# Feasibility and Options Study for Traffic Operation Improvements - Existing Conditions Report

Along the Olympic Boulevard
and Reliez Station Road Corridor


Prepared for:

City of Lafayette

Prepared by:

Stantec

Revision 2

October 1, 2014

# TABLE OF CONTENTS



**LIST OF TABLES**

## LIST OF FIGURES



## LIST OF APPENDICES

# 1.0 INTRODUCTION

This study evaluates the feasibility of resolving traffic-related congestion and safety problems with cost-effective and innovative improvements within the City of Lafayette's corridor between Olympic Boulevard at its intersection with Pleasant Hill Road and Reliez Station Road where it intersects Glenside Drive. As an initial step in this effort, the Stantec team has created this Existing Conditions Summary which documents and attempts to verify the local access and safety issues facing the people who reside within the corridor, and the broader regional connectivity and mobility pressures facing the City of Lafayette's leaders.

This summary describes the role the corridor was intended to play, how it functions today, and what it might feel like in the future if current trends continue. The information contained in this synopsis sets the course for the remainder of the study by identifying and quantifying what impacts the residents and the greater community—and from which springs the study's objectives. The empirical data and analyses presented in this summary, as well as the opinions and views of residents about the impacts, become the measures by which the feasibility of the "options" are measured. The baseline condition established here is the basis for verifying the problem, then testing and comparing a range of solutions.

More explicitly, this existing conditions summary reviews relevant studies to date, assesses data the consultant collected, organizes and categorizes residents' opinions as captured in an on-line survey, in the first community meeting, and during two community walks of the corridor.

# 2.0 BACKGROUND REVIEW

## 2.1 GENERAL PLAN POLICIES

Transportation studies will often begin with a few simple questions: how is this corridor intended to operate, what is its function as part of the City's entire circulation system, what laws or policies govern it, and are there any standards by which we can measure how well the corridor is doing compared to how well it is supposed to be doing? The answers to these questions can usually be found in the City's General Plan—a document that defines the community's vision and establishes a framework of guiding policies, standards and programs to achieve the vision.

The current City of Lafayette General Plan Circulation Element[1] categorizes the City's streets into three classifications (excluding freeways); arterial, collector, and local streets. Arterial streets are defined as major streets with controlled intersections that carry traffic channeled from collector and local streets to regional or major destinations such as Highway 24. According to the General Plan Circulation Chapter (Table 1- Street Classification System Definitions) Pleasant Hill

[1] City of Lafayette General Plan Circulation chapter was originally adopted by resolution in 2002, and amended in part by resolutions in 2009, September 2012, and November 2012. Cited source for the street classification system is Draft EIR on the Lafayette General Plan Revision, Section 3: Traffic and Circulation, prepared by Leonard Charles and Associates and Robert L. Harrison Transportation Planning, September 1998.

Road, Olympic Boulevard, the segment of Reliez Station Road south of Olympic Boulevard, and Glenside Drive are classified as arterial streets.

Lafayette evaluates the performance of its streets using the concept of automobile Level of Service (LOS), a qualitative grading system using letter grades A through F to identify operating conditions based on the amount of delay drivers experience at intersections. The City's General Plan was prepared at a time when transportation performance emphasized the mobility of automobiles. The General Plan contains a policy establishing a goal of LOS D as the measure of roadway and intersection performance. However, it should be noted that while an intersection may operate at LOS D, individual users of the roadway might experience failing conditions, as the LOS is a weighted average of the delay experienced by all users of the intersection. Furthermore, the City of Lafayette has made a designation between "good" and "poor" LOS D, in which Downtown intersections have a goal of "poor" LOS D and intersections outside of Downtown have a goal of "good" LOS D.

As stated earlier, the General Plan establishes policies and programs, and identifies capital improvements consistent with the path to achieve the City's vision. Policy C-1.5 (Roadway Improvements) includes a program that is relevant to the study corridor. Program C-1.5.2 is to construct improvements at the time an analysis of traffic service levels and safety factors establishes a necessity for such an improvement. This program includes the intersection of Pleasant Hill Road and Olympic Blvd and lists two potential improvements—a roundabout or a traffic signal. It is important to note that programs used for implementing policies are updated as conditions change over time. This feasibility study, in fact, reexamines prior recommendations included in General Plan programs to determine current viability.

