



Date: May 20, 2005

Memorandum

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cc: Ms. Christina Atienza, MTC

From: Mark Bowman, P.E.

Subject: TETAP On-Call Services for Lafayette P04047.05

The City of Lafayette was awarded a grant under the Traffic Engineering Technical Assistance Program (TETAP) by the Metropolitan Transportation Commission (MTC) for a limited scope traffic operations and safety evaluation. The purpose of this study was to provide a list of recommendations the City could consider implementing. The results of the study are summarized in this memo.

Project Scope

The following project description was provided in the application for the TETAP grant:

Las Trampas Road intersects Reliez Station Road at the apex of a curvy, steep hill. Reliez Station Road is a two-lane arterial that serves as a primary travel route connecting the Town of Moraga and the southern half of Lafayette with SR 24, I-680 and the downtowns of Lafayette and Walnut Creek. It carries over 14,500 vehicles each day on an undivided roadway with a speed limit of 25 mph. Las Trampas Road serves as a neighborhood collector and intersects Reliez Station Road at a right angle. Drivers desiring to turn out of Las Trampas Road face several challenges including high vehicle travel speeds, few gaps in traffic during peak periods, limited sight distance, narrow travel lanes, and steep and winding grades. On several occasions in the past, the City has tried to address neighborhood concerns regarding this intersection by studying advance warning signs, a traffic signal and mirrors. With recent advances in solar powered roadway signage and traffic devices, this location is ripe for re-evaluation.

Subsequent discussions and a meeting with City staff at the site resulted in the following additions to the scope of study.

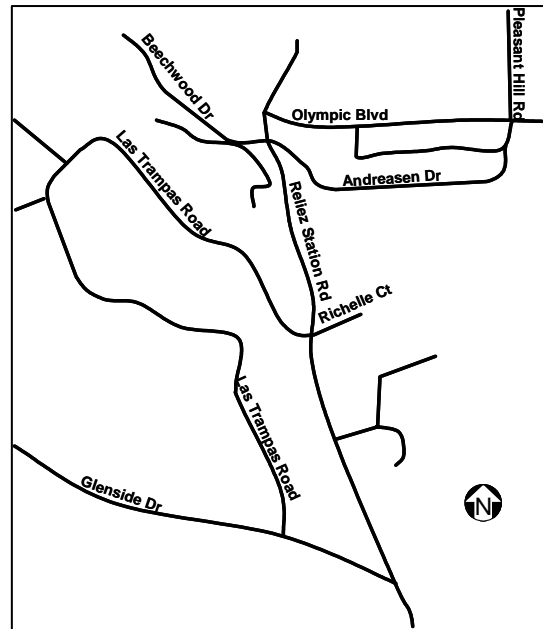
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The study area (Figure 1) will include the section of Reliez Station Road from the Las Trampas Road intersection to the Olympic Boulevard intersection. The study area will be evaluated and potential measures to improve safety will be identified. Potential solutions at this intersection and at the intersection of Reliez Station Road and Olympic Boulevard will include a modern roundabout. The following issues will be addressed:

1. Sight distance at the intersection of Reliez Station Road and Las Trampas Road;
2. Congestion at the Reliez Station Road / Olympic Boulevard intersection;
3. Rear-end collisions for northbound traffic on Reliez Station Road at the Olympic Boulevard intersection;
4. The effects of traffic entering Reliez Station Road from Beechwood Drive on traffic flow and safety; and
5. Deer crossings of Reliez Station Road, which have been identified as a safety hazard.

Figure 1: Study Area



City staff provided an assessment of traffic safety in the study area although no comprehensive collision data for the study area was provided. No peak hour traffic volume data were available.

Reliez Station Road / Las Trampas Road Intersection

The sight distance at the Reliez Station Road / Las Trampas Road intersection is constrained in two directions. Vehicles approaching Reliez Station Road from Las Trampas Road have inadequate visibility of traffic traveling southbound on Reliez Station Road. Vehicles approaching Las Trampas Road from Richelle Court also have inadequate visibility of traffic traveling northbound on Reliez Station Road.

Convex mirrors encased in Plexiglas have been strategically placed to improve the visibility of traffic approaching the intersection for motorists trying to enter Reliez Station Road. The effectiveness of the mirrors can be limited during rainy weather, when condensation occurs, or during low light conditions when motorists may not have their lights turned on. The mirrors appear to be somewhat effective in providing increased sight distance.

