



TRANSPORTATION DIVISION

STAFF REPORT

TO: PLANNING & TRANSPORTATION COMMISSION

FROM: DAVID STILLMAN **DEPARTMENT:** Planning and
Community Environment

AGENDA DATE: JULY 27, 2005

SUBJECT: Public hearing to review findings and recommendations regarding evaluation of performance of the new traffic signal on Middlefield at the midtown commercial center, the existing pedestrian-actuated signal on Middlefield at midtown, the feasibility of additional provisions for bicycle and pedestrian travel along and across Middlefield at midtown, and the desirability of further review of transportation/planning issues associated with the midtown area.

RECOMMENDATION:

Staff recommends that the Commission approve (1) the retention of the existing lane configurations along Middlefield Road between Oregon Expressway and Colorado Avenue; (2) the retention of the existing midblock pedestrian signal on Middlefield Road south of Webster (at Walgreens), and (3) the formation of a Committee to further review larger transportation/planning issues associated with the Midtown area.

SUMMARY OF KEY ISSUES:

On May 19, 2003, City Council passed a motion (CMR:265:03) approving the installation of a traffic signal with left turn pockets at the intersection of Middlefield Road/Bryson Avenue, and asking staff to evaluate the impacts of the traffic signal, as well as a "three-lane" option, and return to Council with a report and recommendation within 12 months of completion of the traffic signal. The intersection had the fourth highest accident rate in

the City, and the traffic signal and left-turn pockets were a necessary safety improvement.

Middlefield Road is classified as a residential arterial and carries approximately 18,000 vehicles per day between Oregon Expressway and Colorado Avenue. Bryson is a local street and carries approximately 500 vehicles per day. The Midtown Shopping Center, which has a main driveway across Middlefield Road from Bryson, carries more traffic than Bryson, with approximately 250 vehicles entering and exiting the driveway during the p.m. peak hour as compared with 50 vehicles entering and exiting Bryson during that time.

Prior to the installation of the traffic signal, Middlefield Road was an undivided four-lane roadway within this segment. The road measures 46 feet from curb face to curb face, which resulted in two 13-foot-wide outside lanes and two 10-foot-wide inside lanes. At Colorado Avenue, the lanes along Middlefield narrowed to 9 to 9-1/2 feet to accommodate five lanes (four through lanes and a left-turn pocket). The lack of a traffic signal at the Middlefield/Bryson intersection, and the fact that vehicles turning left into the shopping center or into Bryson were required to do so from the inside through lane, resulted in numerous right-angle, rear-end and sideswipe accidents over the years.

When the traffic signal was installed, left-turn pockets were added on Middlefield at Bryson, which required narrowing the existing through lanes because of limited right-of-way. Consequently, the curb lanes were each narrowed to 9-1/2 feet wide, and each of the remaining lanes were made 9 feet wide so as to fit within the available 46-foot curb-to-curb width. The configuration was made almost identical to that already in existence on Middlefield at Colorado. The Middlefield/Colorado intersection was not modified.

The new traffic signal and associated striping changes were completed in July, 2004. The previous month, a Committee was formed with the purpose of (1) evaluating traffic flow along Middlefield, including impacts resulting from the existing midblock pedestrian signal, and (2) look for ways to improve the safety and quality of pedestrian and bicycle travel along the segment. Implicit in both of these tasks, and consistent with Council's direction, was the evaluation of a possible "three-lane" option on Middlefield. The three-lane option involves the elimination of one through travel lane in each direction on Middlefield between Oregon Expressway and Colorado Avenue (exclusive of these intersections), in order to accommodate bicycle lanes. A two-way left-turn pocket would be provided to allow for left turns. The three-lane option is consistent with the Bicycle Master Plan, which provides for bicycle lanes along the entire length of Middlefield Road. The Committee had as its core the Traffic Action Committee of the Midtown Residents Association and included merchants of the Midtown Shopping Center, residents of nearby residential streets, Transportation Division staff, and Palo Alto

Bicycle Advisory Committee (PABAC) representation. The Committee met approximately once per month.

Committee Recommendations

Midblock Pedestrian Signal

One task the Committee faced was to determine whether the existing midblock pedestrian signal on Middlefield Road south of Webster (near Walgreens) should remain following installation of the new signal at Bryson. The arguments in favor of removing the signal were (1) because a new signal existed at Bryson, pedestrians who ordinarily used the midblock signal would have a protected crossing only a short distance away, without having to walk to Colorado, and so the midblock signal is unnecessary; and (2) with the installation of the new signal, there were now three very closely-spaced traffic signals along Middlefield Road in Midtown. These closely spaced signals could have a perceived or a real detrimental effect on traffic flow through the area, resulting in delays or additional neighborhood cut-through traffic. The arguments in favor of keeping the signal were (1) the protected crossing afforded by the signal could provide a real convenience for pedestrians, especially those coming from north of Webster. Removal of the signal could result in an inconvenience for those pedestrians, as well as create a potential safety issue if those pedestrians elect to still cross Middlefield at the same location but without the benefit of the signal to stop traffic; and (2) there is a significant cost involved in removing a traffic signal. There would have to be a real benefit to the removal, in terms of safety or convenience, to justify the cost.

