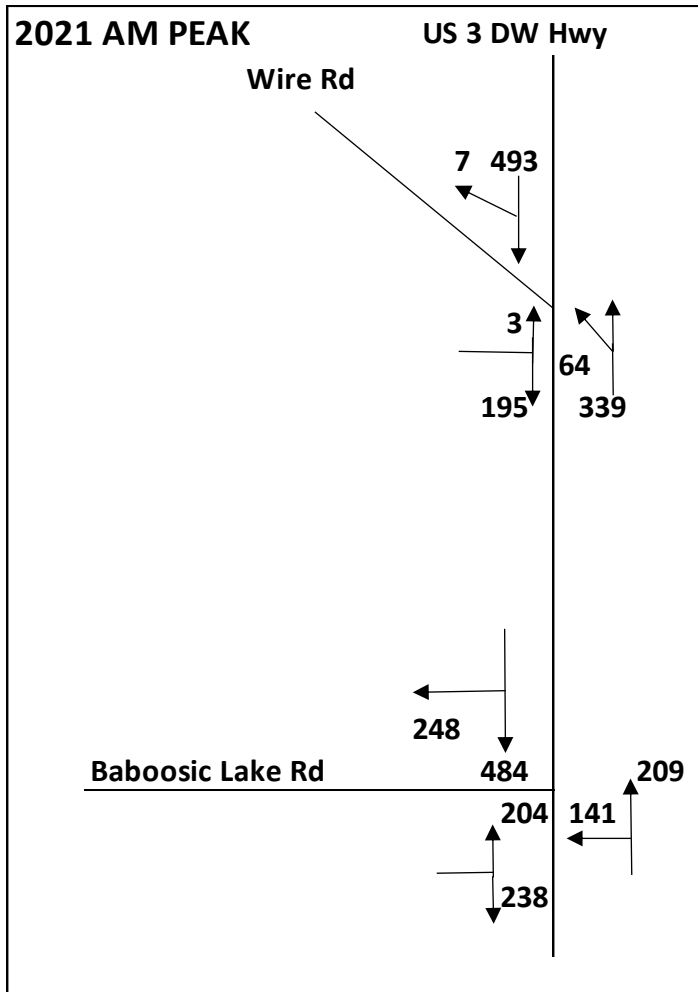
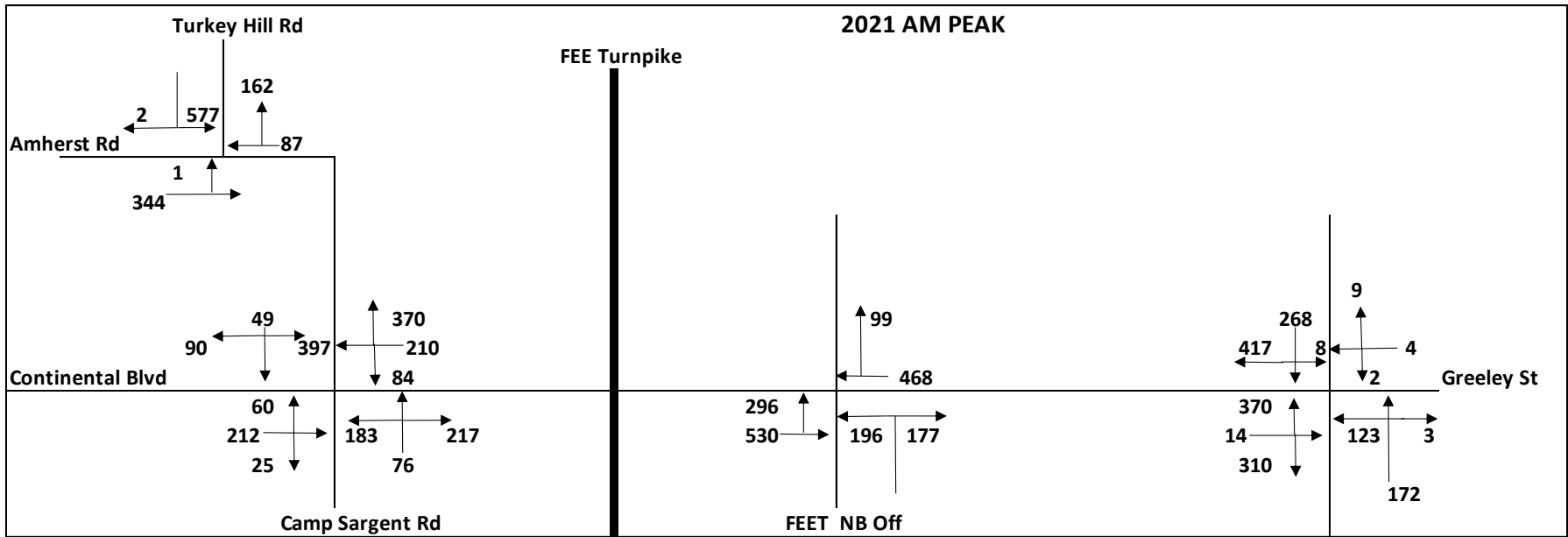
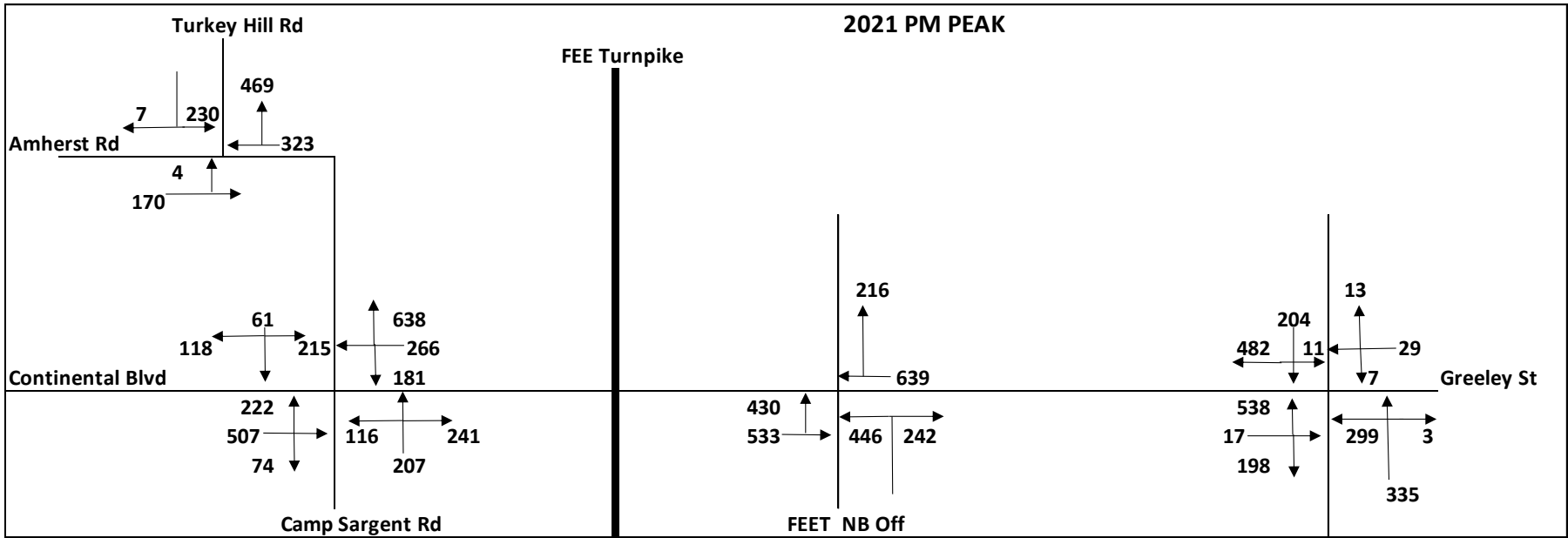


Figure 3 - Existing Peak Hour Turning Movements, Greeley St/Continental Blvd Corridor





### Intersection Capacity Analysis

Table 13 provides the results of intersection capacity analysis for locations counted in 2021 and compares with the 2002 base year results that were reported in the previous Turnpike Exit 12 Study. Most intersections operate at similar service levels as they did twenty years ago, with one notable exception. The US 3/Bedford Road intersection operates at LOS E overall during the afternoon peak, a decline of two service levels from 2002. The southbound approach on US 3 is deep into failure level, with a v/c ratio of 1.25. Queue lengths extend far to the north and can take several signal cycles to clear the intersection. This approach was experiencing a 46 second delay in 2002, indicative of an LOS D condition. The degeneration to LOS F has been a prime rationale for the re-evaluation of the need for the north ramps.



**Table 13, Intersection Capacity Analysis, 2004 Study & 2021 Existing Conditions**

	2002 Study Base Year				2021 Existing Conditions					
	AM Peak		PM Peak		AM Peak			PM Peak		
	Delay	LOS	Delay	LOS	Delay	V/C	LOS	Delay	V/C	LOS
<b>Signalized Intersections</b>										
<b>FEET SB On/Bed Rd/Back R Rd</b>	<b>17.2</b>	<b>B</b>	<b>23.5</b>	<b>C</b>	<b>22.7</b>		<b>C</b>	<b>28.7</b>		<b>C</b>
Bedford Rd EB LT	21	C	22	C	29	0.07	C	31	0.13	C
Bedford Rd EB Thru	21	C	19	B	31	0.60	C	23	0.33	C
Bedford Rd EB RT	3	A	3	A	3	0.18	A	3	0.11	A
Bedford Rd WB LT	27	C	24	C	40	0.63	D	41	0.57	D
Bedford Rd WB Thru	18	B	27	C	27	0.42	C	51	0.93	D
Bedford Rd WB Right			(Included with Thru)		3	0.05	A	41	0.17	A
Back River Rd SB All	23	C	22	C	20	0.19	B	16	0.16	B
<b>FEET NB Off/Bedford Rd</b>	<b>10.4</b>	<b>B</b>	<b>28.1</b>	<b>C</b>	<b>14.5</b>		<b>B</b>	<b>15.3</b>		<b>B</b>
Bedford Rd EB Thru	9	A	0	A	16	0.55	B	12	0.36	B
Bedford Rd WB Thru	10	A	64	E	17	0.58	B	19	0.74	B
Exit 12 Off-Ramp LT	14	B	25	C	12	0.16	B	18	0.54	B
Exit 12 Off-Ramp RT	15	B	17	B	2	0.06	A	2	0.11	A
<b>US 3/Bedford Rd</b>	<b>22.5</b>	<b>C</b>	<b>26.3</b>	<b>C</b>	<b>29.4</b>		<b>C</b>	<b>61.0</b>		<b>E</b>
Bedford Rd EB LT/Thru	43	D	42	D	37	0.70	D	47	0.70	D
Bedford Rd EB RT	7	A	8	A	2	0.15	A	3	0.24	A
Driveway WB All	16	B	19	B	39	0.04	D	48	0.29	D
US 3 NB LT	23	C	28	C	44	0.49	D	51	0.68	D
US 3 NB Thru/RT	9	A	7	A	18	0.39	B	25	0.50	C
US 3 SB LT			(Included with LT)		37	0.02	D	44	0.10	D
<b>US 3 SB Thru</b>	<b>26</b>	<b>C</b>	<b>46</b>	<b>D</b>	<b>54</b>	<b>0.91</b>	<b>D</b>	<b>163</b>	<b>1.25</b>	<b>F</b>
US 3 SB RT	21	C	19	B	4	0.34	A	8	0.51	A
<b>US 3/Baboosic Lake Rd</b>	<b>29.5</b>	<b>C</b>	<b>23.0</b>	<b>C</b>	<b>19.2</b>		<b>B</b>	<b>19.3</b>		<b>B</b>
Baboosic Lake Rd EB LT	26	C	27	C	58	0.70	E	54	0.69	D
Baboosic Lake Rd EB RT	59	E	35	D	8	0.50	A	6	0.39	A
US 3 NB LT	14	B	33	C	53	0.53	D	26	0.37	C
US 3 NB Thru	8	A	18	B	9	0.19	A	18	0.63	B
US 3 SB LT			(Included with LT)		10	0.01	A	12	0.01	B
US 3 SB Thru	34	C	23	C	11	0.42	B	13	0.42	B
US 3 SB RT	27	C	14	B	3	0.25	A	4	0.26	A
<b>Greeley St/Tnpk Exit 11 Ramps</b>	<b>17.0</b>	<b>B</b>	<b>28.8</b>	<b>C</b>	<b>19.5</b>		<b>B</b>	<b>25.0</b>		<b>C</b>
Greeley St EB LT	23	C	49	D	32	0.62	D	38	0.79	D
Greeley St EB Thru	5	A	10	A	10	0.26	C	10	0.26	A
Greeley St WB Thru	26	C	28	C	34	0.55	C	48	0.86	D
Greeley St WB RT			(Included with Thru)		3	0.07	A	3	0.14	A
FEE Turnpike Ramps NB LT	32	C	33	C	21	0.17	C	23	0.39	C
FEE Turnpike Ramps NB RT	11	B	38	D	3	0.11	A	3	0.15	A