In addition to Policy C-1.5, the Circulation chapter of the General Plan has several other policies and goals that are applicable to this study. These include Goal C-1, Goal C-3, Policy C-3.1, Goal C-6, Policy C-8.2, Goal C-11, Policy C-11.1, C-11.2, C-11.5, C-11.6 that address safety, efficiency, preservation of Lafayette's character, through traffic, pedestrian walkways, cycling promotion, and the implementation of Complete Streets concepts.

## 2.2 PAST STUDIES OF THE CORRIDOR AND THEIR OUTCOME

The Olympic Boulevard and Reliez Station Road corridor is one of a limited number of connections between neighborhoods in the southern part of the City of Lafayette and destinations such as Walnut Creek, Highway 24, I-680, Pleasant Hill, and Acalanes High School. In addition, people traveling to and from St. Mary's College and the Town of Moraga to and from the east and north would tend to use either St. Mary's Road or Reliez Station Road due to Moraga's limited roadway network. As Walnut Creek and the I-680 corridor continue to develop, destinations to and from the east make Reliez Station Road the more direct route. This section describes two recent traffic studies that examined transportation safety issues in the Pleasant Hill Road / Olympic Boulevard / Reliez Station Road corridor.

In 2001, the Metropolitan Transportation Commission (MTC), through the Traffic Engineering Technical Assistance Program (TETAP), funded a comprehensive evaluation of Pleasant Hill Road between Mt. Diablo Boulevard and Olympic Boulevard. The goal of the study was to reduce vehicular speeds, encourage pedestrian and bicycle travel, and identify improvements to signalized and unsignalized intersections in the corridor. This study recommended various short-range and long-range improvements along Pleasant Hill Road. To date, the City has implemented several of the study's recommendations, such as installation of a traffic signal at the intersection of Pleasant Hill Road and Condit Road and pedestrian and bicycle enhancements. In 2005, MTC funded another study which included the section of Reliez Station Road from the Las Trampas Road intersection to the Olympic Boulevard intersection. The study evaluated potential measures to improve safety at the intersection of Reliez Station Road and Las Trampas Road including installing a traffic signal, reconstructing the intersection as a modern roundabout, and advanced flashing beacons. The consultant recommended the advanced flashing beacons which were implemented (see **Figure 1**). The study also suggested improvements at the intersection of Reliez Station Road and Olympic Boulevard, but did not go as far as recommending the improvements without further study. This feasibility study is reexamining some of the suggested improvements on Reliez Station Road at Olympic Boulevard and at Las Trampas Road.

Recently, a pavement improvement project was completed on Reliez Station Road between Olympic Boulevard and Glenside Drive. This project did not significantly change traffic conditions along the corridor. However, the roadway striping, replacement of guardrails, new pavement, and tactile paving may provide visibility, roadway traction, and safety benefits. A study that is currently underway which may impact this project is the Olympic Corridor Trail Connector Study. The Draft Preferred Alignment Report was submitted in June 2014 and final recommendations are expected by the end of 2014.


**Figure 1: Flashing Beacon Warning of Cross Traffic Ahead**

## 3.0 RESIDENT SURVEY RESULTS

Recognizing that many residents cannot participate in community meetings or attend nighttime public hearings, the City of Lafayette and the consultant developed a brief on-line survey as an alternative way for the community to voice their concerns, issues, or ideas for the study corridor. Using a commercial on-line survey tool (SurveyMonkey) a seven-question survey was developed and linked to the City's website. The survey was advertised on the City's website, included in the widely distributed study fact sheet/flyer, put on large signs visible to drivers and posted within the corridor, and mentioned at the study's first community meeting. Finally, the City sent a link to the survey using an email blast to existing and study-related lists of residents and interested parties.