Staff conducted pedestrian counts at the midblock signal, as well as at the new Bryson signal, to determine the usage of the midblock signal and to determine the impact of its operation. Counts were conducted for one hour during the morning peak, two hours during the lunchtime peak and one hour during the afternoon peak. Both the number of pedestrians, and the number of corresponding signal cycles, were recorded. For example, if two pedestrians crossed, it was noted whether they crossed at separate times or whether they crossed together. Whereas two pedestrians were served in both cases, the latter case would result in much less of an impact to traffic operations on Middlefield because the signal only had to change once, rather than twice, to serve the pedestrians.

During the morning peak, a total of 10 pedestrians crossed at Bryson, and 19 crossed at the midblock signal. The midblock signal cycled 14 times to serve the 19 pedestrians. During the lunchtime peak, 49 pedestrians crossed at Bryson, and 18 crossed at the midblock signal. The midblock signal cycled 13 times to serve the 18 pedestrians. Finally, during the afternoon peak, 17 pedestrians crossed at Bryson, and 19 crossed at the midblock signal. The midblock signal cycled 11 times to serve the 19 pedestrians.

The results can be summarized as follows: an average of 19 pedestrians per hour crossed Middlefield at Bryson, an average of 14 pedestrians per hour crossed Middlefield at the midblock signal, and the midblock signal cycled an average of 9.5 times per hour to serve those pedestrians.

Based on this data, it appears that the midblock signal is used regularly, such that its removal would likely result in an inconvenience for many people. However, because this signal turns red for Middlefield traffic an average of 9.5 times per hour (or approximately once every six minutes), its operation is not likely to result in any additional delay for traffic on Middlefield. This signal, and the one at Bryson, have cycle lengths of about 60-70 seconds, and therefore the midblock signal would be expected to turn red for Middlefield traffic about once for every six times the new signal at Bryson turns red for Middlefield traffic. Consequently, any effect the midblock signal has on Middlefield Road traffic is relatively infrequent and minor, and the safety and convenience benefits of retaining the signal appear to outweigh the benefits of its removal. Additionally, this signal is coordinated with the signals at Bryson and Colorado, so the incremental delay resulting from the operation of this signal is insignificant for this reason as well. Finally, during the time the evaluation was being performed, several pedestrians expressed their desire that the signal remain. No complaints have been received by the Transportation Division regarding the operation of the signal or its effect on traffic.

The Committee discussed this issue at length, given the above data, and voted unanimously to retain the midblock pedestrian signal.

Three-lane option

As mentioned previously, the three-lane option involves eliminating one through lane in each direction on Middlefield, the primary purpose being to allow room for bicycle lanes. Because it is necessary to retain the existing vehicle capacity provided by the existing two-through-lane approach configurations on Middlefield at Oregon Expressway and Colorado, a three-lane option would not extend the entire distance between Oregon Expressway and Colorado. Instead, it would extend roughly from Marion Avenue to just north of Colorado. Because the traffic signal at Oregon Expressway/Middlefield Road is operated and maintained by the County of Santa Clara, it is not possible to coordinate that signal with the City-owned signals along Middlefield Road. Consequently, if a three-lane conversion of Middlefield Road were to extend all the way to the Oregon Expressway intersection, vehicle queues at Oregon Expressway and Colorado would be very long and the operation of these two intersections, and consequently the operation of the Middlefield Road segment itself, would be adversely affected. Under the three-lane

scenario, a two-way center left-turn lane would be provided over the length of the three-lane portion to safely accommodate left turn movements from Middlefield into the Midtown Shopping Center, onto Bryson, onto Webster, or into other driveways along the segment.

The viability of the three-lane option was determined by performing a real-world field test. The test was performed on December 14, 2004. The test was performed during the p.m. peak hours of 4 p.m. to 6 p.m., which is the time of day during which there is the heaviest traffic volume along Middlefield Road. The period was chosen because it would provide for a "worst case" scenario, as any permanent lane reductions would necessarily have to accommodate peak hour traffic and so the effects at this time would be critical.

