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MEMORANDUM

DATE: September 5, 2017

TO: Debbie Bauman, Project Manager, City of Albuquerque

FROM: Eric J. Wrage, P.E., PTOE

SUBJECT: **RIO GRANDE BOULEVARD ROAD DIET – BEFORE AND AFTER SUMMARY**

The purpose of this memo is to provide a summary of the traffic analysis comparing the pre-road diet traffic volumes to data collected 3 months after the interim road diet striping was implemented.

BACKGROUND AND SUMMARY

As part of the Rio Grande Boulevard Road Diet (Road Diet) project, traffic volumes along Rio Grande Boulevard, 2nd Street, and 4th Street were to be collected prior to the interim re-striping to 3-lanes and again 3 months after. This was done to evaluate actual changes to traffic operations and traffic volumes resulting from the Road Diet.

The "before" traffic volumes were collected in April 2016 while school was in session. The results will be summarized in this memo, and were also documented in an October 6, 2016 memo from TJ Scarberry.

The "after" counts were collected in March and April of 2017, also while school was in session. The reason for the additional time required for the first "after" traffic counts was due to weather and spring break for Albuquerque Public Schools and the University of New Mexico.

In addition to turning movement counts at key intersections, and the tube counts (volume, speed and vehicle classification), travel time runs were performed along all three corridors (Rio Grande, 2nd Street and 4th Street). These travel time runs consisted of timed travel along the corridor during the AM, PM, mid-day and weekends.

The turning movement counts at the intersections were used to perform signalized intersection capacity analysis at key intersections near the Road Diet vicinity.

In general, the data indicates the Road Diet slightly reduced speed and traffic volume on Rio Grande Boulevard without substantial impact on traffic operations along Rio Grande Boulevard, 2nd Street or 4th Street.

Intersection LOS

Intersection level of service (LOS) is defined by the Highway Capacity Manual (HCM) by the following criteria:

Table 1 – LOS Definitions			
Level of Service	**Signalized (sec/veh)**	**Definition**	**Un-Signalized (sec/veh)**
A	<10	Most vehicles do not stop.	<10
B	>10 and <20	Some vehicles stop.	>10 and <15
C	>20 and <35	Significant numbers of vehicles stop.	>15 and <25
D	>35 and <55	Many vehicles stop.	>25 and <35
E	>55 and <80	Limit of acceptable delay.	>35 and <50
F	>80	Unacceptable delay.	>50

The following intersections were evaluated:

Rio Grande Boulevard and Griegos Road
Rio Grande Boulevard and Candelaria Road
Rio Grande Boulevard and Matthew Avenue
Rio Grande Boulevard and Indian School Road

2nd Street and Osuna Road
2nd Street and Montaño Road
2nd Street and Griegos Road
2nd Street and Candelaria Road

4th Street and Osuna Road
4th Street and Montaño Road
4th Street and Griegos Road
4th Street and Candelaria Road

The intersections were evaluated using the Synchro software package, which implements the HCM signalized intersection capacity analysis procedures. The cycle lengths used in the analysis is the current cycle lengths being run in the field, and is listed in the tables. The signal timing and corridor offsets were optimized in Synchro, considering each corridor (Rio Grande Boulevard, 2nd Street and 4th Street) as a separate interconnected system. Table 2, Table 3 and Table 4 shows the results. The results are slightly different from the October 6, 2016 memo, as that analysis considered each intersection individually, with the cycle length optimized for each individual intersection. This analysis considered each corridor as a network, and used a common cycle length for each intersection on the corridor. This more closely corresponds to the actual conditions. Please be advised the City revised the signal timing on Rio Grande Boulevard after the interim re-striping was implemented.

It can be seen from the tables that the Road Diet did not materially affect operational performance, as there were only minor changes in LOS and average vehicle delay. In addition, no

movements were found to operate at LOS F at any of the intersections in either the “before” or “after” scenarios.