Approximately 250 responses were received from an on-line survey that was open to the public between May 21 and June 21, 2014. Respondents of the survey were asked to identify what they believe are the top issues regarding the study corridor, the purpose of their trips recently made in the corridor, and the zip code of their residence to determine origins and destinations of corridor traffic.

As stated in the Request for Proposals for the Feasibility and Options Study for Traffic Operation Improvements along the Olympic Boulevard and Reliez Station Road Corridor, the high priority problems are believed to be:

- Congestion (traffic backups) at Pleasant Hill Road / Olympic Boulevard
- Congestion and pedestrian safety at Olympic Boulevard / Reliez Station Road
- Vehicle movement and congestion at Reliez Station Road / Beechwood Drive / Andreason Drive
- Vehicle movement and pedestrian safety at Reliez Station Rd / Las Trampas Rd / Richelle Court

The survey results of the top concerns of residents (**Figure 2**) validate the City's list of high priority problems in the study corridor that need to be solved.

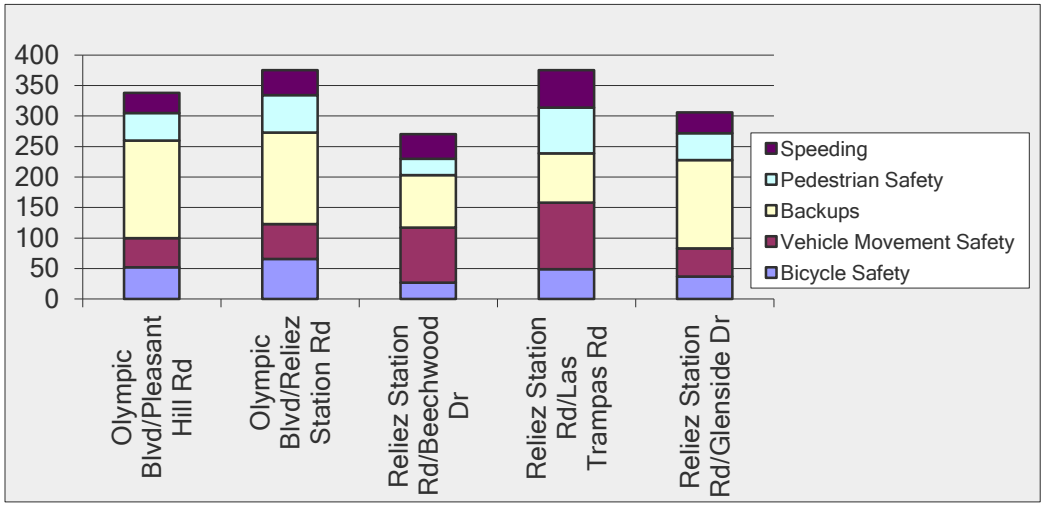


**Figure 2: Top Issues Identified in the Resident Survey**

Consistent with the City's priority issues, respondents of the survey identified traffic back-ups as the one of the most predominant issue in the corridor, along with side street access onto Reliez Station Road and associated pedestrian safety issues. 55.7% of survey respondents indicated that they lived in the study corridor or needed to use it to get to their residence. 17.0% indicated that they lived north of the study area, while 27.3% indicated that they lived just south of the study corridor.

Detailed results of the survey can be found in Appendix A.

# 4.0 COMMMUNITY MEETING / COMMUNITY WALKS

## 4.1 COMMUNITY MEETING #1

The meeting (Community Meeting #1) took place on the evening of June 4, 2014 and was attended by approximately 50 people (**Figure 3**). The meeting, held at the Lafayette Community Center located on St. Mary's Road, started with a presentation by the consultants on information collected to date followed by small group discussions facilitated by the consultants. The meeting was organized in workshop style with four "stations" representing three distinct geographic segments of the study corridor, each known to have unique issues, and one for the corridor as a whole. Groups of residents spent 15 minutes at a station focusing on the issues of that segment of the study corridor, then all attendees rotated to another station so that everyone had the opportunity to address issues for each segment.