Table 13, continued

Signalized Intersections	2002 Study Base Year				2021 Existing Conditions					
	AM Peak		PM Peak		AM Peak			PM Peak		
	Delay	LOS	Delay	LOS	Delay	V/C	LOS	Delay	V/C	LOS
<b>Cntl Blvd/Amh Rd/Cmp Sgt Rd</b>	<b>32.4</b>	<b>C</b>	<b>28.9</b>	<b>C</b>	<b>29.1</b>		<b>C</b>	<b>30.9</b>		<b>C</b>
Continental Blvd EB LT	33	C	43	D	43	0.24	D	84	0.91	F
Continental Blvd EB Thru/RT	35	C	44	D	29	0.24	C	35	0.61	D
Continental Blvd WB LT	NA	NA	NA	NA	44	0.32	D	58	0.69	E
Continental Blvd WB Thru	39	D	33	C	34	0.40	C	36	0.52	D
Continental Blvd WB RT	9	A	12	B	0	0.25	A	1	0.43	A
Camp Sargent Rd NB LT	33	C	42	D	60	0.71	E	48	0.44	D
Camp Sargent Rd NB Thru	31	C	47	D	43	0.28	D	62	0.73	E
Camp Sargent Rd NB RT	19	B	18	B	3	0.20	A	1	0.22	A
Amherst Rd SB LT	56	E	39	D	52	0.82	D	36	0.44	D
Amherst Rd SB Thru	24	C	33	C	30	0.10	C	30	0.12	C
Amherst Rd SB RT	3	A	2	A	1	0.09	A	1	0.11	A
<b>US 3/Greeley St</b>	<b>17.7</b>	<b>B</b>	<b>24.1</b>	<b>C</b>	<b>20.5</b>		<b>C</b>	<b>31.9</b>		<b>C</b>
Greeley St EB LT/Thru	32	C	22	C	46	0.58	D	63	0.83	E
Greeley St EB RT	5	A	2	A	4	0.44	A	3	0.30	A
Greeley St WB All	19	B	7	A	35	0.16	C	45	0.39	D
US 3 NB LT	21	C	42	D	48	0.39	D	49	0.65	D
US 3 NB Thru/RT	11	B	31	C	17	0.12	B	25	0.28	C
US 3 SB Left	28	C	37	D	43	0.05	D	37	0.05	D
US 3 SB Thru	36	D	44	D	18	0.18	B	24	0.17	C
US 3 SB RT	0	A	0	A	4	0.46	A	5	0.58	A
<b>Unsignalized Intersections</b>										
<b>Turkey Hill Rd/Amherst Rd</b>					<b>52</b>		<b>D</b>	<b>5</b>		<b>A</b>
Amherst Rd EB LT	3	A	8	B	8	0.01	A	9	0.01	A
Turkey Hill Rd SB Left/RTs	171	F	40	E	107	1.13	F	27	0.60	D
<b>US 3/Wire Road</b>					<b>3</b>		<b>A</b>	<b>3</b>		<b>B</b>
US 3 NB LT	9	A	10	A	9	0.07	A	10	0.26	A
Wire Rd EB Left/RTs	17	C	17	C	21	0.01	C	69	0.16	F
Wire Rd EB RT	(Included with RT)				16	0.39	C	14	0.23	B
<b>Bedford Rd/Wire Rd</b>					<b>10</b>		<b>A</b>	<b>12</b>		<b>B</b>
Bedford Rd EB All	10	A	9	A	11	0.62	B	11	0.48	B
Bedford Rd WB All	8	A	10	A	9	0.33	A	13	0.75	B
Wire Rd NB All	8	A	9	A	9	0.14	A	11	0.36	B
Wire Rd SB All	10	A	9	A	10	0.35	A	10	0.27	B

## Crash Data Analysis

Highway crash statistics provide a key indicator of locations where non-recurring delay may be a problem. NRPC utilizes crash data from the NH Department of Safety to identify the number of crashes occurring along highway segments and the crash rate, measured by the number of crashes per million vehicle miles of travel. Segments which generate relatively high crash rates should be further evaluated to determine whether mitigating measures might reduce crash rates and, consequently, the infrequent but potentially dramatic impacts on roadway congestion.

Crash data covers the period from 2017 through 2020 only since prior data was kept by two separate state entities and is considered not as reliable. Crash rates were developed for all NRPC region state highways and data are reported in the Congestion Management Process report of March 2022. Both US 3 in Merrimack and Continental Boulevard exhibit lower than average crash rates, while Greeley Street experiences a significantly higher than average rate. This is probably due to the considerable congestion that occurs along the short highway segment coupled with substantial lane-changing activity.

**Table 14 – Study Area Crash Rates**

<b>US 3 DW Highway</b>	<u>Length</u>	<u>AWDT</u>	MVM/ <u>Year</u>	Ave Yrly <u>Crashes</u>	Crashes/ <u>MVM/Yr</u>
Bedford Rd - Manchester TL	1.99	15600	11.33	16	1.41
Baboosic Lake Rd - Bedford Rd	1.67	14600	8.90	10	1.09
Greeley St - Baboosic Lake Rd	1.96	14600	10.44	17	1.63
Industrial Dr - Greeley St	1.28	10600	4.95	6	1.28
Nashua TL - Industrial Dr	2.39	13300	11.60	9	0.78
<b>Continental Blvd</b>	3.86	16800	23.67	42	1.77
<b>Greeley St</b>	0.40	15700	2.29	11	4.94

## FUTURE CONDITIONS ANALYSIS

### Traffic Model Update

The future conditions analysis to develop the future Baseline also known as the No-Build for 2045 began with calibration of the regional traffic model. This process entails adjustments to network inputs such as lane capacity and free-flow speeds in order to achieve model volumes that replicate ground counts as closely as possible. The results of model calibration are shown in Table 15. Some locations more closely fit actual traffic conditions than others. Since the highway assignment was calibrated to closely match travel speeds along roadways during congested hours, it is likely that discrepancies result mainly from trip generation and distribution variances from actual travel behavior. Calibrating these model functions would require a major commitment to model development, including conducting regional travel surveys. For the purpose of regional studies, the model is adequate and model differences from ground counts are accounted for when predicting future volumes.

Table 15 - Traffic Model Calibration Results for Study Area Intersections

	Intersection Approaches			Pct	1-way	2021	% Model
	AM	PM	Total	AWDT	AWDT	Model	Error
<b>FEE SB On/Bedford Rd/Back River Rd</b>							
Bedford Rd EB	591	403	994	16%	6,210	6,712	8%
Bedford Rd WB	562	1022	1584	16%	9,900	10,053	2%
Back River Rd SB	227	199	426	16%	2,660	3,412	28%
<b>FEE NB Off Ramp/Bedford Rd</b>							
Bedford Rd EB	388	288	676	12%	5,700	4,671	-18%
Bedford Rd WB	436	636	1072	16%	7,150	4,465	-38%
FEET Exit 12 NB Off Ramp	224	562	786	15%	5,300	7,688	45%
<b>US 3/Bedford Rd</b>							
US 3 NB	460	655	1115	16%	7,150	6,248	-13%
US 3 SB	731	903	1634	16%	10,210	7,205	-29%
Bedford Rd EB	486	464	950	17%	5,700	4,152	-27%
<b>US 3/Baboosic Lake Rd</b>							
US 3 NB	351	888	1239	15%	8,060	6,466	-20%
US 3 SB	735	719	1454	16%	9,090	7,123	-22%
Baboosic Lake Rd EB	443	411	854	16%	5,340	3,678	-31%
<b>Greeley St/FEET Exit 11 Ramps</b>							
Greeley St EB	826	963	1789	16%	11,180	11,677	4%
Greeley St WB	567	855	1422	16%	8,890	8,367	-6%
FEE Turnpike Ramps NB	373	688	1061	20%	5,300	7,201	36%
<b>Continental Blv/Amherst Rd/Camp Sgt Rd</b>							
Continental Blvd EB	297	803	1100	16%	6,970	8,113	16%
Continental Blvd WB	664	1085	1749	16%	10,930	11,677	7%
Camp Sargent Rd NB	476	564	1040	16%	6,500	4,577	-30%
Amherst Rd SB	536	394	930	16%	5,810	4,192	-28%
<b>US 3/Greeley St</b>							
US 3 NB	298	637	935	16%	5,840	5,859	0%
US 3 SB	693	697	1390	15%	9,090	8,189	-10%
Greeley St EB	694	753	1447	17%	8,440	7,692	-9%
Greeley St WB	15	49	64	16%	400	466	17%
<b>Turkey Hill Rd/Amherst Rd</b>							
Amherst Rd EB	355	174	529	20%	2,705	4,475	65%
Amherst Rd WB	249	792	1041	20%	6,510	7,756	19%
Turkey Hill Rd SB	579	237	816	20%	4,030	3,679	-9%
<b>US 3/Wire Rd</b>							
US 3 NB	403	866	1269	16%	7,930	7,233	-9%
US 3 SB	500	551	1051	16%	6,765	6,455	-5%
Wire Rd EB	198	115	313	15%	2,075	1,974	-5%
<b>Bedford Rd/Wire Rd</b>							
Bedford Rd EB	293	227	520	16%	3,250	2,783	-14%
Bedford Rd WB	159	354	513	16%	3,210	3,045	-5%
Wire Rd NB	66	170	236	16%	1,480	900	-39%
Wire Rd SB	167	129	296	16%	1,850	1,542	-17%
<b>TOTAL - All Approaches</b>					201,625	187,149	-7%

Forecasting future traffic volumes is dependent on the growth in land use inputs which are entered into the trip generation function of the model. NRPC has worked closely with town planning departments to keep land use forecasts current. The most recent update of the model's land use inputs was undertaken in 2019, with the townwide estimates shown in Table 16. In Merrimack, population was projected to grow by 10.6% through 2045. Population and household growth are the primary determinants of trip productions. The growth in employment was in the same range as population growth, at about 12%. There do exist some projections which need to be carefully reviewed and evaluated with the next model update, likely to occur in 2022-2023 with incorporation of 2020 U.S Census data and an update of employment data. NRPC will be particularly looking at the wide variance between population and housing growth in Hudson, with the latter now projected to increase by 85%.