The curb lanes in each direction along Middlefield were closed with traffic cones from Marion Avenue to just north of Colorado, emulating as closely as possible what the effects to vehicle traffic would be if a three-lane section were permanently striped along Middlefield. The closure was designed to maintain smooth traffic flow through the use of gradual cone tapers, advance warning signs and openings at driveways. The desired intent was to create a situation under which any vehicle delays would be a result only of the lane closure, rather than a result of driver surprise at an unexpected traffic control situation. The closure was not advertised to the general public in advance, so that drivers would not be tempted to avoid the area and so typical traffic volumes would exist on the day of the test. To confirm that typical volumes existed, traffic count hoses were placed on Middlefield the day of the test, and on a subsequent "typical" day for comparison purposes. The traffic volumes on both days were comparable.

The effect of the three-lane scenario was determined qualitatively by direct observation of traffic conditions during the field test (by Transportation Division staff, the Committee as a whole and other interested observers), and quantitatively by performing a travel time study. The travel time study was performed by driving repeatedly (ten times in each direction) up and down the segment of Middlefield affected by the lane closure during the two-hour test period on the day of the field test, and again during a "typical" day without the lane closures but during the same time period. The time taken to drive the segment was recorded on each run. These times were then averaged, and the results from the day of the field test were compared with the results from the "typical" day.

During the field test, significant congestion was observed along Middlefield Road, especially in the southbound direction. Southbound vehicle queues along Middlefield repeatedly backed up from Colorado, to north of Moreno. Vehicles making left turns onto Middlefield from Moreno or Webster had great difficulty, sometimes waiting several minutes for a suitable gap in Middlefield Road traffic. Additionally, safety seemed to be

often compromised when, if a suitable gap didn't appear, some drivers would become impatient and attempt to complete left turns anyway, creating near-miss situations or further congestion. The travel time studies performed on the day of the field test resulted in an average time to travel southbound from Moreno to Colorado of 53 seconds (for an average speed of 9.5 mph), and an average time to travel northbound from Colorado to Moreno of 42 seconds (for an average speed of 13.2 mph). Additionally, the time taken to complete a left turn from Moreno onto Middlefield was recorded. The average of six attempts was 87 seconds.

On the "typical" day without the lane closures, qualitatively the level of congestion seemed lower. The average time to travel southbound from Moreno to Colorado was 31 seconds (for an average speed of 16 mpg), and the average time to travel northbound from Colorado to Moreno was 35 seconds (also for an average speed of 16 mph). The average time taken to complete a left turn from Moreno onto Middlefield was 59 seconds.

To summarize the data, the lane closure field test, which closely represents a "three-lane" scenario, resulted in a 69% increase in travel time along the segment in the southbound direction, a 22% increase in travel time in the northbound direction, and a 47% increase in time required to complete a left turn onto Middlefield from Moreno.

The primary appeal of a three-lane scenario is that it allows bicycle lanes to be striped along this segment of Middlefield. However, because the existing lane configuration (two through lanes in each direction) must be maintained at Oregon Expressway and at Colorado, the bike lane would not run continuously between these two streets, and would therefore be only a couple blocks long and consequently would have limited utility. Bicyclists using the bike lane would have to merge with vehicles in the curb lane, and share that lane with vehicles, on the approaches to Oregon Expressway and Colorado. This merge is in itself a potential point of conflict, and so a three-lane scenario is not a perfect solution to the problem of striping bike lanes along this constrained section of roadway.

The Committee discussed at length the advantages and disadvantages of permanently implementing a three-lane scenario. The advantages are (1) a short section of bike lane can be striped on Middlefield Road in both directions between Marion, and just north of Colorado. This would be a first step towards continuous bicycle lanes along Middlefield, which is consistent with the Bicycle Master Plan; (2) traffic is "calmed" along Middlefield, which is perceived by some to have excessively high vehicle speeds. The disadvantages are (1) congestion is unacceptably increased along Middlefield Road; (2) neighborhood cut-through traffic would likely increase. Even if, in absolute terms, a 22 second increase in travel time on Middlefield is not significant, the perception is that it is

significant and some vehicles would likely choose to avoid Middlefield in favor of a parallel residential street; (3) the three-lane scenario may reduce safety along the corridor by increasing driver frustration, requiring left-turning vehicles to accept smaller gaps to complete turning movements, and result in more drivers using residential streets to complete their travels; and (4) the resulting bike lane would have little usefulness since it is not continuous at either end.

The Committee agreed unanimously that the disadvantages outweighed the advantages, and rejected the three-lane option in favor of retaining the existing lane configurations.

Formation of Ongoing Committee

Although the primary purpose of the Committee was to determine the fate of the midblock pedestrian signal and the three-lane scenario, the Committee engaged in many open discussions regarding other possible methods of accommodating bicyclists in the Midtown area, increasing the safety of pedestrians and bicycles, and in general improving access to the Midtown Shopping Center. No decisions were made regarding these issues and many are beyond the current scope of discussion; however, the Committee expressed the desire to continue the open discussion between residents, merchants, PABAC and City staff to achieve those goals. Consequently, staff is recommending that this open discussion be continued in the form of an ongoing Committee, very similar to the current one, that would discuss these issues, make recommendations, and return to the Planning and Transportation Commission and City Council as necessary for action.