Other potential solutions to the sight distance issue are discussed below.

Traffic Signal

The City staff has evaluated the installation of a traffic signal at this location. Although we did not have access to the signal warrant study or traffic volumes, we suspect that a traffic signal would not be warranted. Further, installation of a traffic signal would be problematic because of the limited visibility of the signal from approaching motorists. A traffic signal does not appear to be an appropriate solution to the sight distance problem at this intersection.

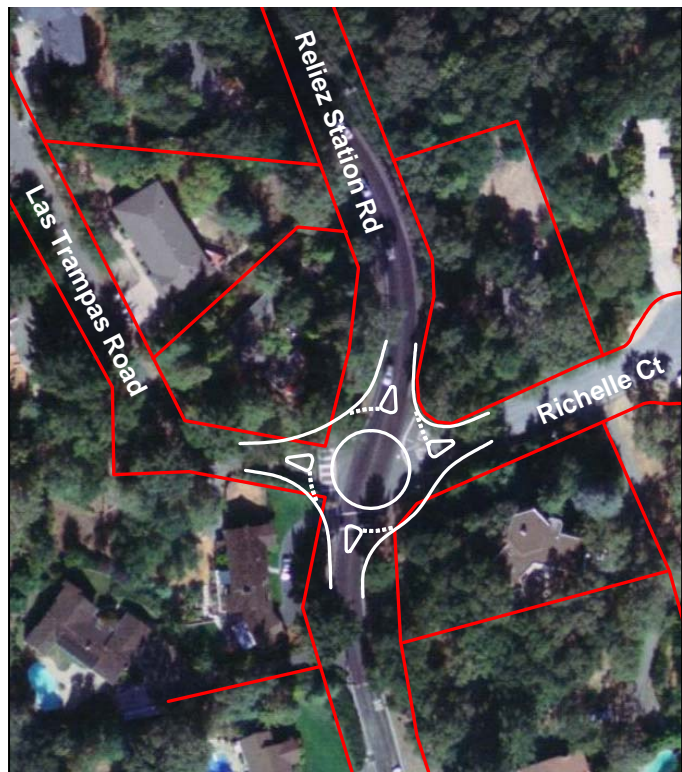
Modern Roundabout

A modern roundabout could be a potential remedy at the intersection; however additional study would be required before implementing this option. An example of how a modern roundabout might be installed is illustrated in Figure 2. To accommodate the relatively high traffic volumes at the intersection, a roundabout design would need to have an inscribed diameter of 80 to 100 feet. The inscribed diameter is the distance across the roundabout to the outside of the traveled way. Although the figure does not show the roundabout to scale, it illustrates the likelihood that property would need to be acquired for the installation of a roundabout at this location.

Other issues should be considered before a decision is made to install a roundabout at this intersection. Installation of a roundabout may not improve safety at the intersection. Motorists traveling on Reliez Station Road would be required to yield the right-of-way to vehicles already in the circle. Vehicles stopped at the roundabout could be subject to rear-end collisions because of the limited sight distance on Reliez Station Road. In addition, because the number of conflicting circulating vehicles in the roundabout is likely to be low, motorists on Reliez Station Road may become complacent, may not expect the occasional conflicting vehicle within the circle, and may not yield as required before entering the roundabout. Finally, safety for bicyclists and pedestrians may not be improved by installation of a roundabout.

Before a roundabout is considered at this location, additional safety studies should be conducted. A roundabout should not be installed unless there is a demonstrated safety

Figure 2: Potential Modern Roundabout



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problem of the type susceptible to correction by the roundabout and a roundabout is expected to result in a net safety benefit.

Advance Flashing Beacon

Flashing beacon installations may be effective in improving safety at the intersection. In combination with an intersection advance warning sign, a flashing beacon might be used to emphasize to motorists traveling along Reliez Station Road that there is an intersection ahead where vehicles may be entering the roadway. Vehicle detectors could be placed at the approaches to the intersection on Las Trampas Road and Richelle Court. If the detector for Las Trampas Road were activated by the presence of a vehicle, the advance flashing beacon for southbound Reliez Station Road could be activated. Likewise, if the detector for Richelle Court were activated by the presence of a vehicle, the advance flashing beacon for northbound Reliez Station Road could be activated. As an alternative, both beacons could be activated by the presence of a vehicle at either detector.