**Table 16 – Nashua Region Projected Population & Employment, 2045**

	Population				Employment			
	2020	2045	Growth	Pct. Change	2020	2045	Growth	Pct. Change
Amherst	11,753	12,059	306	2.6%	4,507	4,941	434	9.6%
Brookline	5,639	6,479	840	14.9%	487	707	220	45.2%
Hollis	8,342	9,260	918	11.0%	2,067	2,282	215	10.4%
Hudson	25,394	27,908	2,514	9.9%	10,191	18,873	8,682	85.2%
Litchfield	8,478	9,097	619	7.3%	915	1,316	401	43.8%
Lyndeborough	1,702	2,095	393	23.1%	98	119	21	21.4%
Mason	1,448	1,480	32	2.2%	181	200	19	10.5%
Merrimack	26,632	29,455	2,823	10.6%	17,202	19,243	2,041	11.9%
Milford	16,131	18,647	2,516	15.6%	6,097	7,234	1,137	18.6%
Mt. Vernon	2,584	2,667	83	3.2%	138	181	43	31.2%
Nashua	91,322	95,523	4,201	4.6%	51,192	56,093	4,901	9.6%
Pelham	14,222	16,057	1,835	12.9%	2,363	2,505	142	6.0%
Wilton	3,896	4,177	<u>281</u>	<u>7.2%</u>	<u>1,208</u>	<u>1,336</u>	<u>128</u>	<u>10.6%</u>
<b>NRPC Region</b>	<b>217,543</b>	<b>234,904</b>	<b>17,361</b>	<b>8.0%</b>	<b>96,646</b>	<b>115,030</b>	<b>18,384</b>	<b>19.0%</b>

In consultation with the Town of Merrimack, NRPC made further adjustments to the future year trip table that is used for traffic assignment. A list of residential and commercial developments was provided to NRPC for doing an interim model land use update. The list was compared with the previous future development scenario and trip table adjustments were done manually prior to running the 2045 No-Build scenario. Table 17 provides a summary of the data provided to NRPC and the marginal units of households and employment that were factored into the future year trip table. These additions resulted in 5,243 daily trips being added to the 2045 trip table.

**Table 18 - Revised 2045 Land Use Inputs for Regional Model**

	Existing Land Use			Previous Projection			2045 Revised		Change to Forecast		
	2020 Units	2020 Emp	2020 Trips	2045 Units	2045 Emp	2045 Trips	HH Dev Scen	Emp Dev Scen	HH to Add	Emp to Add	Trips Added
<b>Development</b>											
Edgebrook Hgts Res/Comm	0	0	0	0	0	0	232	30	232	30	1003
Townsend Pl/Bowers Land	161	32	1021	161	43	1144	137	0	137	0	548
57-59 DWH 166k mfg/whse	3	214	469	3	202	525	0	20	0	20	50
Innovation Realty	0	602	2926	0	549	3278	90	0	90	0	360
TC Boston 323k dist facility	0	95	535	0	277	600	0	40	0	0	0
Residences @ Exec Park	0	82	354	270	106	396	280	0	10	0	40
Neighborworks	8	13	132	8	25	148	45	0	45	0	180
Merrimack 360 Plaza	170	3	864	170	6	967	40	100	40	100	660
Overlook Estates	76	314	1877	76	330	2102	45	0	45	0	180
Chestnut Hill	79	5	509	79	0	570	77	0	77	0	308
Greenfield Farm	70	1	410	70	0	459	66	0	66	0	264
Gilbert Crossing	2	69	680	2	1061	761	336	0	336	0	1344
Flatley Retail 190k sf	0	0	4	1	60	4	0	60	0	60	150
Flatley Industrial 100k sf	0	270	534	0	188	598	0	30	0	0	0
Flatley Warehouse 120k	0	61	165	0	86	184	0	30	0	0	0
Merrimack Park Place	0	0	0	185	0	0	224	0	39	0	156

Traffic Volume Forecast – 2045 No-Build Scenario

Table 19 provides a summary of the 2045 No-Build traffic assignment for study area roadways. For a nearly 25-year period, the increases can be considered moderate. US 3 in Merrimack is projected to increase between 15-21%. Bedford Road growth is estimated at just under 20%. Traffic increases on the Turnpike are forecasted at 13% for mainline segments in Merrimack; however, ramp increases are projected in excess of 20%. This indicates that traffic to and from Merrimack locations will exceed that traveling through to other destinations. Back River Road shows high rates of traffic growth (+28%) but nowhere near the projections of the 2004 study, which presented a major shift to utilization of this local road as a collector or arterial functioning facility. Wire Road also is predicted to experience high rates of increase in the order of 30% but being a relatively low-volume roadway to begin with, the growth is not such that congestion will appreciably worsen.

**Table 19 - 2021 Existing & 2045 No-Build Average Weekday Traffic**

		2021	2045	
		AWDT	No-Build	% Δ
FEE Turnpike	Exit 12 to 13	68,300	77,180	13%
FEE Turnpike	Exit 12 SB On Ramp	5,320	6,280	18%
FEE Turnpike	Exit 12 NB Off Ramp	4,910	5,940	21%
FEE Turnpike	Exit 11 to 12	79,000	89,270	13%
FEE Turnpike	Exit 11 SB On Ramp	3,500	4,290	23%
FEE Turnpike	Exit 11 SB Off Ramp	5,200	6,380	23%
FEE Turnpike	Exit 11 NB OffRamp	4,350	5,340	23%
FEE Turnpike	Exit 11 NB On Ramp	5,650	6,930	23%
FEE Turnpike	Exit 10 to 11	77,300	87,350	13%
US 3	Bedford TL	12,100	14,400	19%
US 3	North of Hilton Dr	17,000	20,230	19%
US 3	South of Bedford Rd	14,300	17,300	21%
US 3	Over Souhegan River	16,100	18,520	15%
US 3	North of Greeley St	14,330	16,770	17%
US 3	North of Industrial Dr	13,900	16,470	18%
Bedford Rd	Bedford TL	2,300	2,710	18%
Bedford Rd	West of US 3	10,250	12,200	19%
Bedford Rd	Over Baboosic Brook	7,000	8,260	18%
Back River Rd	Bedford TL	3,000	3,840	28%
Baboosic Lake Rd	Over FEE Turnpike	9,470	9,750	3%
Continental Blv	West of Amherst Rd	13,000	14,820	14%
Greeley St	West of US 3	16,500	19,470	18%
Wire Rd	Bedford TL	2,530	3,360	33%
Wire Rd	West of FEE Turnpike	4,010	5,130	28%
Amherst Rd	W. of Turkey Hill Rd.	5,410	6,110	13%
Turkey Hill Rd	Over Souhegan River	8,200	8,960	9%
Turkey Hill Rd	North of Amherst Rd	7,130	7,790	9%

The daily changes in link volumes were applied to each study area intersection approach and converted to turning movements. The resulting volumes are presented in Table 20 and illustrated in Figures 4 through 6.

**Table 20 - 2045 No-Build Intersection Volumes**

	AM PEAK								PM PEAK							
	2020 Existing			2045 Estimate				% Δ	2020 Existing			2045 Estimate				
	L	T	R	L	T	R	L		T	R	L	T	R	% Δ		
<b><u>FEE SB On/Bedfd Rd/B River</u></b>																
Bedford Rd EB	29	300	262	33	338	295	13%	35	204	164	39	223	192	13%		
Bedford Rd WB	266	225	71	296	251	79	11%	163	603	256	182	672	285	11%		
Back River Rd SB	88	117	22	132	176	33	50%	84	73	42	118	119	63	50%		
<b><u>FEE NB Off Ramp/Bedford Rd</u></b>																
Bedford Rd EB	0	388	0	0	438	0	13%	0	288	0	0	333	0	16%		
Bedford Rd WB	0	436	0	0	475	0	9%	0	636	0	0	693	0	9%		
FEET Exit 12 NB Off Ramp	126	0	98	149	0	116	18%	386	0	176	449	0	214	18%		
<b><u>US 3/Bedford Rd</u></b>																
US 3 NB	105	352	3	127	427	4	21%	219	419	17	265	508	21	21%		
US 3 SB	3	401	327	4	473	386	18%	16	489	398	19	594	452	18%		
Bedford Rd EB	356	1	129	428	1	155	20%	247	20	197	297	24	237	20%		
<b><u>US 3/Baboosic Lake Rd</u></b>																
US 3 NB	141	209	1	165	244	1	17%	242	645	1	283	754	1	17%		
US 3 SB	3	484	248	3	533	273	10%	1	463	255	1	510	281	10%		
Baboosic Lake Rd EB	204	1	238	189	1	220	-7%	225	2	184	208	2	170	-7%		
<b><u>Greeley St/FEET Exit 11 Ramps</u></b>																
Greeley St EB	296	530	0	329	589	0	11%	430	533	0	478	592	0	11%		
Greeley St WB	0	468	99	0	551	116	18%	0	639	216	0	729	277	18%		
FEE Turnpike Ramps NB	196	0	177	241	0	217	23%	446	0	242	527	0	317	23%		
<b><u>Cntl Blv/Amhr Rd/Camp Sgt Rd</u></b>																
Continental Blvd EB	60	212	25	67	238	28	12%	222	507	74	249	570	83	12%		
Continental Blvd WB	84	210	370	94	234	412	11%	181	266	638	202	296	710	11%		
Camp Sargent Rd NB	183	76	217	244	101	290	33%	116	207	241	155	276	322	33%		
Amherst Rd SB	397	49	90	386	48	88	-3%	215	61	118	209	59	115	-3%		
<b><u>US 3/Greeley St</u></b>																
US 3 NB	123	172	3	148	207	4	21%	299	335	3	360	404	4	21%		
US 3 SB	8	268	417	9	310	482	16%	11	204	482	13	236	558	16%		
Greeley St EB	370	14	310	437	17	366	18%	538	17	198	636	20	234	18%		
Greeley St WB	2	4	9	2	5	11	19%	7	29	13	8	34	15	19%		
<b><u>Turkey Hill Rd/Amherst Rd</u></b>																
Amherst Rd EB	1	354	0	1	396	0	12%	4	170	0	4	190	0	12%		
Amherst Rd WB	0	87	162	0	97	181	12%	0	323	469	0	361	525	12%		
Turkey Hill Rd SB	577	0	2	627	0	2	9%	230	0	7	250	0	8	9%		
<b><u>US 3/Wire Rd</u></b>																
US 3 NB	64	339	0	72	381	0	12%	230	636	0	259	715	0	12%		
US 3 SB	0	493	7	0	520	7	5%	0	542	9	0	571	9	5%		
Wire Rd EB	3	0	195	4	0	247	26%	10	0	105	13	0	133	26%		
<b><u>Bedford Rd/Wire Rd</u></b>																
Bedford Rd EB	0	228	65	0	268	76	17%	0	195	32	0	229	38	17%		
Bedford Rd WB	1	109	49	1	112	50	3%	3	255	96	3	262	99	3%		
Wire Rd NB	25	34	7	36	49	10	44%	60	108	2	107	134	3	43%		
Wire Rd SB	80	85	2	84	89	2	5%	66	61	2	69	64	2	5%		