Table 2 – Rio Grande Boulevard Signalized Intersection Analysis Results Before and Three Months After								
Cycle Length	**LOS**				**Average Vehicle Delay (sec)**			
90 seconds AM	**AM**		**PM**		**AM**		**PM**	
90 seconds PM	**Before**	**After**	**Before**	**After**	**Before**	**After**	**Before**	**After**
Griegos	A	A	B	B	7.3	7.9	11.3	10.8
Candelaria	B	B	B	B	10.3	11.4	11.5	15.9
Matthew	A	A	A	A	3.7	4.6	4.5	6.1
Indian School	A	A	B	B	8.1	6.9	13.6	15.0

Table 3 – 2nd Street Signalized Intersection Analysis Results Before and Three Months After								
Cycle Length	**LOS**				**Average Vehicle Delay (sec)**			
110 seconds AM	**AM**		**PM**		**AM**		**PM**	
120 seconds PM	**Before**	**After**	**Before**	**After**	**Before**	**After**	**Before**	**After**
Osuna	C	C	C	D	31.7	30.8	32.4	35.8
Montaño	C	D	D	D	34.7	36.1	40.9	40.8
Griegos	B	B	D	D	19.6	18.4	39.8	36.3
Candelaria	C	C	C	C	31.9	32.0	30.6	33.3

Table 4 – 4th Street Signalized Intersection Analysis Results Before and Three Months After								
Cycle Length	**LOS**				**Average Vehicle Delay (sec)**			
110 seconds AM	**AM**		**PM**		**AM**		**PM**	
120 seconds PM	**Before**	**After**	**Before**	**After**	**Before**	**After**	**Before**	**After**
Osuna	C	C	C	C	30.5	28.3	30.2	33.2
Montaño	D	D	D	D	38.1	37.4	44.0	42.7
Griegos	C	C	C	D	29.5	29.6	34.7	44.6
Candelaria	C	C	C	B	22.8	23.8	23.1	17.6

Tube Count Summary

Traffic Volumes

Seven-day tube counts were collected at nine locations in the study area. The tube counts collected traffic volume, vehicle speeds and vehicle classification. The following tables summarize the seven-day traffic counts.

Table 5 – 7-Day Average Daily Volume – Rio Grande Boulevard								
Location	**NB**				**SB**			
	Before	**After**	**Change**	**% Change**	**Before**	**After**	**Change**	**% Change**
North of Candelaria	5,391	4,872	-519	-9.6%	5,152	4,866	-286	-5.6%
North of Matthew	7,326	6,454	-872	-11.9%	6,847	6,564	-283	-4.1%
North of Indian School	8,444	7,355	-1,089	-12.9%	8,074	7,602	-472	-5.8%

The traffic volume data shows a slight reduction in daily volume on Rio Grande Boulevard after the interim re-striping was implemented. Traffic reduced from 800 to 1,550 vehicles a day.

Table 6 – 7-Day Average Daily Volume – 2nd Street								
Location	**NB**				**SB**			
	Before	**After**	**Change**	**% Change**	**Before**	**After**	**Change**	**% Change**
North of Montaño	9,814	9,569	-245	-2.5%	10,084	10,004	-80	-0.8%
North of Griegos	9,287	9,085	-202	-2.2%	9,875	9,829	-46	-0.5%
North of Candelaria	8,389	8,133	-256	-3.1%	8,259	8,184	-75	-0.9%

The traffic volume data also shows a slight reduction in daily volume on 2nd Street. However, the changes are relatively small and are likely due to seasonal variations in traffic volume.

Table 7 – 7-Day Average Daily Volume – 4th Street								
Location	**NB**				**SB**			
	Before	**After**	**Change**	**% Change**	**Before**	**After**	**Change**	**% Change**
North of Montaño	7,992	8,438	446	5.6%	8,572	8,676	104	1.2%
North of Griegos	11,665	11,935	270	2.3%	11,758	12,202	444	3.8%
North of Candelaria	9,729	9,496	-233	-2.4%	9,240	10,309	1,069	11.6%

4th Street did show a slight increase in daily traffic volumes, suggesting some traffic that previously used Rio Grande Boulevard diverted to 4th Street.

