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## TECHNICAL MEMORANDUM

### Latham Square Traffic Analysis

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Date: February 14, 2013  
To: Jamie Parks  
From: Aaron Elias and Erin Ferguson

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Project #: 13235

Kittelison & Associates Inc. (KAI) conducted a traffic analysis to evaluate two alternative roadway configurations around Latham Square in downtown Oakland. The City of Oakland is exploring the feasibility of enhancing Latham Square as a pedestrian plaza and in doing so, is considering altering the adjacent roadway network and circulation patterns. This technical memorandum documents the traffic analysis findings for the two alternatives.

KAI determined intersection LOS and intersection Volume to Capacity Ratios (V/C) for eight (8) signalized intersections near Latham Square during the AM and PM peak hour for the existing conditions. In addition to existing conditions, the two proposed reconfigurations were evaluated. Alternative 1 (Full Plaza) assumes a complete closure of the Telegraph Avenue connection between 16<sup>th</sup> Street and Broadway. Alternative 2 (Signalized Plaza) assumes the intersection of Broadway, 15<sup>th</sup> Street, and Telegraph Avenue would be redesigned into one offset signalized intersection.

## TRAFFIC VOLUMES

Existing traffic volumes for this study were available from a previous study (1800 San Pablo EIR) for three of the eight intersections analyzed. The traffic volumes for the other five intersections were collected by a traffic count data vendor working for KAI. Exhibit 1 documents the list of the intersections analyzed for this study, the source of the traffic volume information, and the month/year the traffic counts were collected. The traffic volume data sheets for the intersections collected as part of this effort are attached to this technical memorandum.

### Exhibit 1 - Analysis Intersections, Traffic Volume Source, and Month/Year Collected

#	Intersection	Source	Month/Year
1	Telegraph Ave./Broadway/15 <sup>th</sup> St.	KAI	January 2013
2	Telegraph Ave./16 <sup>th</sup> St.	KAI	January 2013
3	Telegraph Ave./17 <sup>th</sup> St.	1800 San Pablo EIR	May 2011
4	Telegraph Ave./18 <sup>th</sup> St.	1800 San Pablo EIR	May 2011
5	Telegraph Ave./19 <sup>th</sup> St.	1800 San Pablo EIR	May 2011
6	Broadway Ave./19 <sup>th</sup> St.	KAI	January 2013
7	Broadway Ave./17 <sup>th</sup> St.	KAI	January 2013
8	Broadway Ave./16 <sup>th</sup> St.	KAI	January 2013

Traffic volume data sheets for the five intersections counted in January 2013 include the peak hour factor (PHF), pedestrian volumes, bicycle volumes, heavy vehicle percentages and auto volumes. These values were used in the traffic operations analysis, which was conducted using Synchro software. The remaining three intersections were counted in May 2011 and only included auto volumes. Therefore, KAI made the following assumptions:

- Existing auto volumes from the May 2011 counts were transferred as reported in the 1800 San Pablo EIR;
- Pedestrian and bicycle volumes were copied from the nearest intersection where bicycle and pedestrian counts were available; and
- PHF and heavy vehicle percentages were left at the Synchro default values of 0.92 and 2%, respectively. These values are consistent with the data collected in January 2013 for the intersection of Telegraph Avenue and 16<sup>th</sup> Street