Figure 4 - 2045 No-Build Intersection Turning Movements, Bedford Street Corridor

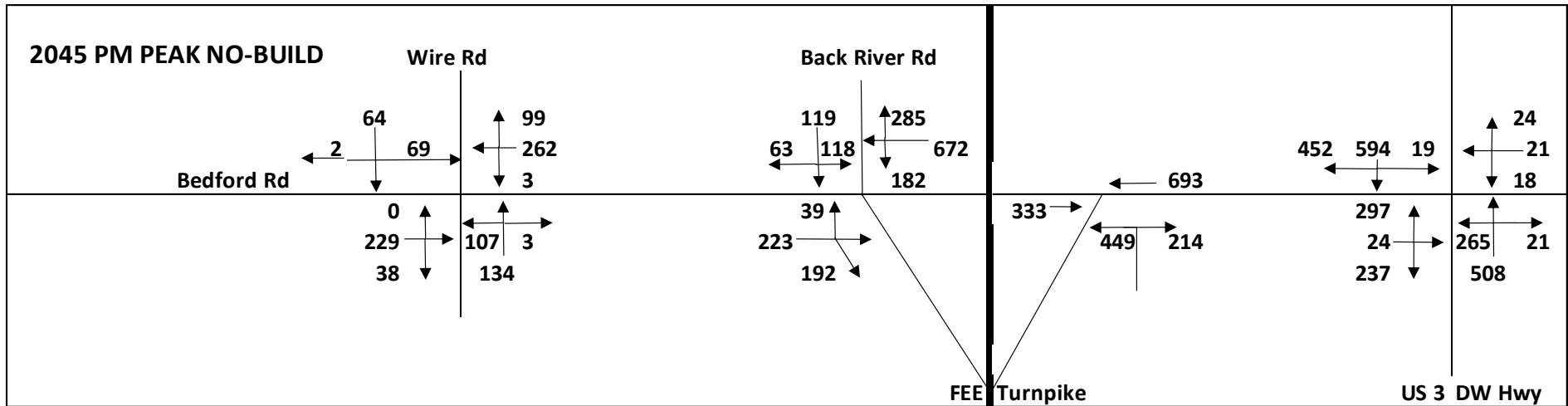
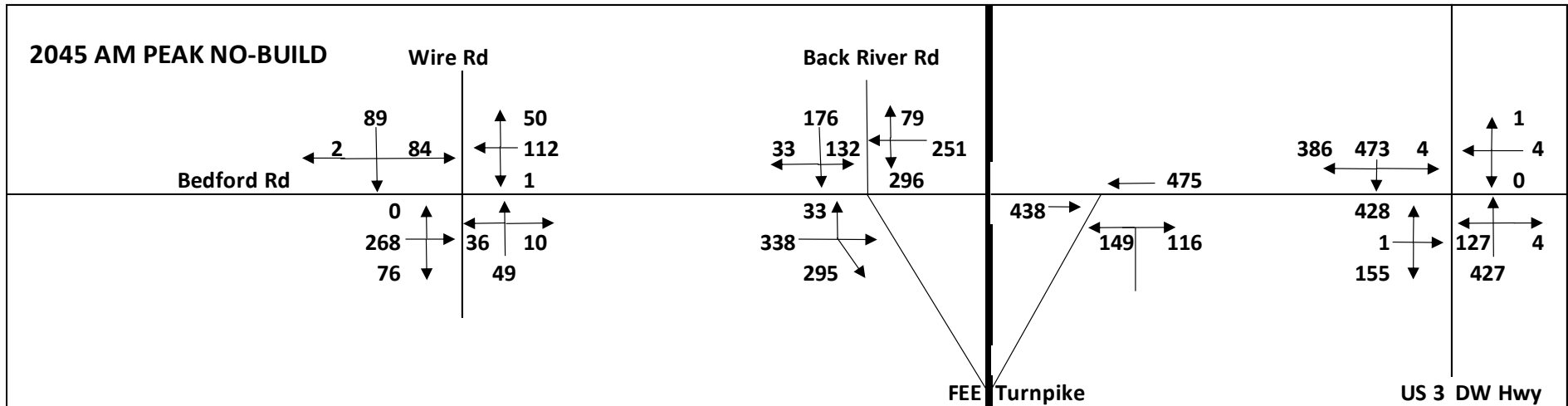
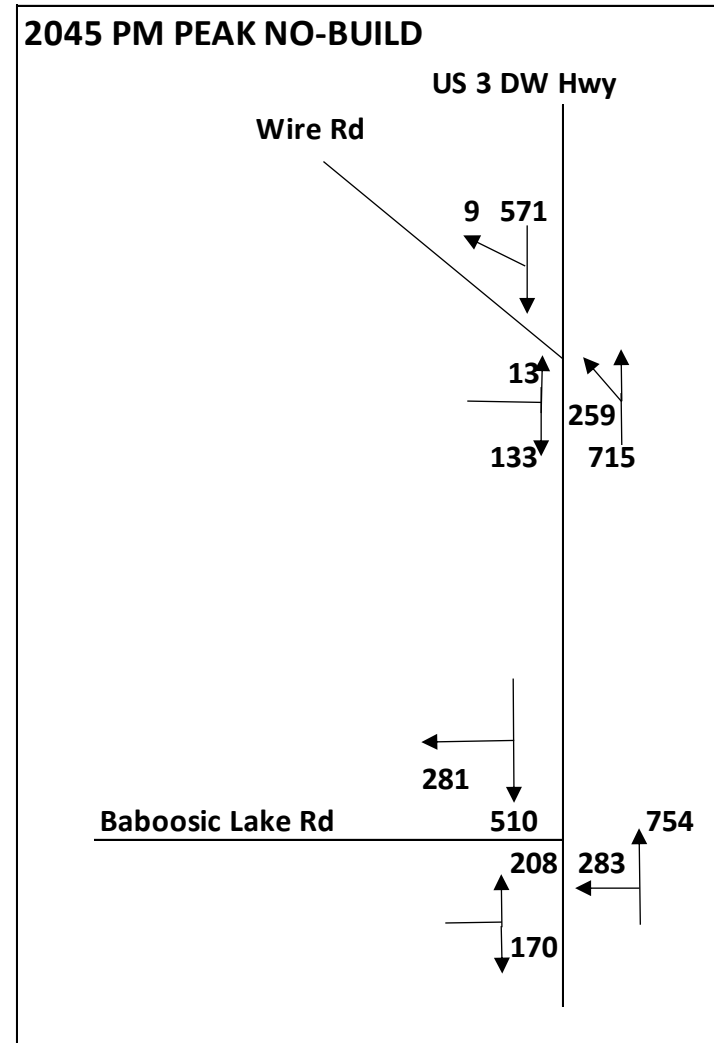
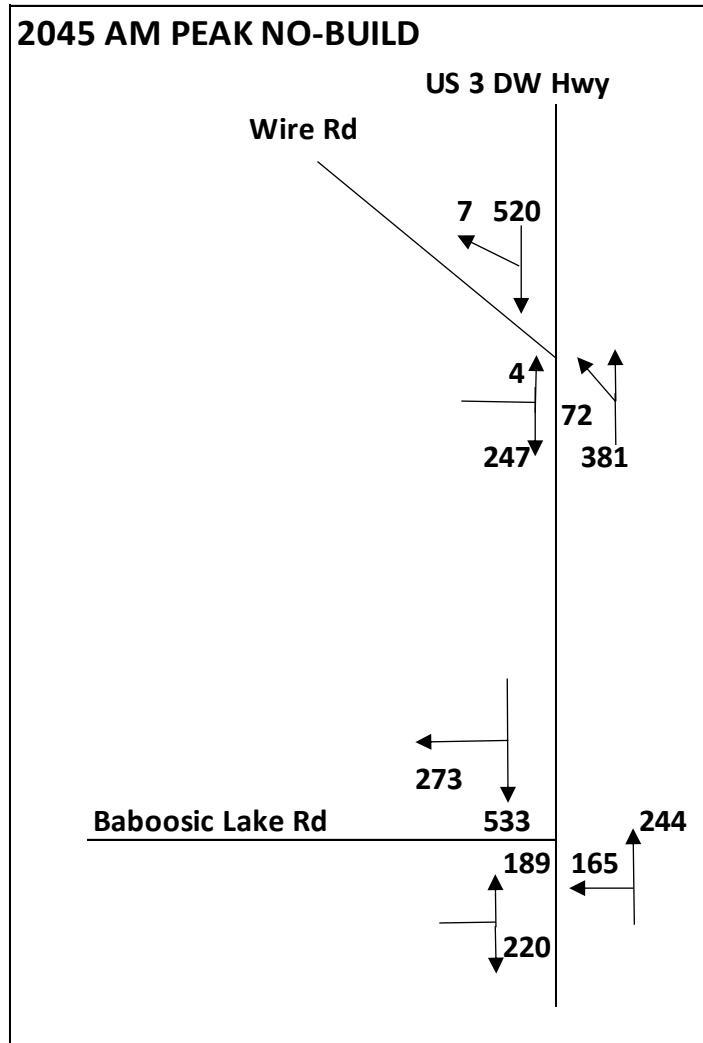
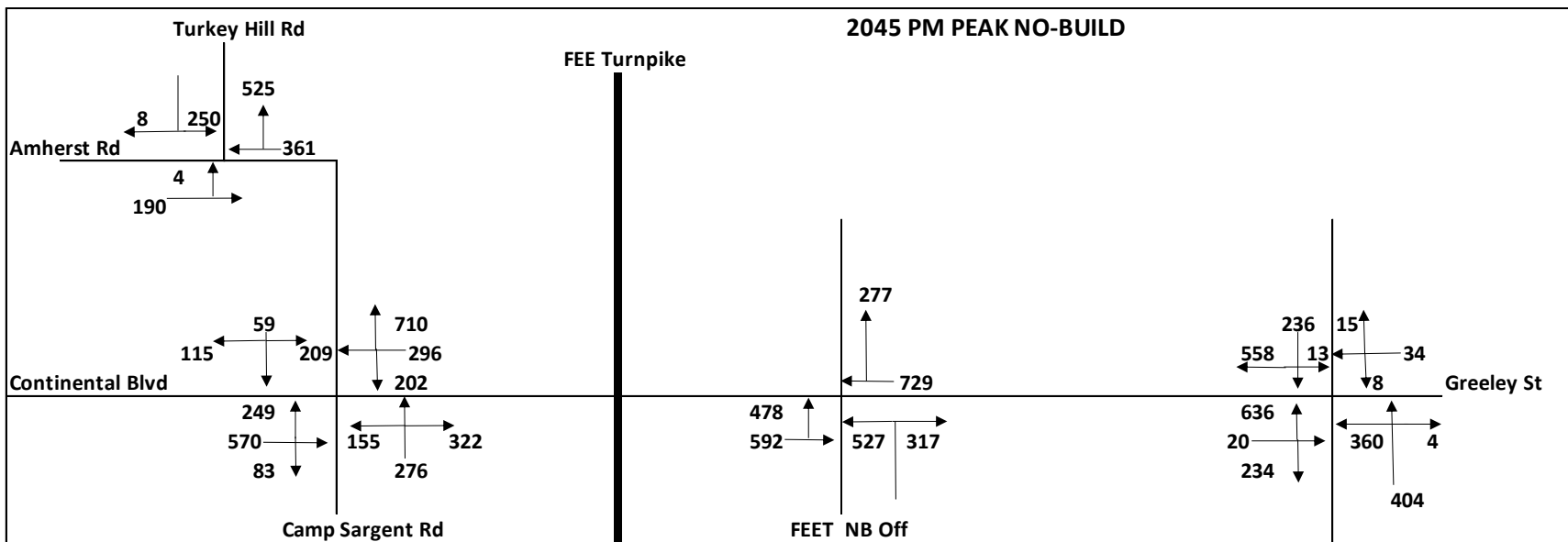
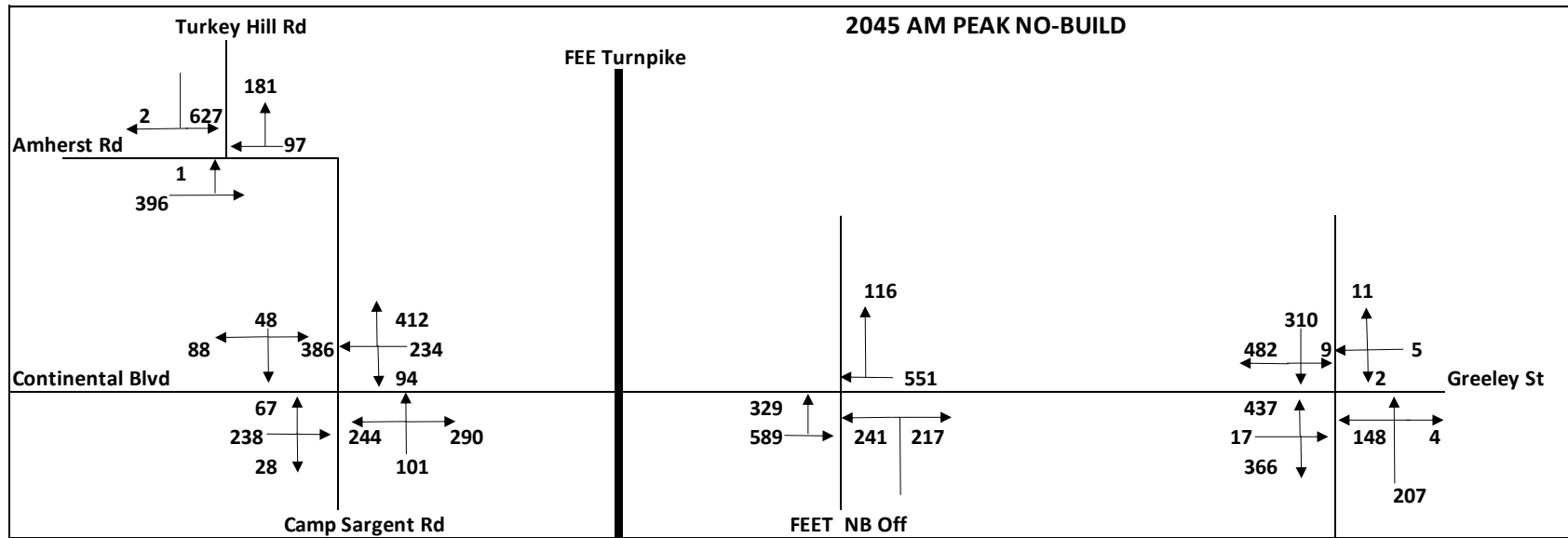


Figure 5 - 2045 No-Build Intersection Turning Movements, US 3 from Wire Road to Baboosic Lake Road Corridor



3

Figure 6 - 2045 No-Build Intersection Turning Movements, Greeley St/Continental Blvd Corridor



Intersection Capacity Analysis – 2045 No-Build

By 2045, the main intersection of concern in the study area, US 3/Bedford Road is forecasted to deteriorate one full service level overall for both peak periods at LOS E and F for the respective hours. The US 3 southbound approach will be at F for the AM as well as PM (which now operates at a failure condition).