85th Percentile Speed

The 85th percentile speed is the speed which 85% of the drivers drive (or 15% drive faster than) and is typically used as the speed which determines the posted speed limit. This, of course, depends on roadway context and other factors; however, it is a useful measure of general driver behavior along a roadway. The following tables summarize the 85th percentile speed along the corridors in the study area.

Table 8 – 85th Percentile Speed (MPH)- Rio Grande Boulevard

Location	NB				SB			
	Before	After	Change	% Change	Before	After	Change	% Change
North of Candelaria	44.9	43.3	-1.6	-3.6%	44.1	41.3	-2.8	-6.3%
North of Matthew	44.6	42.0	-2.6	-5.8%	43.7	40.3	-3.4	-7.8%
North of Indian School	44.0	44.4	0.4	0.9%	43.7	44.5	0.8	1.9%

It can be seen from the table that the interim striping Road Diet did result in overall reduction in the 85th percentile speed along Rio Grande Boulevard. North of Indian School Road, prior to the interim striping Road Diet, the 85th percentile speed was comparable, or a bit higher, after the striping went into effect. However, in the locations when the Road Diet was in place, the 85th percentile speeds reduced by 1.6 to 3.4 miles per hour (MPH), or from 3.6% to 7.8%.

Table 9 – 85th Percentile Speed (MPH)- 2nd Street

Location	NB				SB			
	Before	After	Change	% Change	Before	After	Change	% Change
North of Montaño	49.2	49.6	0.4	0.8%	49.8	50.4	0.6	1.2%
North of Griegos	46.9	48.1	1.2	2.6%	46.6	47.2	0.6	1.3%
North of Candelaria	48.0	47.3	-0.7	-1.5%	47.8	49.0	1.2	2.5%

Table 10 – 85th Percentile Speed (MPH)- 4th Street

Location	NB				SB			
	Before	After	Change	% Change	Before	After	Change	% Change
North of Montaño	39.2	39.5	0.3	0.8%	39.1	39.6	0.5	1.3%
North of Griegos	39.8	41.1	1.3	3.3%	39.6	39.5	-0.1	-0.3%
North of Candelaria	38.0	42.7	4.7	12.4%	39.1	38.8	-0.3	-0.8%

The 85th percentile speeds along 2nd and 4th Street varied slightly between the before and after data. The increase in speed on 4th Street north of Candelaria Road appears to be an outlier, due to the large increase.

Travel Time Summary

The travel time runs were performed on Rio Grande Boulevard, 2nd Street, 4th Street, Montaño Road, Griegos Road, Candelaria Road and Menaul Boulevard. These are actual travel times along the corridors, using the "average car" technique, where the test vehicle travels per the driver's judgment of the average speed of the traffic stream. The following tables summarize the results.

Table 11 – Travel Time Summaries – North/South – AM Peak Hour

Rio Grande - NB	TT Before	TT After	% Change	Ave Speed Before	Ave Speed After	% Change
Indian School - Montaño	264.0	247.2	-6.4%	31.9	34.3	7.5%
Rio Grande - SB						
Montaño - Indian School	284.6	265.2	-6.8%	29.8	32.0	7.4%
4th Street - NB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Menaul - Montaño	247.6	233.2	-5.8%	28.0	29.7	6.1%
4th Street - SB						
Montaño - Menaul	289.8	237.8	-17.9%	23.8	29.2	22.7%
2nd Street - NB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Menaul - Montaño	295.4	246.8	-16.5%	23.9	28.6	19.7%
2nd Street - SB						
Montaño - Menaul	252.8	223.8	-11.5%	28.0	31.5	12.5%

The travel time results do not show the same results as the tube counts. In the above table, travel time decreased and travel speed increased, even along Rio Grande Boulevard. It should be noted the City adjusted the traffic signal timing along Rio Grande Boulevard after the interim re-striping was complete, so this may explain some of the changes along Rio Grande Boulevard. However, it does not explain the changes along 2nd Street and 4th Street.