Report of Effectiveness of Middlefield/Bryson Traffic Signal

The primary reason that the Middlefield/Bryson traffic signal was constructed was to enhance safety at the intersection. Within a 5-1/2 year period prior to its installation, there were 25 accidents at the intersection, making the intersection the fourth worst (in terms of rate) in the city during the study period. Of the 25 accidents, 14 were broadside-type accidents and six were rear-ends. This averages to about 2-1/2 accidents per year that were of a broadside-type, which are generally the worst type in terms of severity and injury.

In the year following the installation of the traffic signal, there have been five reported accidents at the intersection. Three of these were low-speed accidents related to temporary construction occurring near the intersection, one involved a vehicle being cut off by another vehicle (improper lane change), and one was a rear-end accident.

Consequently, within a one-year period since the completion of the traffic signal, there have been no broadside-type accidents, a significant improvement over the pre-signal

condition. There has been no improvement with respect to rear-end accidents, which have continued at the rate of about one per year. However, if the three construction-related accidents are removed from consideration (as these would have likely occurred under any circumstances and are not a reflection of specific site conditions), the overall accident rate has been brought down to two per year, with the broadside accident rate being particularly improved. Therefore, the traffic signal and associated striping changes appear to have successfully mitigated the safety problems at the intersection.

ALTERNATIVES TO STAFF RECOMMENDATION

Alternative #1: Remove existing midblock pedestrian traffic signal.

This alternative would involve the complete removal of the existing midblock pedestrian signal, as well as the associated crosswalk. The crosswalk would need to be removed due to the fact that an uncontrolled midblock crosswalk across an undivided four-lane roadway with high traffic volumes has many potential safety problems which could not be easily mitigated. If the signal were to be removed, the only safe alternative for crossing Middlefield would be for pedestrians to walk 300 feet to the new traffic signal at Bryson Avenue. The analysis conducted by staff concluded that the midblock pedestrian signal is fairly well used, does not contribute to vehicle delays along Middlefield, and could create inconvenience for pedestrians if it is removed. The approximate cost of removing the signal is \$50,000.

Alternative #2: Implement three-lane scenario.

This alternative involves eliminating one vehicle travel lane along Middlefield between Moreno and just north of Colorado, and striping a two-way left-turn lane and bicycle lanes within this segment. This alternative would provide for partial implementation of the Bicycle Master Plan. The analysis conducted by staff concluded that this scenario would significantly contribute to delay, congestion and safety problems for all users of Middlefield Road, while not providing any real benefit for bicyclists. The approximate cost of implementing a three-lane scenario is \$25,000.

RESOURCE IMPACT:

The staff recommendations are to retain all existing features and improvements along the Middlefield Road segment. Consequently, there is no cost associated with the recommendations and no resource impact. The recommendation to form a Committee to further review transportation and planning issues associated with the Midtown area falls within the normal work responsibilities of the Planning Department and Transportation Division, and so resources are already allocated for this purpose.

POLICY IMPLICATIONS

The staff recommendation is in conformance with Goal T-6 of the Comprehensive Plan, which advocates a “high level of safety for motorists, pedestrians, and bicyclists on Palo Alto streets.” Traffic safety is one of the City’s top priorities and the primary purpose of the staff recommendations is to maintain street improvements which have enhanced safety along Middlefield Road.

The recommended improvements are not in conformance with Program T-24, which states, “Provide adequate outside through-lane widths for shared use by motorists and bicyclists when constructing or modifying roadways, where feasible”. Middlefield Road is designated as having a bike lane in the Bicycle Master Plan. However, because the provision of bicycle lanes could only be accomplished at the expense of degrading the overall safety of the road segment (including, potentially, the safety of bicyclists), the safety objectives of Goal T-6 take precedence and overall consistency with the Comprehensive Plan is maintained.

ATTACHMENTS:

A. Existing Conditions – Middlefield Road/Bryson Avenue

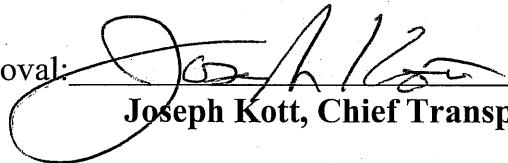
COURTESY COPIES:

Midtown/Middlefield Stakeholder’s Group
Midtown Residents Association Traffic Committee
Palo Alto Bicycle Advisory Committee

Prepared by: David Stillman, Transportation Engineer

Reviewed by: Joseph Kott, Chief Transportation Official

Department/Division Head Approval:



Joseph Kott, Chief Transportation Official

ATTACHMENT A

EXISTING CONDITION