**Table 21 - Intersection Capacity Analysis, 2021 & 2045 No-Build**

Signalized Intersections	2021 Existing Conditions						2045 No-Build					
	AM Peak			PM Peak			AM Peak			PM Peak		
	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS
<b>FEET SB On/Bed Rd/Back R Rd</b>	<b>23.5</b>		<b>C</b>	<b>28.7</b>		<b>C</b>	<b>25.5</b>		<b>C</b>	<b>35.1</b>		<b>D</b>
Bedford Rd EB LT	29.8	0.09	C	31.4	0.09	C	30.2	0.10	C	31.3	0.14	C
Bedford Rd EB Thru	28.7	0.58	C	23.0	0.58	C	29.8	0.62	C	23.0	0.36	C
Bedford Rd EB RT	0.3	0.18	A	0.2	0.18	A	0.3	0.20	A	0.2	0.13	A
Bedford Rd WB LT	49.7	0.78	D	41.4	0.78	D	58.8	0.86	D	42.3	0.61	D
Bedford Rd WB Thru	24.8	0.41	C	51.1	0.41	D	25.2	0.44	C	69.6	1.02	E
Bedford Rd WB Right	0.1	0.05	A	0.2	0.05	A	0.1	0.05	A	0.3	0.19	A
Back River Rd SB All	18.1	0.18	B	16.1	0.18	B	19.9	0.28	C	18.2	0.26	B
<b>FEET NB Off/Bedford Rd</b>	<b>12.7</b>		<b>B</b>	<b>15.3</b>		<b>B</b>	<b>13.1</b>		<b>B</b>	<b>16.6</b>		<b>B</b>
Bedford Rd EB Thru	14.1	0.52	B	12.0	0.36	B	14.7	0.59	B	11.9	0.40	B
Bedford Rd WB Thru	14.5	0.56	B	19.0	0.74	B	14.8	0.60	B	21.0	0.78	C
Exit 12 Off-Ramp LT	12.2	0.17	B	18.0	0.54	B	12.9	0.19	B	21.3	0.66	C
Exit 12 Off-Ramp RT	0.1	0.06	A	0.1	0.11	A	0.1	0.07	A	0.2	0.14	A
<b>US 3/Bedford Rd</b>	<b>29.4</b>		<b>C</b>	<b>61.0</b>		<b>E</b>	<b>43.0</b>		<b>E</b>	<b>72.6</b>		<b>F</b>
Bedford Rd EB LT/Thru	37.1	0.70	D	47.3	0.70	D	47.9	0.85	D	83.3	0.90	F
Bedford Rd EB RT	2.4	0.15	A	3.1	0.24	A	3.3	0.18	A	3.4	0.27	A
Driveway WB All	38.6	0.04	D	48.4	0.29	D	39.4	0.04	D	67.5	0.39	E
US 3 NB LT	44.3	0.49	D	50.7	0.68	D	45.1	0.55	D	59.0	0.67	E
US 3 NB Thru/RT	18.4	0.39	B	25.1	0.50	C	17.9	0.46	B	22.7	0.51	C
US 3 SB LT	36.7	0.02	D	43.6	0.10	D	40.0	0.03	D	65.9	0.18	E
US 3 SB Thru	53.7	0.91	D	162.6	1.25	F	97.6	1.09	F	181.6	1.29	F
US 3 SB RT	3.5	0.34	A	7.6	0.51	A	4.6	0.41	A	10.7	0.56	B
<b>US 3/Baboosic Lake Rd</b>	<b>18.5</b>		<b>B</b>	<b>19.3</b>		<b>B</b>	<b>17.9</b>		<b>B</b>	<b>21.4</b>		<b>C</b>
Baboosic Lake Rd EB LT	58.1	0.70	E	54.0	0.69	D	60.0	0.70	E	57.6	0.70	E
Baboosic Lake Rd EB RT	3.5	0.33	A	6.2	0.39	A	3.6	0.31	A	6.7	0.39	A
US 3 NB LT	53.4	0.53	D	26.0	0.37	C	51.3	0.52	D	20.2	0.33	C
US 3 NB Thru	8.8	0.19	A	18.4	0.63	B	8.2	0.21	A	26.7	0.84	C
US 3 SB LT	9.7	0.01	A	12.0	0.01	B	9.0	0.01	A	11.3	0.01	B
US 3 SB Thru	11.2	0.42	B	13.5	0.42	B	10.9	0.45	B	13.0	0.45	B
US 3 SB RT	3.4	0.25	A	3.9	0.26	A	3.6	0.27	A	4.2	0.28	A
<b>Greeley St/Tnpg Exit 11 Ramps</b>	<b>19.8</b>		<b>B</b>	<b>26.3</b>		<b>C</b>	<b>21.4</b>		<b>C</b>	<b>34.2</b>		<b>C</b>
Greeley St EB LT	29.5	0.60	C	37.8	0.79	D	30.7	0.64	C	44.1	0.86	D
Greeley St EB Thru	10.2	0.28	B	9.8	0.26	A	10.3	0.30	B	10.0	0.29	A
Greeley St WB Thru	36.4	0.66	D	53.2	0.91	D	41.0	0.77	D	82.3	1.04	F
Greeley St WB RT	0.1	0.07	A	0.2	0.14	A	0.1	0.08	A	0.3	0.19	A
FEE Turnpike Ramps NB LT	19.4	0.16	B	23.0	0.38	C	20.3	0.20	C	24.1	0.46	C
FEE Turnpike Ramps NB RT	0.1	0.11	A	0.2	0.15	A	0.2	0.14	A	0.3	0.20	A

Table 21, continued

Signalized Intersections	2021 Existing Conditions						2045 No-Build					
	AM Peak			PM Peak			AM Peak			PM Peak		
	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS
<b>Cntl Blvd/Amh Rd/Cmp Sgt Rd</b>	<b>29.1</b>		<b>C</b>	<b>30.9</b>		<b>C</b>	<b>32.3</b>		<b>C</b>	<b>37.6</b>		<b>D</b>
Continental Blvd EB LT	43.2	0.24	D	83.6	0.91	F	43.7	0.27	D	107.9	1.02	F
Continental Blvd EB Thru/RT	28.9	0.24	C	35.1	0.61	D	29.3	0.27	C	37.0	0.66	D
Continental Blvd WB LT	44.4	0.32	D	57.5	0.69	E	45.2	0.36	D	63.5	0.77	E
Continental Blvd WB Thru	34.0	0.40	C	36.3	0.52	D	34.9	0.44	C	37.8	0.56	D
Continental Blvd WB RT	0.4	0.25	A	0.9	0.43	A	0.5	0.28	A	1.1	0.47	A
Camp Sargent Rd NB LT	59.7	0.71	E	47.8	0.44	D	90.8	0.95	F	53.4	0.60	D
Camp Sargent Rd NB Thru	43.3	0.28	D	61.8	0.73	E	45.3	0.37	D	101.8	1.00	F
Camp Sargent Rd NB RT	2.6	0.20	A	1.4	0.22	A	3.7	0.27	A	1.4	0.28	A
Amherst Rd SB LT	51.8	0.82	D	35.8	0.44	D	49.9	0.80	D	35.5	0.43	D
Amherst Rd SB Thru	30.0	0.10	C	30.3	0.12	C	30.0	0.10	C	30.3	0.12	C
Amherst Rd SB RT	0.9	0.09	A	0.9	0.11	A	0.9	0.08	A	0.9	0.11	A
<b>US 3/Greeley St</b>	<b>20.5</b>		<b>C</b>	<b>31.9</b>		<b>C</b>	<b>21.3</b>		<b>C</b>	<b>35.7</b>		<b>D</b>
Greeley St EB LT/Thru	46.0	0.58	D	63.0	0.83	E	46.7	0.62	D	61.4	0.83	F
Greeley St EB RT	4.0	0.44	A	3.0	0.30	A	4.1	0.48	A	2.5	0.32	A
Greeley St WB All	35.0	0.16	C	45.0	0.39	D	33.9	0.19	C	54.7	0.46	D
US 3 NB LT	48.0	0.39	D	49.0	0.65	D	48.9	0.45	D	58.6	0.75	E
US 3 NB Thru/RT	17.0	0.12	B	25.0	0.28	C	18.1	0.15	B	33.2	0.36	C
US 3 SB Left	43.0	0.05	D	37.0	0.05	D	42.6	0.05	D	42.7	0.05	D
US 3 SB Thru	18.0	0.18	B	24.0	0.17	C	19.0	0.22	B	31.5	0.21	C
US 3 SB RT	4.0	0.46	A	5.0	0.58	A	4.2	0.53	A	7.0	0.65	A
<b>Unsignalized Intersections</b>												
<b>Turkey Hill Rd/Amherst Rd</b>	<b>52.1</b>		<b>D</b>	<b>5.4</b>		<b>A</b>	<b>90.1</b>		<b>F</b>	<b>8.3</b>		<b>A</b>
Amherst Rd EB LT	7.8	0.01	A	9.4	0.01	A	7.8	0.01	A	9.7	0.01	A
Turkey Hill Rd SB Left/RTs	106.5	1.13	F	27.1	0.60	D	186.7	1.43	F	40.6	0.75	E
<b>US 3/Wire Road</b>	<b>3.4</b>		<b>A</b>	<b>2.9</b>		<b>B</b>	<b>4.4</b>		<b>A</b>	<b>3.6</b>		<b>A</b>
US 3 NB LT	8.8	0.07	A	9.9	0.26	A	8.9	0.08	A	10.4	0.30	A
Wire Rd EB LT	20.5	0.01	C	69.3	0.16	F	22.9	0.02	C	106.7	0.29	F
Wire Rd EB RT	15.9	0.39	C	14.2	0.23	B	19.0	0.51	C	15.6	0.30	C
<b>Bedford Rd/Wire Rd</b>	<b>9.9</b>		<b>A</b>	<b>11.8</b>		<b>B</b>	<b>10.8</b>		<b>B</b>	<b>13.8</b>		<b>B</b>
Bedford Rd EB All	10.5	0.62	B	11.0	0.48	B	11.9	0.72	B	12.9	0.56	B
Bedford Rd WB All	9.2	0.33	A	13.2	0.75	B	9.6	0.34	A	15.5	0.77	C
Wire Rd NB All	9.0	0.14	A	11.1	0.36	B	9.6	0.20	A	13.6	0.51	B
Wire Rd SB All	9.8	0.35	A	10.4	0.27	B	10.4	0.37	B	11.3	0.28	B

All other study area intersections are expected to operate no worse than LOS D, which defines the minimum acceptable standard for an urban intersection. However, there are individual movements which will be problematic or in a complete failure condition. These include: Bedford Rd. westbound at the FEET southbound on-ramp, Baboosic Lake Rd. eastbound at US 3, Greeley St. westbound at the FEET NB on-ramp, Continental Blvd. and Camp Sargent Rd. approaches at their intersection with Amherst Rd. and Greeley Street, and continued deterioration of the Turkey Hill approach to Amherst Road.