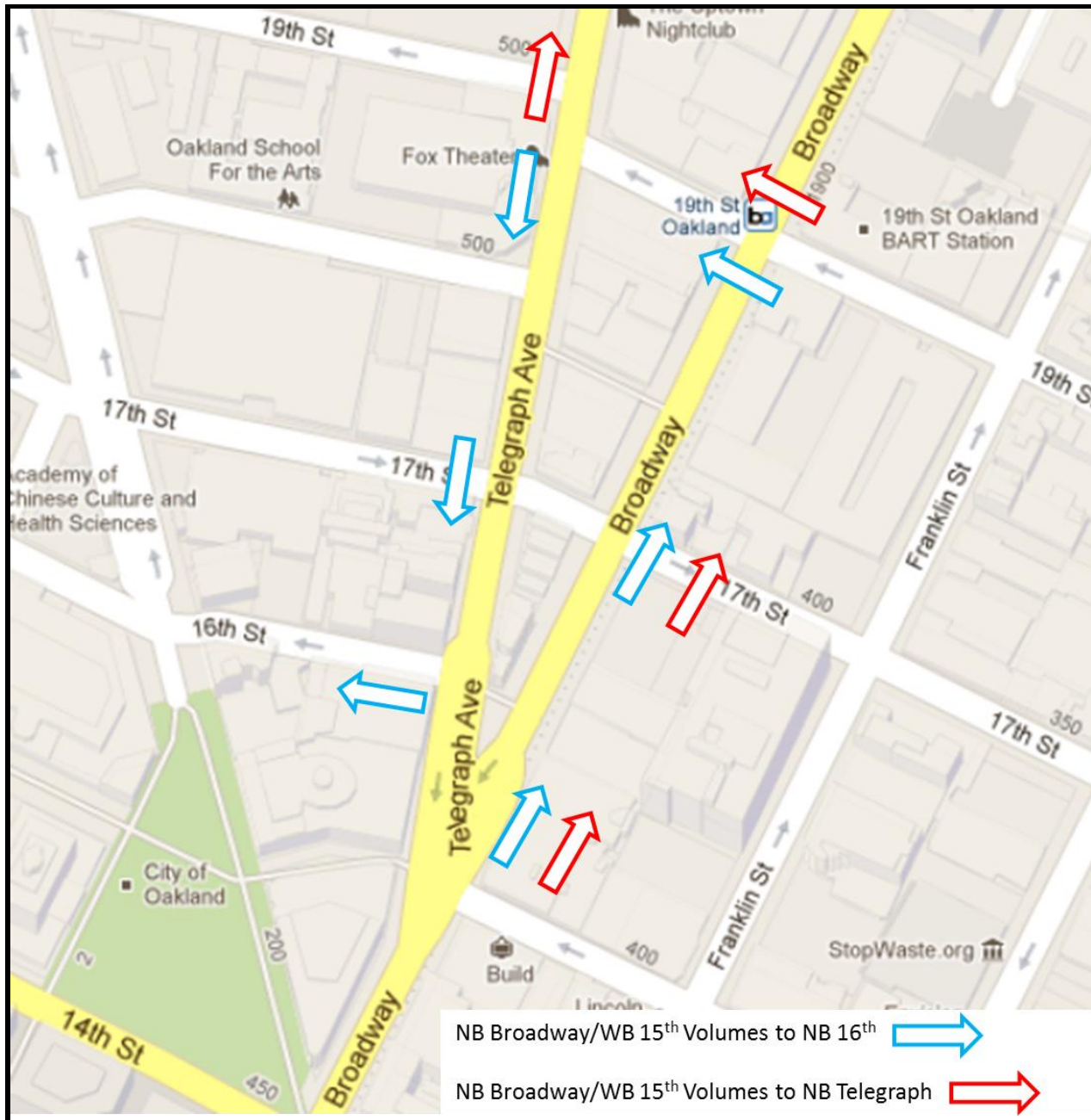
KAI met with the City of Oakland on January 25, 2013 to discuss the traffic operations analysis and the appropriate assumptions for rerouting traffic in Alternative 1, the full plaza alternative that eliminates the Telegraph Avenue/Broadway intersection. The agreed upon assumptions are noted below and shown in the following exhibits.

- Traffic traveling northbound on Broadway and westbound on 15<sup>th</sup> Street to northbound Telegraph Avenue was routed north to 19<sup>th</sup> Street and west to Telegraph Avenue. This is shown in Exhibit 2 by the red arrows.
- Traffic traveling northbound on Broadway and westbound on 15<sup>th</sup> Street to westbound 16<sup>th</sup> Street was routed to northbound Broadway to 19<sup>th</sup> Street, west to Telegraph Avenue, and then south on Telegraph Avenue to 16<sup>th</sup> Street. This is shown in Exhibit 2 by the blue arrows.