Another potential use of an advance flashing beacon has been described in the publication, *State of the Art: Residential Traffic Management* (FHWA 1980). This treatment involves coupling speed detection technology, flashing beacons and standard or possibly unique signs. In operation, if a vehicle were traveling above the desired limit, speed detection gear would trigger a flashing beacon sign installation, calling attention to the sign message and singling out the driver traveling too fast. Signs associated with the beacon could be standard ones - speed limit or SLOW signs for instance - or special messages might be considered.

As with the potential installation of a modern roundabout, a comprehensive traffic safety study would be required to determine if an advance flashing beacon might provide safety benefits, and if so, which type of application might be most effective. For example, if speeding is found to be a contributing factor, flashing beacons coupled with speed limit signs might be the appropriate treatment. If speed is not a significant factor, flashing beacons coupled with an advance intersection warning sign might be preferred.

Reliez Station Road / Olympic Boulevard Intersection

Traffic congestion is a significant issue at the intersection of Reliez Station Road and Olympic Boulevard during the peak traffic periods. The intersection is controlled with stop signs for all approaches (Figure 3). Traffic queues build on northbound Reliez Station Road during the morning peak hour and westbound along Olympic Boulevard during the afternoon peak hour. Rear-end collisions for northbound traffic on Reliez Station Road has been identified by City staff as a safety problem.

The vast majority of traffic proceeds between the southern section of Reliez Station Road and Olympic Boulevard. A small amount of traffic uses Reliez Station Road north of the intersection. Northbound traffic is served by two lanes: one lane serves traffic that continues north along Reliez Station Road, and another lane serves the predominant

movement between Reliez Station Road and Olympic Boulevard. Single lanes serve all other intersection approaches.

Beechwood Drive and Andreasen Drive intersect Reliez Station Road just south of the intersection, complicating traffic operations at the intersection. Beechwood Drive carries a significant volume of traffic. The long northbound queues and the steady stream of westbound left-turning traffic at the intersection makes it difficult for Beechwood Drive traffic to enter northbound Reliez Station Road.

Two options were developed to alleviate congestion at the intersection. Any alternative that would significantly reduce congestion would have to reduce delay for northbound right-turning traffic on Reliez Station Road and for westbound left-turning traffic on Olympic Boulevard.

Figure 3: Reliez Station Road / Olympic Boulevard Intersection



Traffic Signal

A traffic signal could improve the capacity of the intersection. A signal warrant study should be conducted and a signal should only be installed if one or more warrants are satisfied. A traffic signal could be designed to provide overlapped left-turn phasing that would allow northbound right turning traffic to proceed on a green arrow at the same time westbound traffic is being served. The northbound right-turning traffic could also be served at the same time as the through movements on Reliez Station Road.

A traffic signal at this location would be likely to remain green for the predominant vehicular movement until a vehicle or pedestrian would activate a phase that would cause a red signal to be displayed for the predominant vehicular movement. If the activation of the red signal is rare, motorists may not expect the change and the number of accidents at the intersections may increase. If a signal is warranted, an evaluation of signal visibility should be performed to make sure a signal installation is feasible. An advance flashing beacon may be needed to warn northbound motorists on Reliez Station Road. If an advance flashing beacon is installed it could be operated to flash when the northbound right turn signal turns red.

A traffic signal would provide a reasonable level of service for users of the Lafayette-Moraga Regional Trail and other pedestrians at the intersection. Signal control would do little to improve access to Reliez Station Road from Beechwood Drive or Andreasen Drive.

These roadways also should not be served by signals unless they satisfy one or more traffic signal warrants.

Modern Roundabout

Another alternative for reducing congestion at the intersection involves the installation of a modern roundabout (Figure 4). Many of the same issues discussed for the application of a roundabout at the intersection of Reliez Station Road and Las Trampas Road would also apply to the intersection of Reliez Station Road and Olympic Boulevard. The roundabout would need to be relatively large to provide adequate capacity and would require the acquisition of nearby property.

A roundabout may not improve traffic safety because of the low volume of traffic using Reliez Station Road north of the intersection. Also, a roundabout would increase the traffic flow south of the intersection and make it more difficult for traffic to enter Reliez Station Road from Beechwood Drive and Andreasen Drive. Finally, crossing the north leg of a roundabout may be more problematic for users of the Lafayette-Moraga Regional Trail.