Traffic Volume Forecast – 2045 Build Scenario

The north ramps were coded into the regional travel model network and the traffic assignment was rerun with the 2045 trip table previously used for the No-Build scenario. Table 22 provides a comparison of daily roadway volumes between the two scenarios. The primary goal of the project is realized, as US 3 traffic declines north of Bedford Road up through the Bedford line. A substantial increase in traffic occurs on Bedford Road west of US 3, as additional traffic is being attracted to the new north ramps. Elsewhere, changes in traffic volumes are low to moderate resulting from new ramp construction.

**Table 22 - 2045 No-Build and Build Scenarios Average Weekday Traffic**

		2045	2045	
		No-Build	Build	% Δ
FEE Turnpike	Exit 12 to 13	77,180	80,670	5%
FEE Turnpike	Exit 12 SB On Ramp	6,280	6,090	-3%
FEE Turnpike	Exit 12 NB Off Ramp	5,940	5,750	-3%
FEE Turnpike	Exit 12 SB Off Ramp	--	6,660	--
FEE Turnpike	Exit 12 NB On Ramp	--	6,800	--
FEE Turnpike	Exit 11 to 12	89,270	89,080	0%
FEE Turnpike	Exit 11 SB On Ramp	4,290	4,000	-7%
FEE Turnpike	Exit 11 SB Off Ramp	6,380	6,070	-5%
FEE Turnpike	Exit 11 NB OffRamp	5,340	5,270	-1%
FEE Turnpike	Exit 11 NB On Ramp	6,930	6,810	-2%
FEE Turnpike	Exit 10 to 11	87,350	87,340	0%
US 3	Bedford TL	14,400	12,640	-12%
US 3	North of Hilton Dr	20,230	18,420	-9%
US 3	South of Bedford Rd	17,300	17,550	1%
US 3	Over Souhegan River	18,520	18,250	-1%
US 3	North of Greeley St	16,770	16,310	-3%
US 3	North of Industrial Dr	16,470	16,830	2%
Bedford Rd	Bedford TL	2,710	2,630	-3%
Bedford Rd	West of US 3	12,200	14,120	16%
Bedford Rd	Over Baboosic Brook	8,260	8,910	8%
Back River Rd	Bedford TL	3,840	1,930	-50%
Baboosic Lake Rd	Over FEE Turnpike	9,750	10,040	3%
Continental Blv	West of Amherst Rd	14,820	14,990	1%
Greeley St	West of US 3	19,470	19,350	-1%
Wire Rd	Bedford TL	3,360	2,810	-16%
Wire Rd	West of FEE Turnpike	5,130	5,160	1%
Amherst Rd	W. of Turkey Hill Rd.	6,110	6,010	-2%
Turkey Hill Rd	Over Souhegan River	8,960	9,070	1%
Turkey Hill Rd	North of Amherst Rd	7,790	7,720	-1%

A travel path analysis was conducted on the roadway volume changes to identify the new paths that would be taken resulting from construction of the north ramps. This process resulted in the intersection turning movements shown in Table 23 and Figures 7 through 9.

**Table 23 - 2045 Build Scenario Intersection Volumes**

	AM PEAK								PM PEAK							
	2045 NB			2045 BLD				% Δ	2045 NB			2045 BLD				% Δ
	L	T	R	L	T	R	L		T	R	L	T	R			
<b><u>FEE NB Off Ramp/Bedford Rd</u></b>																
Bedford Rd EB	0	438	0	245	372	0	41%	0	333	0	174	569	0	123%		
Bedford Rd WB	0	475	0	0	309	299	28%	0	693	0	0	520	213	6%		
FEET Exit 12 NB Off Ramp	149	0	116	145	0	113	-2%	449	0	214	427	0	182	-8%		
<b><u>FEE SB On-Off/Bedford Rd</u></b>																
Bedford Rd EB				0	423	452	--				0	410	302	--		
Bedford Rd WB				275	231	0	--				175	766	0	--		
FTT Exit 12 SB Off Ramp				202	0	148	--				333	0	179	--		
<b><u>Bedford Rd/Back River Rd</u></b>																
Bedford Rd EB				33	608	0	--				27	477	0	--		
Bedford Rd WB				0	289	91	--				0	726	228	--		
Back River Rd SB				293	0	33	--				213	0	57	--		
<b><u>US 3/Bedford Rd</u></b>																
US 3 NB	127	427	4	191	384	4	4%	265	508	21	371	414	21	2%		
US 3 SB	4	473	386	4	383	413	-7%	19	594	452	19	446	408	-18%		
Bedford Rd EB	428	1	155	364	1	217	0%	297	24	237	287	24	396	27%		
<b><u>US 3/Baboosic Lake Rd</u></b>																
US 3 NB	165	244	1	167	242	1	0%	283	754	1	286	746	1	-1%		
US 3 SB	3	533	273	3	522	289	1%	1	510	281	1	500	298	1%		
Baboosic Lake Rd EB	189	1	220	204	1	220	4%	208	2	170	225	2	170	4%		
<b><u>Greeley St/FEET Exit 11 Ramps</u></b>																
Greeley St EB	329	589	0	321	565	0	-3%	478	592	0	468	586	0	-1%		
Greeley St WB	0	551	116	0	534	111	-3%	0	729	277	0	722	270	-1%		
FEE Turnpike Ramps NB	241	0	217	239	0	213	-1%	527	0	317	532	0	311	0%		
<b><u>Cntl Blv/Amhr Rd/Camp Sgt Rd</u></b>																
Continental Blvd EB	67	238	28	66	240	28	0%	249	570	83	247	564	83	-1%		
Continental Blvd WB	94	234	412	94	236	379	-4%	202	296	710	202	299	667	-3%		
Camp Sargent Rd NB	244	101	290	246	99	287	-1%	155	276	322	157	270	319	-1%		
Amherst Rd SB	386	48	88	371	47	86	-3%	209	59	115	199	58	116	-3%		
<b><u>US 3/Greeley St</u></b>																
US 3 NB	148	207	4	147	205	4	-1%	360	404	4	356	404	4	0%		
US 3 SB	9	310	482	9	307	468	-2%	13	236	558	13	231	541	-3%		
Greeley St EB	437	17	366	420	17	362	-3%	636	20	234	623	20	232	-2%		
Greeley St WB	2	5	11	2	5	11	1%	8	34	15	8	34	15	-2%		
<b><u>Turkey Hill Rd/Amherst Rd</u></b>																
Amherst Rd EB	1	396	0	1	388	0	-2%	4	190	0	4	186	0	-2%		
Amherst Rd WB	0	97	181	0	94	176	-3%	0	361	525	0	350	509	-3%		
Turkey Hill Rd SB	627	0	2	608	0	2	-3%	250	0	8	243	0	8	-2%		
<b><u>US 3/Wire Rd</u></b>																
US 3 NB	72	381	0	70	392	0	2%	259	715	0	251	736	0	1%		
US 3 SB	0	520	7	0	525	7	1%	0	571	9	0	577	9	1%		
Wire Rd EB	4	0	247	5	0	242	-1%	13	0	133	18	0	130	2%		
<b><u>Bedford Rd/Wire Rd</u></b>																
Bedford Rd EB	0	268	76	0	241	76	-8%	0	229	38	0	263	38	13%		
Bedford Rd WB	1	112	50	1	121	53	7%	3	262	99	3	249	94	-5%		
Wire Rd NB	36	49	10	36	49	10	0%	107	134	3	107	134	3	0%		
Wire Rd SB	84	89	2	84	89	2	0%	69	64	2	69	64	2	0%		

Figure 7 - 2045 Build Intersection Turning Movements, Bedford Street Corridor

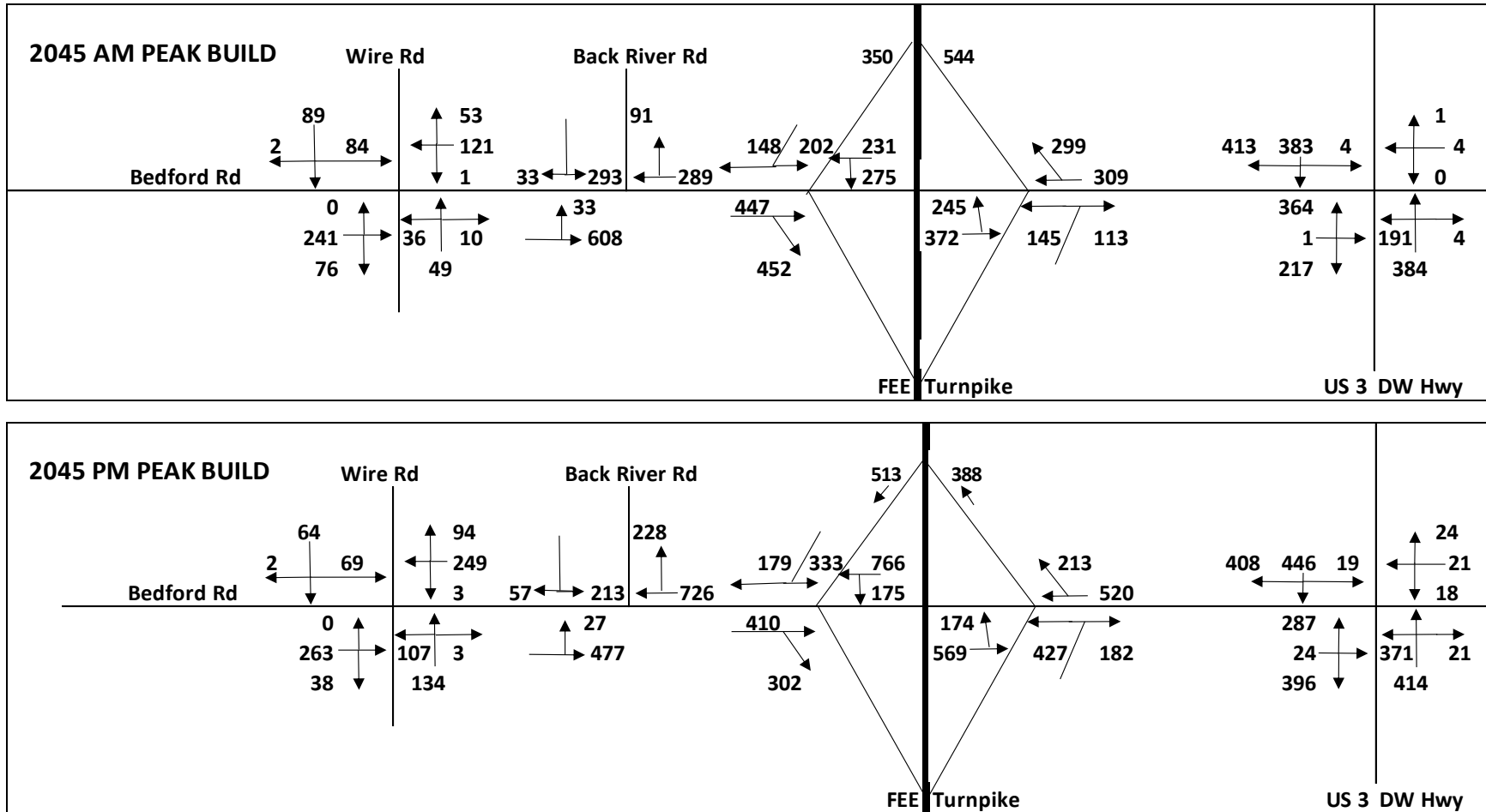




Figure 8 - 2045 Build Intersection Turning Movements, US 3 from Wire Rd to Baboosic Lake Rd Corridor