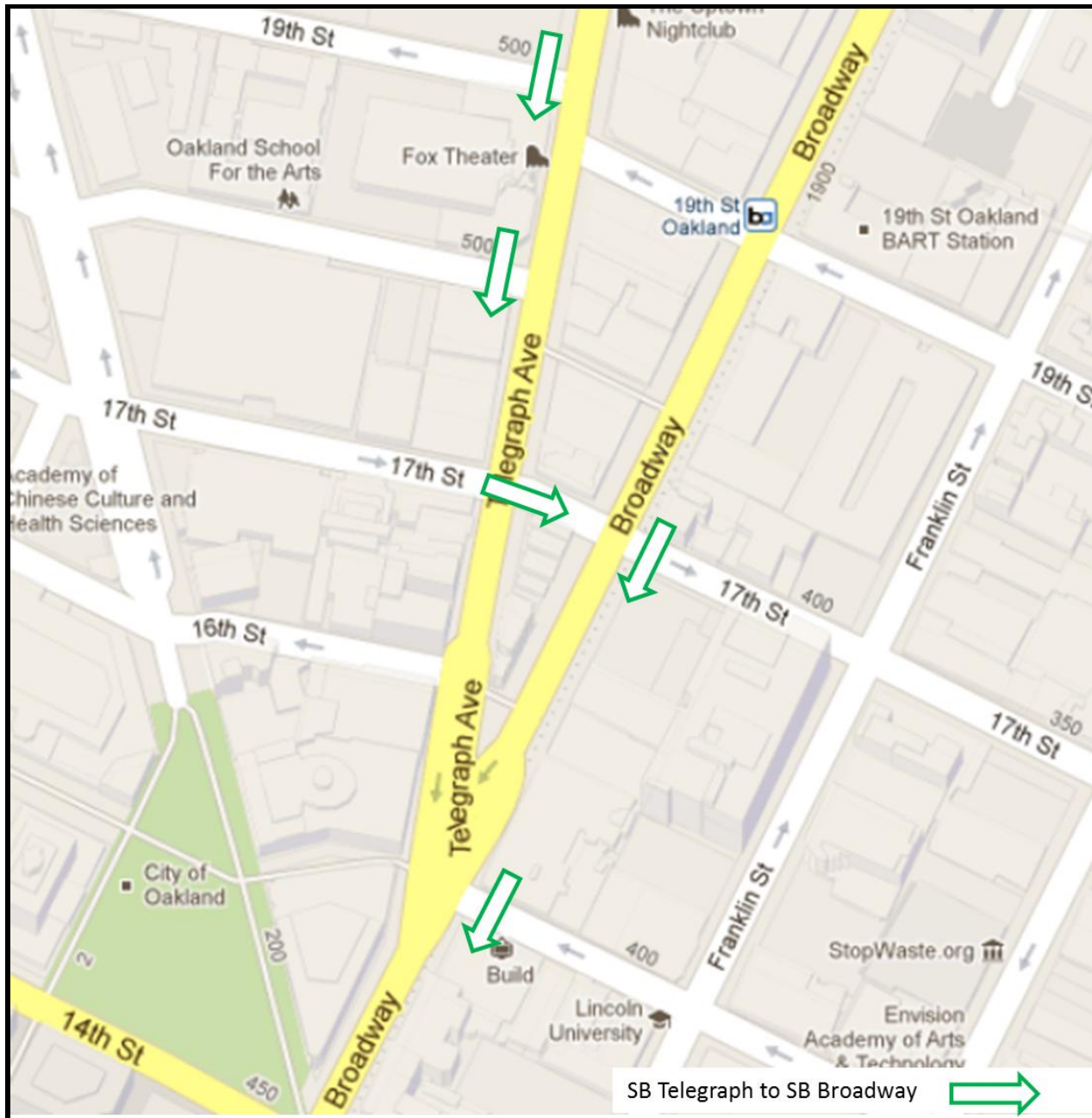
- Traffic traveling southbound from Telegraph Avenue to Broadway was routed from Telegraph Avenue to Broadway using 17<sup>th</sup> Street as shown in Exhibit 3 by the green arrows.
- Two-way traffic on Telegraph Avenue between 16<sup>th</sup> Street and 17<sup>th</sup> Street was assumed to still exist allowing for u-turns at the south end. A nominal value of 20 vehicles per hour was assumed to be making the u-turn and using the northbound approach to the intersection of Telegraph Avenue and 17<sup>th</sup> Street. This is a more conservative analysis than assuming Telegraph Avenue is one-way southbound between 17<sup>th</sup> Street and 16<sup>th</sup> Street.

These rerouting assumptions are essentially the worst-case scenarios assuming all traffic will use the same diversion route. In actuality, there are several viable alternative routes that can be used which would diffuse the impact of the closure on these eight intersections.

