

## Quebec Alternatives Analysis Traffic Memo

### **Traffic Volumes and Counts**

In April 2013, City and County of Denver (CCD) provided the Team with two built existing conditions Synchro models: AM Peak Period and PM Peak Period. Turning movement volumes in the models were for the AM peak and PM peak in December 2012. The signal timings in the Synchro models were the current timings in the field as of April 2013.

ADT traffic counts were also taken in March 2013. These counts are located in Appendix A.

### **Projected Percent Growth**

Year 2015 and 2035 DRCOG travel demand models were used to determine an appropriate percent growth rate per year to apply to future conditions. The models were unaltered and no new travel demand model runs were conducted. Screenline volumes of both Quebec and Syracuse were combined to determine the overall travel pattern growth. The growth rate varied between 0.5% and 0.8% at different locations along the corridor. A 1% growth rate was applied to this project.

Table 1. Percent Growth Rate Projections from 2015 and 2035 DRCOG Travel Demand Model

	NB					SB				
	Quebec		Syracuse		Combined Screenline	Quebec		Syracuse		Combined Screenline
	2015	2035	2015	2035	% Growth/yr	2015	2035	2015	2035	% Growth/yr
<b>South of Montview</b>	13066	14405	1216	2369	0.8%	13263	14530	1515	2505	0.8%
<b>North of Colfax</b>	13497	14480	1476	2939	0.8%	13658	14446	1931	3121	0.6%
<b>North of 11th</b>	12092	13402	2898	3420	0.6%	12886	14051	2584	2847	0.5%

### **Synchro and SimTraffic Analysis**

#### Level of Service

All alternatives were analyzed in Synchro 8. The existing 2012 turning movement volumes were provided by CCD and were used to allow for comparative evaluations of the alternatives. The PM peak hour volumes were larger than AM peak hour volumes therefore the PM was used as the controlling peak hour analysis. Table 2 shows the Level of Service (LOS) for all major intersections along the Quebec corridor for each alternative using existing 2012 PM peak volumes and optimized signal timings. The Synchro output sheets for existing and all alternatives are located in Appendix B.

Table 2. 2012 PM Peak Period Intersection Level of Service

Intersection	Existing Conditions	Reconfigure: 2 Lanes	Reconfigure: 4 lanes	Directional Priority: Quebec
Quebec & 26th Ave	B	A	A	A
Quebec & 23rd Ave	B	A	A	A
Quebec & Montview	D	C	C	D
Quebec & 17th Ave	E	B	C	D
Quebec & Colfax	D	C	C	D
Quebec & 14th Ave	C	C	B	C
Quebec & 13th Ave	E	C	B	B
Quebec & 11th Ave	C	B	B	C
Quebec & E 8th Ave	D	B	B	B
Quebec & E 6th Ave	C	C	C	C

Travel Time

SimTraffic 8 was used to run simulations of the Synchro model and determine travel times for the PM peak period. The analysis measured the time needed to travel through the entire Quebec corridor from 6<sup>th</sup> Avenue to 26<sup>th</sup> Avenue northbound and 26<sup>th</sup> Avenue to 6<sup>th</sup> Avenue southbound. The travel time begins once the vehicle enters into the first intersection and ends after it passes through the last intersection. Table 3 and Table 4 show the results from the SimTraffic simulations for the PM peak period using the existing 2012 traffic volumes.

Table 3. Northbound 2012 PM Peak Period Travel Times in Seconds

Intersection	2012 PM Northbound			
	Existing	2 Lanes	4 Lanes	Directional Quebec only
Quebec & E 6th Ave	0.0	0.0	0.0	0.0
Quebec & E 8th Ave	73.2	53.9	46.5	39.9
Quebec & 11th Ave	51.5	49.4	42.4	83.7
Quebec & 13th Ave	55.5	59.6	48.6	54.4
Quebec & 14th Ave	20.7	21.2	25.4	40.6
Quebec & Colfax	58.1	49.4	40.1	90.7
Quebec & 17th Ave	65.2	53.6	42	100.7
Quebec & Montview	73.9	49.3	46.1	70.8
Quebec & 23rd Ave	45.3	29.9	29.9	39
Quebec & 26th Ave	26.4	25.6	25.6	35.5
<b>Total Travel Time (s)</b>	<b>469.8</b>	<b>391.9</b>	<b>346.6</b>	<b>555.3</b>