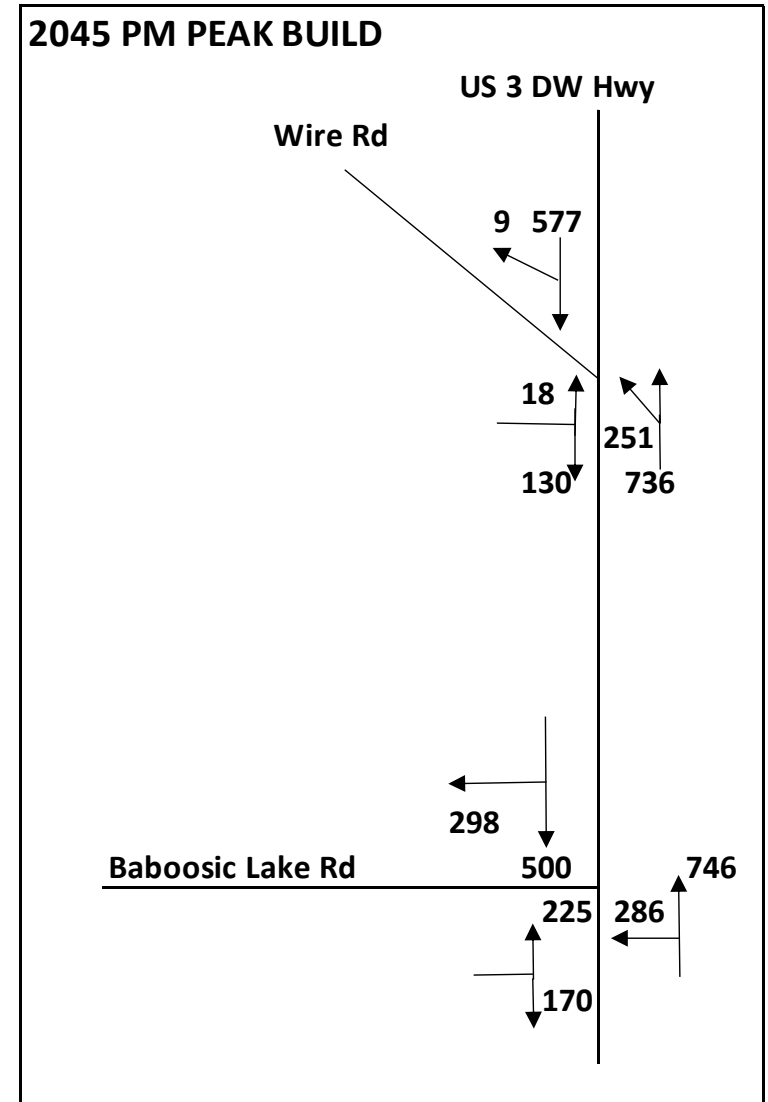
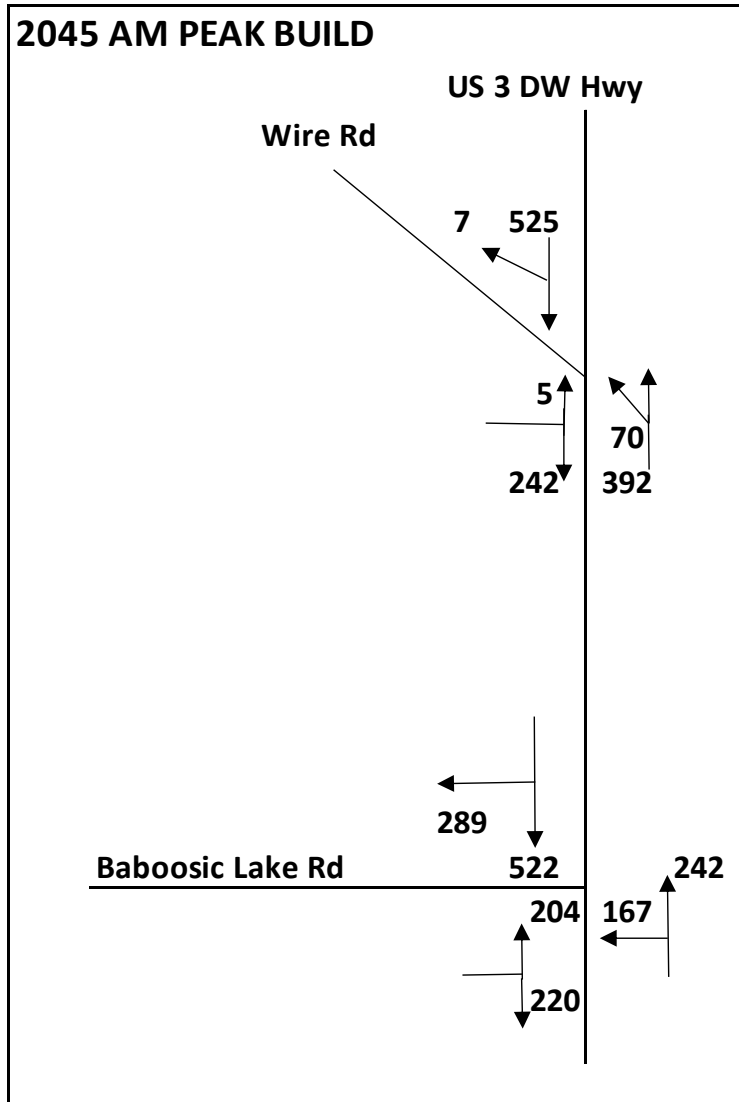
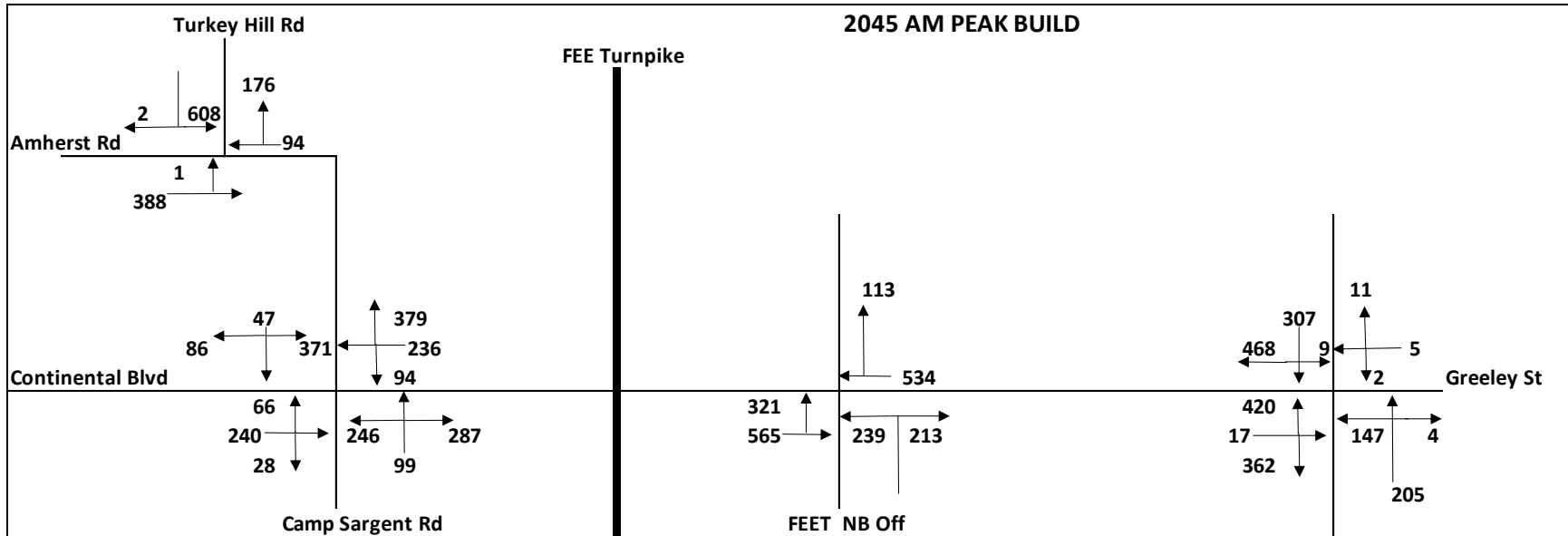
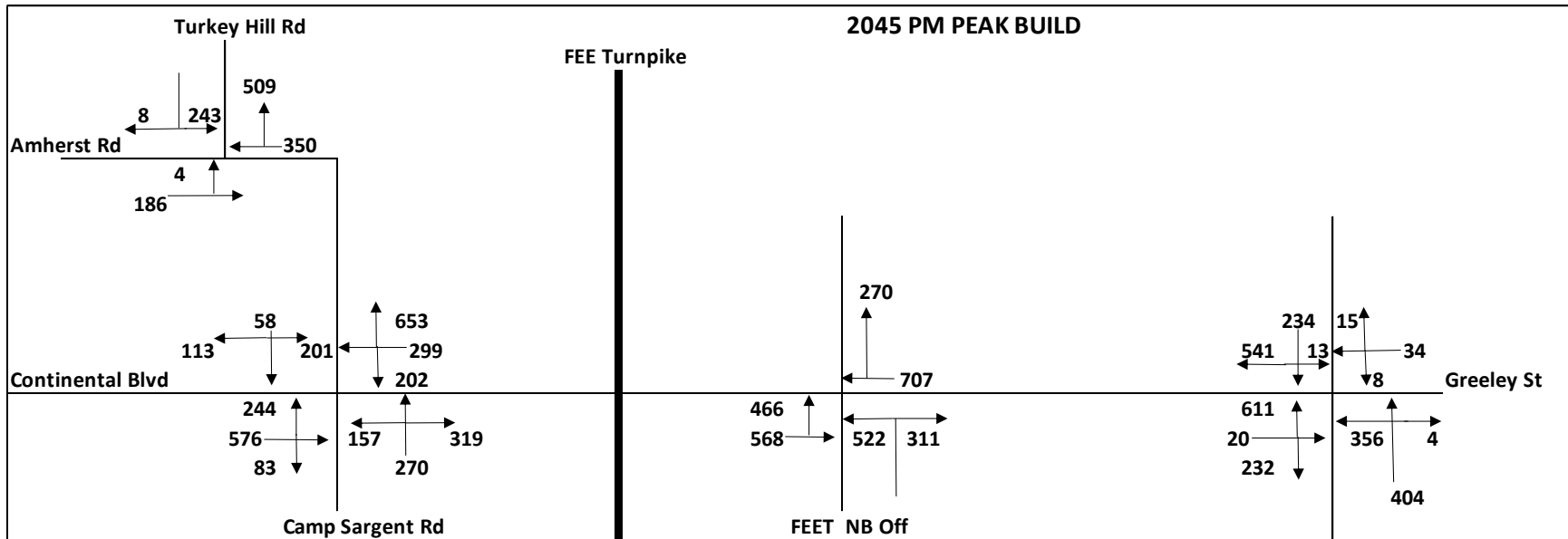


Figure 9 - 2045 Build Intersection Turning Movements, Greeley St/Continental Blvd Corridor



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## Intersection Capacity Analysis – 2045 Build

Table 24 presents the intersection conditions under the Build scenario. There is a substantial improvement in LOS for the US 3/Bedford Road intersection overall, from E to C in the AM and F to D in the PM. The projected 182 second delay for afternoon southbound traffic on US 3 is reduced by about 60% to around 75 seconds for the PM. From the perspective of alleviating the most troublesome intersection in the study area, it can be concluded that the project would be an effective solution. The impacts on other study area intersections are not considerable, either for improving or worsening congestion. In the analysis one project modification is made from the 2004 study. At that time, the newly created intersection of Bedford Road/Back River Road – separated from the existing junction with the FEET southbound ramps – was evaluated as an unsignalized intersection and the capacity analysis indicated LOS F for the Back River Road approach, particularly severe in the PM period. The present study evaluates this as a signalized intersection, which would be necessary to achieve proper traffic flow with the other nearby signalized intersections. In fact, coordination of the signals could be implemented that would enable the Bedford Rd/Back River Rd intersection to operate at LOS C.