**Exhibit 2 - NB Broadway/WB 15<sup>th</sup> Street to WB 16<sup>th</sup> Street and NB Telegraph Avenue Alternative Routes**



### Exhibit 3 - SB Telegraph Avenue to SB Broadway Alternative Route



### ALTERNATIVE 1 - FINDINGS

The primary traffic analysis for this study was to determine the impact of closing Telegraph Avenue between 16<sup>th</sup> Street and Broadway. During the AM peak hour, 233 vehicles from westbound 15<sup>th</sup> Street and northbound Broadway were rerouted to 19<sup>th</sup> Street along the paths shown in Exhibit 2. Of these 233 vehicles, 60 vehicles were headed to westbound 16<sup>th</sup> Street and 173 were headed for northbound Telegraph Avenue.

A total of 245 southbound vehicles on Telegraph Avenue were rerouted to southbound Broadway via 17<sup>th</sup> Street as shown in Exhibit 3. The impact of rerouting of these two traffic volumes on intersection LOS and V/C ratios for the study intersections is shown in Exhibit 4.

As Exhibit 4 shows, one intersection, the Broadway/19<sup>th</sup> Street intersection, experiences a change in level-of-service (LOS). It changes from LOS A in the existing conditions to LOS B under Alternative 1. The other study intersections remain at LOS B. The City of Oakland's LOS standard for downtown intersections is LOS E or better. Therefore, these intersections are projected to meet the City's LOS standard for Alternative 1 (Full Plaza) during the AM peak hour.

**Exhibit 4 – Alternative 1 Intersection LOS and V/C Ratio Comparison for the AM Peak Hour**

Study Intersection Name		Existing AM Peak Hour			Alternative 1 AM Peak Hour		
		Delay	LOS	V/C	Delay	LOS	V/C
1	Telegraph Ave./Broadway/15 <sup>th</sup> St.	17.8	B	0.24	19.8	B	0.24
2	Telegraph Ave. & 16 <sup>th</sup> St.	7.2	A	0.17	N/A*	N/A*	N/A*
3	Telegraph Ave. & 17 <sup>th</sup> St.	10.8	B	0.32	13.3	B	0.40
4	Telegraph Ave. & 18 <sup>th</sup> St.	10.7	B	0.23	10.1	B	0.25
5	Telegraph Ave. & 19 <sup>th</sup> St.	10.6	B	0.28	11.5	B	0.25
6	Broadway & 19 <sup>th</sup> St.	8.8	A	0.22	10.2	B	0.40
7	Broadway & 17 <sup>th</sup> St.	15.0	B	0.39	16.6	B	0.53
8	Broadway & 16 <sup>th</sup> St.	12.4	B	0.12	11.4	B	0.22
N/A* - Not applicable because under Alternative 1 Telegraph Avenue between 16 <sup>th</sup> Street and 17 <sup>th</sup> Street is one-way southbound and has a continuous connection to 16 <sup>th</sup> Street.							

The amount of traffic rerouted for the PM peak hour was higher than the AM peak hour with 370 vehicles from northbound Broadway and westbound 15<sup>th</sup> Street rerouted to Telegraph Avenue via 19<sup>th</sup> Street. Of these 370 vehicles, 80 were headed to westbound 16<sup>th</sup> Street and 290 were headed for northbound Telegraph Avenue.

Southbound Telegraph Avenue traffic totaled 255 vehicles which were rerouted to southbound Broadway via 17<sup>th</sup> Street. The LOS and V/C ratio for the PM peak hour is shown in Exhibit 5. The Broadway/19<sup>th</sup> Street intersection is affected the most due to the additional northbound left turns. This intersection changes from LOS B in existing PM conditions to LOS C under Alternative 1. The other study intersections operate at LOS B or better. Therefore, these intersections are projected to meet the City's LOS standard for Alternative 1 (Full Plaza) during the PM peak hour.