Table 4. Southbound 2012 PM Peak Period Travel Times in Seconds

Intersection	2012 PM Southbound			
	Existing	2 Lanes	4 Lanes	Directional Quebec only
Quebec & 26th Ave	0.0	0.0	0.0	0.0
Quebec & 23rd Ave	34.9	34.0	34.0	25.7
Quebec & Montview	58.4	39.5	41.3	36.3
Quebec & 17th Ave	159.9	51.5	45.2	42.1
Quebec & Colfax	98.4	68.0	54.1	52.0
Quebec & 14th Ave	20.4	31.6	19.3	44.2
Quebec & 13th Ave	22.9	20.8	16.4	49.2
Quebec & 11th Ave	54.4	57.7	52.7	29.2
Quebec & E 8th Ave	56.5	50.9	42.2	50.4
Quebec & E 6th Ave	23.1	53.1	23.4	43.3
<b>Total Travel Time (s)</b>	528.9	407.1	328.6	372.4

### Longevity

Intersection Capacity Utilization (ICU) method was used to estimate the “longevity” of an intersection or when 100% capacity has been reached at the intersection. The ICU percent can tell how much reserve capacity is available or how much the intersection is overcapacity. The Synchro outputs which reported the Level of Service discussed earlier also reported the ICU percent for the intersection. Year 2042 Synchro models for each alternative were also run using a volume growth rate of 1% per year to determine the future ICU percent.

The purpose of the Longevity calculation was to determine the length of time that one alternative would reach capacity. The ICU value only considers the individual intersection and not the corridor as a whole. This causes potential issues as the intersection configuration for the Reconfigure Quebec options of 2-Lanes and 4-Lanes are the same. The differences exist beyond the intersections. The ICU percent would be the same and therefore would not help determine the length of time that the 4-Lanes option would outperform the 2-Lanes option. Therefore, it was estimated that the continuation of the lanes between intersections of the 4-Lanes option decreased the ICU percent of each intersection by 10%. Instead of subtracting 10% from the Synchro-reported ICU at each intersection of the 4-Lanes option, 5% was subtracted from the ICU of the 4-Lanes option intersections and 5% was added to the ICU of the 2-Lanes option intersections, where applicable.

Between the existing and future Synchro outputs, a straight line interpolation was then used to estimate the year the intersection reaches an ICU of 100%. Note that though the Synchro models are accurate, they do not account for unpredictable real world factors that may change the actual year the

intersection reaches capacity. Therefore longevity is only an estimate for purposes of comparative analysis between alternatives.

With 10 intersections being evaluated for this project, the worst 3 intersections were used to determine the overall longevity of the Quebec corridor. As these 3 intersections begin failing operationally, the effects will ripple out to the other intersections. The worst 3 intersections on the Quebec corridor are at Montview Avenue, 17<sup>th</sup> Avenue and Colfax Avenue. Table 5 shows the results of the 2012 and 2042 PM peak Synchro ICU outputs and the estimated year the intersection reaches ICU of 100%. Appendix C has the 2042 PM peak Synchro outputs for the intersections of Montview Avenue, 17<sup>th</sup> Avenue and Colfax Avenue.

Table 5. Intersection Capacity Utilization

Intersection	Existing Conditions			Reconfigure Quebec: 2 Lanes			Reconfigure Quebec: 4 Lanes			Directional Priority: Quebec		
	2012	2042	Year ICU is 100%	2012	2042	Year ICU is 100%	2012	2042	Year ICU is 100 %	2012	2042	Year ICU is 100%
<b>Quebec &amp; Montview</b>	106.4%	130.9%	Before 2012	89.6%	107.4%	2029	84.6%	102.4%	2039	100.4%	127.2%	2012
<b>Quebec &amp; 17th Ave</b>	105.8%	139.3%	Before 2012	89.1%	109.0%	2029	84.0%	104.0%	2035	103.9%	133.5%	Before 2012
<b>Quebec &amp; Colfax</b>	102.1%	126.4%	Before 2012	91.0%	106.7%	2029	84.7%	101.7%	2040	98.0%	120.9%	2015

**Appendix A**  
**2013 Traffic Counts**

## **Appendix B**

### **2012 Synchro Outputs:**

#### **Level of Service & Intersection Capacity Utilization**

for

#### **PM Peak Existing**

**PM Peak Reconfigure Quebec: 2 Lanes**

**PM Peak Reconfigure Quebec: 4 Lanes**

**PM Peak Directional Priority**

## Appendix C

**2042 Synchro Outputs:**

**Intersection Capacity Utilization**

for

**PM Peak Existing**

**PM Peak Reconfigure Quebec: 2 Lanes**

**PM Peak Reconfigure Quebec: 4 Lanes**

**PM Peak Directional Priority**