## Conclusion

NRPC concludes that the substantial relief that the construction of FEE Turnpike Exit 12 ramps to and from the north provide a degree of traffic congestion relief that warrants addition of the project to the Metropolitan Transportation Plan when it is next updated and approved by the Nashua MPO Policy Committee in December 2023. Although the substantial traffic increases in the interchange area predicted in the 2004 study didn't materialize, the unforeseen new connection from the Manchester Airport Access Road (Wieczorek Drive) has generated a degree of traffic along US 3 from Bedford Road to the Bedford line that cannot be adequately accommodated by the existing traffic network.

The planned widening of two-lane segments of the FEE Turnpike in Merrimack will increase demand along US 3 and is one reason why the traffic model shows a higher rate of volume increase than along the mainline. Additionally, the potential for continued residential and commercial/industrial development in Merrimack also provides a strong rationale for this project.

The next step will be to develop a cost estimate for the proposed interchange project. NRPC has retained the on-call engineering services of a private firm specifically for the purpose of developing accurate cost estimates for proposed projects. The expected funding source would be the State's Turnpike Capital Program.

**Table 24 - Intersection Capacity Analysis, 2045 No-Build & Build Scenarios**

Signalized Intersections	2045 No-Build						2045 Build					
	AM Peak			PM Peak			AM Peak			PM Peak		
	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS
<b>FEET SB Off &amp; On /Bedford Rd</b>	<b>13.1</b>		<b>B</b>	<b>16.6</b>		<b>B</b>	<b>12.9</b>		<b>B</b>	<b>13.0</b>		<b>B</b>
Bedford Rd EB Thru	14.7	0.59	B	11.9	0.40	B	22.9	0.60	C	12.1	0.26	B
Bedford Rd EB RT	14.8	0.60	B	21.0	0.78	C	<1	0.30	A	<1	0.26	A
Bedford Rd WB LT/Thru							21.9	0.78	C	19.2	0.73	B
Exit 12 SB Off LT	12.9	0.19	B	21.3	0.66	C	4.1	0.15	A	13.3	0.40	B
Exit 12 SB Off RT	0.1	0.07	A	0.2	0.14	A	1.1	0.15	A	3.2	0.26	A
<b>FEET NB Off &amp; On/Bedford Rd</b>							<b>11.0</b>		<b>B</b>	<b>11.2</b>		<b>B</b>
Bedford Rd EB LT/Thru							16.1	0.58	B	10.4	0.59	B
Bedford Rd WB Thru/RT							5.8	0.35	A	5.3	0.37	A
FEET Off LT							16.1	0.19	B	25.9	0.73	C
FEET SB Off RT							4.5	0.15	A	4.0	0.28	A
<b>Bedford Road/Back River Rd</b>							<b>23.7</b>		<b>C</b>	<b>20.3</b>		<b>C</b>
Bedford Rd EB LT							32.4	0.16	C	32.1	0.13	C
Bedford Rd EB Thru							32.6	0.82	C	24.2	0.66	C
Bedford Rd WB Thru/Right							13.3	0.25	B	19.4	0.65	B
Bedford Rd SB LT							19.3	0.41	B	17.6	0.29	B
Bedford Rd SB RT							7.5	0.06	A	6.3	0.10	A
<b>US 3/Bedford Rd</b>	<b>43.0</b>		<b>E</b>	<b>72.6</b>		<b>F</b>	<b>31.5</b>		<b>C</b>	<b>45.5</b>		<b>D</b>
Bedford Rd EB LT/Thru	47.9	0.85	D	83.3	0.90	F	42.8	0.75	D	72.8	0.89	E
Bedford Rd EB RT	3.3	0.18	A	3.4	0.27	A	2.7	0.24	A	3.4	0.42	A
Driveway WB All Moves	39.4	0.04	D	67.5	0.39	E	41.2	0.04	D	62.0	0.23	E
US 3 NB LT	45.1	0.55	D	59.0	0.67	E	46.8	0.65	D	99.0	1.02	F
US 3 NB Thru/RT	17.9	0.46	B	22.7	0.51	C	18.3	0.41	B	16.0	0.41	B
US 3 SB LT	40.0	0.03	D	65.9	0.18	E	38.5	0.03	D	62.6	0.24	E
US 3 SB Thru	97.6	1.09	F	181.6	1.29	F	64.2	0.95	E	75.6	0.99	E
US 3 SB RT	4.6	0.41	A	10.7	0.56	B	4.8	0.44	A	7.0	0.50	A
<b>US 3/Baboosic Lake Rd</b>	<b>17.9</b>		<b>B</b>	<b>18.7</b>		<b>B</b>	<b>18.3</b>		<b>B</b>	<b>19.9</b>		<b>B</b>
Baboosic Lake Rd EB LT	60.0	0.70	E	57.6	0.70	E	61.1	0.73	E	54.6	0.69	D
Baboosic Lake Rd EB RT	3.6	0.31	A	6.7	0.39	A	3.4	0.30	A	6.2	0.37	A
US 3 NB LT	51.3	0.52	D	22.0	0.34	D	48.6	0.51	D	21.8	0.36	C
US 3 NB Thru	8.2	0.21	A	18.3	0.66	C	8.4	0.22	A	21.5	0.73	C
US 3 SB LT	9.0	0.01	A	11.3	0.01	B	8.7	0.01	A	12.0	0.01	B
US 3 SB Thru	10.9	0.45	B	13.0	0.45	B	10.9	0.45	B	14.1	0.46	B
US 3 SB RT	3.6	0.27	A	4.2	0.28	A	4.4	0.30	A	4.4	0.30	A
<b>Greeley St/Tnpg Exit 11 Ramps</b>	<b>21.4</b>		<b>C</b>	<b>34.2</b>		<b>C</b>	<b>21.0</b>		<b>C</b>	<b>31.7</b>		<b>C</b>
Greeley St EB LT	30.7	0.64	C	44.1	0.86	D	30.7	0.64	C	42.7	0.85	D
Greeley St EB Thru	10.3	0.30	B	10.0	0.29	A	10.3	0.29	B	9.9	0.28	A
Greeley St WB Thru	41.0	0.77	D	82.3	1.04	F	39.6	0.75	D	73.4	1.01	F
Greeley St WB RT	0.1	0.08	A	0.3	0.19	A	0.1	0.08	A	0.3	0.18	A
FEE Turnpike Ramps NB LT	20.3	0.20	C	24.1	0.46	C	20.0	0.20	C	24.0	0.45	C
FEE Turnpike Ramps NB RT	0.2	0.14	A	0.3	0.20	A	0.2	0.14	A	0.3	0.20	A

Table 24, continued

Signalized Intersections	2021 Existing Conditions						2045 No-Build					
	AM Peak			PM Peak			AM Peak			PM Peak		
	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS
<b>Cntl Blvd/Amh Rd/Cmp Sgt Rd</b>	<b>32.3</b>		<b>C</b>	<b>37.6</b>		<b>D</b>	<b>32.0</b>		<b>C</b>	<b>37.3</b>		<b>D</b>
Continental Blvd EB LT	43.7	0.27	D	107.9	1.02	F	43.7	0.27	D	103.2	1.00	F
Continental Blvd EB Thru/RT	29.3	0.27	C	37.0	0.66	D	29.5	0.27	C	37.2	0.67	D
Continental Blvd WB LT	45.2	0.36	D	63.5	0.77	E	45.2	0.36	D	63.5	0.77	E
Continental Blvd WB Thru	34.9	0.44	C	37.8	0.56	D	35.0	0.45	C	37.9	0.57	D
Continental Blvd WB RT	0.5	0.28	A	1.1	0.47	A	0.5	0.28	A	1.1	0.47	A
Camp Sargent Rd NB LT	90.8	0.95	F	53.4	0.60	D	92.5	0.96	F	53.7	0.61	D
Camp Sargent Rd NB Thru	45.3	0.37	D	101.8	1.00	F	45.2	0.36	D	96.4	0.98	E
Camp Sargent Rd NB RT	3.7	0.27	A	1.4	0.28	A	3.6	0.26	A	1.4	0.28	A
Amherst Rd SB LT	49.9	0.80	D	35.5	0.43	D	47.7	0.76	D	35.2	0.41	D
Amherst Rd SB Thru	30.0	0.10	C	30.3	0.12	C	30.0	0.09	C	30.3	0.12	C
Amherst Rd SB RT	0.9	0.08	A	0.9	0.11	A	0.9	0.08	A	0.9	0.11	A
<b>US 3/Greeley St</b>	<b>21.3</b>		<b>C</b>	<b>35.7</b>		<b>D</b>	<b>21.1</b>		<b>C</b>	<b>35.5</b>		<b>D</b>
Greeley St EB LT/Thru	46.7	0.62	D	61.4	0.84	F	45.4	0.59	D	60.2	0.82	F
Greeley St EB RT	4.1	0.48	A	2.5	0.32	A	4.1	0.47	A	2.5	0.32	A
Greeley St WB All Moves	33.9	0.19	C	54.7	0.46	D	33.9	0.19	C	54.6	0.46	D
US 3 NB LT	48.9	0.45	D	58.6	0.75	E	49.0	0.45	D	58.5	0.74	E
US 3 NB Thru/RT	18.1	0.15	B	33.2	0.36	C	18.1	0.15	B	32.8	0.35	C
US 3 SB Left	42.6	0.05	D	42.7	0.05	D	42.7	0.05	D	42.7	0.05	D
US 3 SB Thru	19.0	0.22	B	31.5	0.21	C	19.0	0.22	B	31.0	0.20	C
US 3 SB RT	4.2	0.53	A	7.0	0.65	A	4.2	0.52	A	6.8	0.65	A
<b>Unsignalized Intersections</b>												
<b>Turkey Hill Rd/Amherst Rd</b>	<b>90.1</b>		<b>F</b>	<b>8.3</b>		<b>A</b>	<b>77.3</b>		<b>F</b>	<b>7.0</b>		<b>A</b>
Amherst Rd EB LT	7.8	0.01	A	9.7	0.01	A	6.4	0.01	A	9.7	0.01	A
Turkey Hill Rd SB Left/RTs	186.7	1.43	F	43.7	0.78	E	160.7	1.30	F	35.9	0.70	E
<b>US 3/Wire Road</b>	<b>4.4</b>		<b>A</b>	<b>3.6</b>		<b>A</b>	<b>4.3</b>		<b>A</b>	<b>4.0</b>		<b>A</b>
US 3 NB LT	8.9	0.08	A	10.4	0.30	A	8.9	0.08	A	10.3	0.29	A
Wire Rd EB LT	22.9	0.02	C	106.7	0.29	F	23.3	0.02	C	124.3	0.41	F
Wire Rd EB RT	19.0	0.51	C	15.6	0.30	C	18.9	0.51	C	15.6	0.29	C
<b>Bedford Rd/Wire Rd</b>	<b>10.8</b>		<b>B</b>	<b>13.8</b>		<b>B</b>	<b>10.5</b>		<b>B</b>	<b>13.6</b>		<b>B</b>
Bedford Rd EB All	11.9	0.72	B	12.9	0.56	B	11.4	0.43	B	13.9	0.48	B
Bedford Rd WB All	9.6	0.34	A	15.5	0.77	C	9.7	0.25	A	15.1	0.54	C
Wire Rd NB All	9.6	0.20	A	13.6	0.51	B	9.5	0.15	A	13.8	0.42	B
Wire Rd SB All	10.4	0.37	B	11.3	0.28	B	10.3	0.26	B	11.4	0.24	B