### Exhibit 5 – Alternative 1 Intersection LOS and V/C Ratio Comparison for the PM Peak Hour

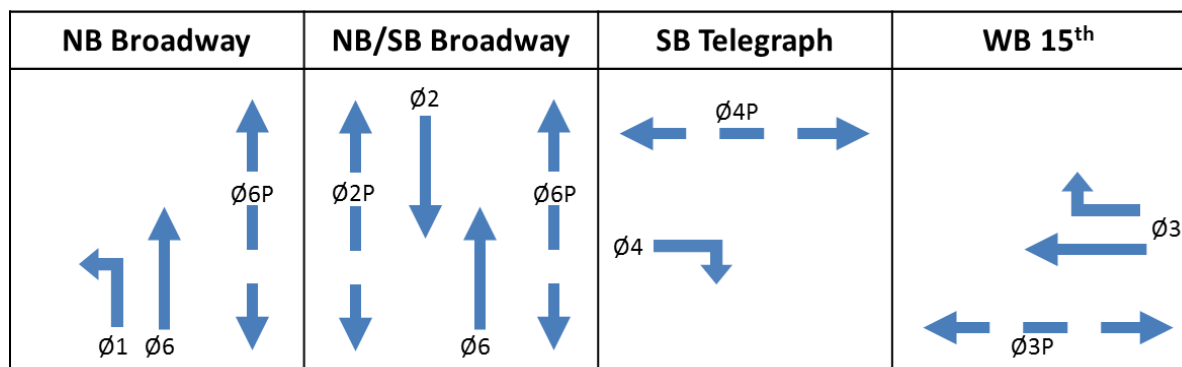
Study Intersection Name		Existing PM Peak Hour			Alternative 1 PM Peak Hour		
		Delay	LOS	V/C	Delay	LOS	V/C
1	Telegraph Ave./Broadway/15 <sup>th</sup> St.	14.1	B	0.33	16.6	B	0.33
2	Telegraph Ave. & 16 <sup>th</sup> St.	9.8	A	0.18	N/A	N/A	N/A
3	Telegraph Ave. & 17 <sup>th</sup> St.	12.8	B	0.27	12.0	B	0.36
4	Telegraph Ave. & 18 <sup>th</sup> St.	5.4	A	0.18	7.8	A	0.20
5	Telegraph Ave. & 19 <sup>th</sup> St.	15.8	B	0.41	16.1	B	0.45
6	Broadway & 19 <sup>th</sup> St.	11.0	B	0.45	32.0	C	0.77
7	Broadway & 17 <sup>th</sup> St.	15.3	B	0.36	16.9	B	0.50
8	Broadway & 16 <sup>th</sup> St.	9.9	A	0.19	10.2	B	0.30
N/A* - Not applicable because under Alternative 1 Telegraph Avenue between 16 <sup>th</sup> Street and 17 <sup>th</sup> Street is one-way southbound and has a continuous connection to 16 <sup>th</sup> Street.							

## ALTERNATIVE 2 - FINDINGS

In addition to analyzing the traffic impact of closing Telegraph Avenue between 16<sup>th</sup> Street and Broadway, KAI was asked to review an option for an offset signalized intersection where Broadway, 15<sup>th</sup> Street, and Telegraph Avenue intersect. The City of Oakland provided Synchro files for the proposed offset intersection. KAI analyzed the proposed offset intersection using traffic volume, pedestrian counts, bicycle counts, and heavy vehicle percentages from the data collection performed at this intersection in January 2013.

Additionally, KAI modified the signal timing in the original files to remove the pedestrian only phase because pedestrian movements could be accommodated using the signal phasing shown in Exhibit 6. Including a pedestrian only phase would result in the intersection operating at LOS F. This is below the City of Oakland standard for downtown intersections (LOS E).

### Exhibit 6 – Signal Phasing for Proposed Offset Signal



Other intersections in the downtown area operate 60 second signal cycles. However, the pedestrian movements at Broadway/Telegraph Avenue & 15<sup>th</sup> Street could not be accommodated in a 60 second cycle due to the crossing distances. Therefore, signal timing at this intersection was optimized based on a 120 second cycle to accommodate both the pedestrian phases and maintain coordination along Broadway. The resulting LOS of the proposed offset signal for the AM and PM peak hour is shown in Exhibit 7. As this exhibit shows, the intersection operates at LOS D in the AM and PM peak hour with existing traffic volumes.

Broadway is a significant transit corridor through Oakland. Given the high transit vehicle volumes, the increased delay caused by the offset signal could potentially affect AC Transit service in downtown. An additional study analyzing the impact on transit service for the offset signal should be considered to quantify the impact.