Table 12 – Travel Time Summaries – East/West – AM Peak Hour						
Montaño - EB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Rio Grande - 2nd Street	543.2	700.4	28.9%	11.6	9.0	-22.4%
Montaño - WB						
2nd Street - Rio Grande	173.0	161.0	-6.9%	35.6	38.1	7.0%
Griegos - EB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Rio Grande - 2nd Street	327.6	385.0	17.5%	19.3	16.3	-15.5%
Griegos - WB						
2nd Street - Rio Grande	277.6	250.2	-9.9%	22.7	25.2	11.0%
Candelaria - EB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Rio Grande - 2nd Street	292.6	301.6	3.1%	23.2	22.4	-3.4%
Candelaria - WB						
2nd Street - Rio Grande	279.0	317.8	13.9%	24.4	21.4	-12.3%
Menaul - EB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Rio Grande - 2nd Street	241.0	264.8	9.9%	24.7	22.5	-8.9%
Menaul - WB						
2nd Street - Rio Grande	237.2	220.2	-7.2%	25.4	27.2	7.1%

Similarly, for the east/west direction, there is a wide variation in travel time between the before and after data. Additional factors could be the small sample size for the actual travel time runs, as a limited number of runs could be made along each corridor during the peak hours and within a reasonable budget.

Table 13 – Travel Time Summaries – North/South – PM Peak Hour						
Rio Grande - NB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Indian School - Montaño	254.0	247.2	-2.7%	33.4	34.2	2.4%
Rio Grande - SB						
Montaño - Indian School	267.8	272.6	1.8%	31.6	31.0	-1.9%
4th Street - NB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Menaul - Montaño	291.8	279.4	-4.2%	23.8	24.9	4.6%
4th Street - SB						
Montaño - Menaul	266.0	244.6	-8.0%	26.1	28.2	8.0%
2nd Street - NB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Menaul - Montaño	312.2	293.8	-5.9%	22.6	24.0	6.2%
2nd Street - SB						
Montaño - Menaul	210.6	215.6	2.4%	33.5	32.7	-2.4%

The PM peak hour results are similar to the AM peak hour, in that there does not appear consistent results with the travel times. Additional considerations could be traffic incidents that occurred during the travel time run that affected the run, yet were not visible to the test driver.

Table 14 – Travel Time Summaries – East/West – PM Peak Hour						
Montaño - EB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Rio Grande - 2nd Street	262.0	228.0	-13.0%	24.0	27.6	15.0%
Montaño - WB						
2nd Street - Rio Grande	243.4	278.8	14.5%	25.4	22.0	-13.4%
Griegos - EB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Rio Grande - 2nd Street	232.2	258.4	11.3%	27.1	24.3	-10.3%
Griegos - WB						
2nd Street - Rio Grande	275.2	322.6	17.2%	22.9	19.5	-14.8%
Candelaria - EB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Rio Grande - 2nd Street	306.0	250.4	-18.2%	22.2	27.1	22.1%
Candelaria - WB						
2nd Street - Rio Grande	274.2	272.4	-0.7%	24.9	24.8	-0.4%
Menaul - EB	**TT Before**	**TT After**	**% Change**	**Ave Speed Before**	**Ave Speed After**	**% Change**
Rio Grande - 2nd Street	243.4	258.8	6.3%	24.6	23.0	-6.5%
Menaul - WB						
2nd Street - Rio Grande	231.4	293.4	26.8%	25.8	20.4	-20.9%

Conclusions

The initial comparison of before and after traffic volumes indicate the Road Diet did result in slightly slower 85th percentile speeds through the area with the reduced lanes. The speed reduction was from 1.6 to 3.4 MPH, a 3.6% to 7.8% reduction along Rio Grande Boulevard. The 85th percentile speeds along 2nd Street and 4th Street varied slightly, with a small increase of 1 MPH found. This suggests limited impacts to speeds along 2nd Street and 4th Street.

The traffic data collected also found a 4% to 13% reduction in traffic volume along Rio Grande Boulevard after implementation of the interim re-striping to the Road Diet configuration. It appears that the bulk of this traffic diverted to 4th Street, which generally showed an increase in traffic volumes in the after period, while 2nd Street traffic volumes were comparable to the before data.

The analysis found all the intersections operate at comparable levels of service and delay after implementation of the Road Diet. In neither scenario did any movement at any intersection operate at LOS F.

EJW/jma