Figure 4: Roundabout Alternative



Conversion to Side-Street Stop Control

The last alternative considered for the Reliez Station Road / Olympic Boulevard intersection was a conversion of the traffic control to side-street stop control, only (Figure 5). This alternative would involve removal of stop controls for northbound Reliez Station Road and westbound Olympic Boulevard. Stop controls would be retained for southbound Reliez Station Road. The roadway may need to be widened to accommodate this change.

This alternative would reduce delays at the intersection for the heavily traveled route; however, there would

Figure 5: Side Street Stop Control



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be several potential disadvantages. This alternative could increase the potential for conflicts between motor vehicles and users of the Lafayette-Moraga Regional Trail and would impede pedestrian crossings of Reliez Station Road south of the intersection. Finally, this alternative would increase the flow of traffic on Reliez Station Road south of the intersection and may make it more difficult for traffic to enter Reliez Station Road from Beechwood Drive and Andreasen Drive.

Deer Crossings

Deer crossings have been identified by local residents as a potential traffic safety concern along Reliez Station Road between Beechwood Drive and Las Trampas Road. A pathway follows along the west side of Reliez Station Road in this section and is separated from the roadway by a four-foot fence. A gap in the fence is located at a driveway about half way along this section and is a logical crossing point for deer. According to City staff, deer crossing were not identified as a contributing factor to traffic collisions in the area.

If deer crossings become a problem in the future, a potential solution could be to provide a warning to motorists, if feasible. A study conducted by the University of Minnesota, *Deer Avoidance: The Assessment Of Real World Enhanced Deer Signage In A Virtual Environment* (Curtis Hammond and Michael G. Wade 2004) showed that the combination of a deer crossing sign in combination with a beacon that flashed when deer were detected was effective in decreasing the speed of the study participants. We are uncertain if detectors could be installed that would detect deer and not be triggered by pedestrians on the path. There may also be liability issues if an accident involving a deer occurs and the detector did not function properly.

Conclusions

A strategy should be developed for the Reliez Station Road corridor that may incorporate some of the elements discussed in this memo. The strategy should be developed in cooperation with affected stakeholders that should include motorists, bicyclists, pedestrians who travel in the corridor and users of the Lafayette-Moraga Regional Trail. A reasonable outcome of the public process might be that no changes should be made to the existing traffic control in the study area at this time.

If the community decides changes to the existing traffic control plan is desirable, additional study may be required before elements are applied that might affect safety for one or more classes of roadway corridor users. Other studies that may be required include: traffic operations studies, right-of-way studies, cost-benefit analysis, and preliminary engineering studies.

Some alternatives may be implemented with a lower level of study than others. For example, installation of advance intersection warning signs with flashing beacons activated by vehicle detectors may only require study of that alternative's cost-effectiveness. Other alternatives like removal of stop signs or installation of modern roundabouts would require more detailed consideration of many other issues including those discussed in this memorandum.

Recommendations

The City staff requested that Dowling Associates provide recommendations on which of the measures discussed in this report appear to have the most promise. Although we do not have enough information to recommend specific measures, we offer the following recommendations for the City staff's further consideration.

It is our opinion that the most reasonable near-term treatment for the Reliez Station Road / Las Trampas Road intersection is to provide advance flashing beacons for both approaches to the intersection along Reliez Station Road, with detectors that would activate the flashing beacons when vehicles approach the intersection from the side streets (Las Trampas Road or Richelle Court). The City may wish to consider installation of a modern roundabout at this location, but additional study would be required to determine if a roundabout would be effective in improving safety and, if so, if it would be worth the cost. We do not recommend installing an unwarranted traffic signal at this intersection

We do not recommend major changes to the traffic control at the Reliez Station Road / Olympic Boulevard intersection unless more extensive studies show that the changes would be warranted. It is our opinion that a traffic signal could improve traffic operations by maintaining smoother traffic flow for the predominant vehicular movement at the intersection; however, we caution that a traffic signal should not be installed unless one or more of the signal warrants are satisfied. We do not believe the installation of a modern roundabout at the Reliez Station Road / Olympic Boulevard intersection or converting the intersection to side-street stop control would be appropriate.

We do not believe flashing beacons would be a feasible means of warning motorists that deer may be crossing the Reliez Station Road. If deer crossing accidents are found to be a problem, the City may wish to consider installation of deer crossing warning signs.