**Exhibit 7 - AM and PM Peak Hour LOS and V/C Ratio for the Proposed Offset Signal at Telegraph Ave. and Broadway**

#	Intersection	AM Peak Hour			PM Peak Hour		
		Delay	LOS	V/C	Delay	LOS	V/C
1	Telegraph Ave./Broadway/15 <sup>th</sup> St.	39.8	D	0.49	43.8	D	0.68

## TRAVEL TIME IMPACTS

In addition to LOS impacts, KAI also analyzed the travel time impacts of rerouting traffic for the two alternatives. This analysis used the delay at the signalized intersections and assumes a segment running speed of 25 miles-per-hour (MPH) to generate the total travel time between two points. Travel times were generated for the existing conditions as well as the two alternatives. The results for the AM and PM peak hour are shown in Exhibit 8 and Exhibit 9, respectively.

As these exhibits show, Alternative 1 (Full Plaza) has only minor impacts to travel between southbound Telegraph and southbound Broadway (and vice versa), with projected changes no greater than 90 seconds in either the AM or PM peak periods. There is a larger impact to travel between northbound Broadway and westbound 16th Street, with increases of approximately 2 minutes in the AM peak and 3 minutes in the PM peak.

Alternative 2 (Signalized Plaza) uniformly adds approximately 1 minute of delay to all movements due to the delay resulting from installation of the offset signal.



### Exhibit 8 – AM Peak Hour Travel Times

Origin	Destination	Existing	Alternative 1	Alternative 2
S/O Broadway/15th St./Telegraph Ave.	W/O 16th St. & Telegraph Ave.	0.6	2.5	1.5
S/O Broadway/15th St./Telegraph Ave.	N/O 19th St. & Telegraph Ave.	1.5	1.8	2.4
N/O 19th St. & Telegraph Ave.	S/O Broadway/15th St./Telegraph Ave.	1.6	2.9	2.2
*All travel times are reported in minutes				

### Exhibit 9 – PM Peak Hour Travel Times

Origin	Destination	Existing	Alternative 1	Alternative 2
S/O Broadway/15th St./Telegraph Ave.	W/O 16th St. & Telegraph Ave.	0.6	3.6	1.5
S/O Broadway/15th St./Telegraph Ave.	N/O 19th St. & Telegraph Ave.	1.6	3.0	2.5
N/O 19th St. & Telegraph Ave.	S/O Broadway/15th St./Telegraph Ave.	1.5	2.1	2.3
*All travel times are reported in minutes				

## SUMMARY

This traffic analysis analyzed 8 signalized intersections near Latham Square and compared existing conditions to two proposed reconfigurations. Alternative 1 evaluated the traffic operations analysis impact of closing Telegraph Avenue between 16<sup>th</sup> and Broadway. Alternative 2 evaluated the traffic operations of having an offset signal for the intersection of Broadway, Telegraph Avenue, and 15<sup>th</sup> Street.

Key findings from the traffic operations analysis were:

- Alternative 1 resulted in a change of level-of-service at the Broadway/19<sup>th</sup> Street intersection during the AM peak hour from LOS A to LOS B and during the PM peak hour from LOS B to LOS C. The other study intersections continue to operate at LOS B or better in the AM and PM peak hours. Therefore, the study intersections all meet City of Oakland LOS standards in the AM and PM peak hour with the Alternative 1 option (Full Plaza).
- Alternative 2 (Signalized Plaza) resulted in LOS D in the AM and PM peak hours at the Broadway/Telegraph Avenue/15<sup>th</sup> Street intersection. This intersection would meet City of Oakland LOS standards for a downtown intersection (LOS E). However, city policy calls for shorter cycle lengths in the downtown area and the 120 second cycle need for the pedestrian movements and signal coordination would make this alternative an exception to that policy.
- The traffic operations analysis results from Alternative 1 indicate better traffic operations are obtained by closing Telegraph Avenue between Broadway and 16<sup>th</sup> Street rather than

reconfiguring the Telegraph Avenue/Broadway/15<sup>th</sup> Street intersection to an offset signal.  
This is due to the high delays that an offset intersection would cause for all users.

Traffic volume data sheets for the five intersections collected for this effort and the Synchro output sheets for existing conditions as well as the two reconfigurations are attached.