**Figure 3: Community Meeting #1 Attracted Fifty Residents**

After the small group discussion period, each station's facilitator reported back to the entire group, and attendees could comment on whether their ideas had been properly summarized. The meeting lasted approximately two hours. Summaries of the issues raised in Community Meeting #1 are located in Appendix B.

## 4.2 COMMUNITY WALK #1

Community Walk #1 took place on a Saturday morning (June 7, 2014) to walk the corridor and have residents show the consultants specific locations of concern (**Figure 4**). Saturdays have different issues than weekdays due to an influx of recreational bicyclists and hikers. Many recreational users park their vehicles in the two lots serving the trailhead of the Lafayette / Moraga Regional Trail. The study corridor is popular to individual and teams of bicyclists training for competition due to its challenging terrain. Frequently, groups of five or more bicyclists will utilize a full travel lane as they ride through the corridor (**Figure 5**). The nine residents who attended, along with city staff and two consultants, walked from the intersection of Pleasant Hill Road and Olympic Boulevard to the intersection of Glenside Drive and Reliez Station Road, stopping frequently to observe and discuss conditions. The walk lasted about two hours. Summaries of the issues discussed during Community Walk #1 and photographs are located in Appendix B.

**Figure 4: Weekday and Weekend Tours of the Corridor**


**Figure 5: Reliez Station Road/Olympic Boulevard Bicycling Corridor**

## 4.3 COMMUNITY WALK #2

Community Walk #2 took place at 7:30 am on Thursday, June 12, 2014, a typical weekday with schools in session, and was attended by approximately twelve people. Like Community Walk #1, residents and consultants started the tour of the corridor at the intersection of Pleasant Hill Road and Olympic Boulevard and proceeded to Glenside Drive and Reliez Station Road. The issues that occur on a weekday morning are different than those on weekends—the difference being primarily in the make-up of the traveling population whereas weekends attract recreational users to the corridor, weekday traffic in the corridor is primarily commuters, students, or parents driving students to school. This walk also lasted about two hours. Notes from Community Walk #2 are provided in Appendix B.

# 5.0 AVERAGE DAILY TRAFFIC (ADT) COUNTS

The average number of vehicles traveling on Olympic Boulevard and Reliez Station Road each day is shown in **Table 1**. The table also shows the vehicle classification, including bicycle, passenger car, long wheelbase vehicle, bus, and 3+-axle truck counts. **Figure 6** provides images of what vehicles from these different classifications look like. Vehicles were counted over the course of three days (April 29, April 30, and May 1, 2014) at two locations using automatic tube counters. Schools and colleges were in session (and not taking final exams) at the time of the counts. The counts indicate that 14,800 vehicles per day travel along the Reliez Station Road portion of the study corridor on a typical weekday. This figure is consistent to within several hundred vehicles of volume counts reported in studies from the last 20 years.

**Table 1: Three-Day (Tuesday to Thursday) Average Volume and Classification Counts**

| Roadway | Count Location | Bicycles | Passenger Cars | Long Wheelbase Vehicles [1] | Buses | 3+-Axle Trucks | Total |
|---|---|---|---|---|---|---|---|
| Olympic Blvd. | W. of Pleasant Hill Road | 54 | 12,351 | 2,007 | 11 | 78 | 14,503 |
| Reliez Station Road | N. of Richelle Court | 39 | 12,909 | 1,772 | 4 | 83 | 14,806 |
| Average | - | 46 | 12,630 | 1,889 | 8 | 81 | 14,655 |
| % of Total Traffic | | <1% | 86% | 12% | <1% | 1% | 100% |

Notes:

[1] Long wheelbase vehicles are two-axle vehicles with greater than average distance between the front and rear axle. This classification includes large pick-up trucks and "single unit" trucks (sometimes called a bob-tail truck—a truck approximately 25-35 feet in length but without a pivoting trailer. They correspond to Vehicle Classifications #3 and #5 shown in Figure 6.

Source: Stantec, 2014.

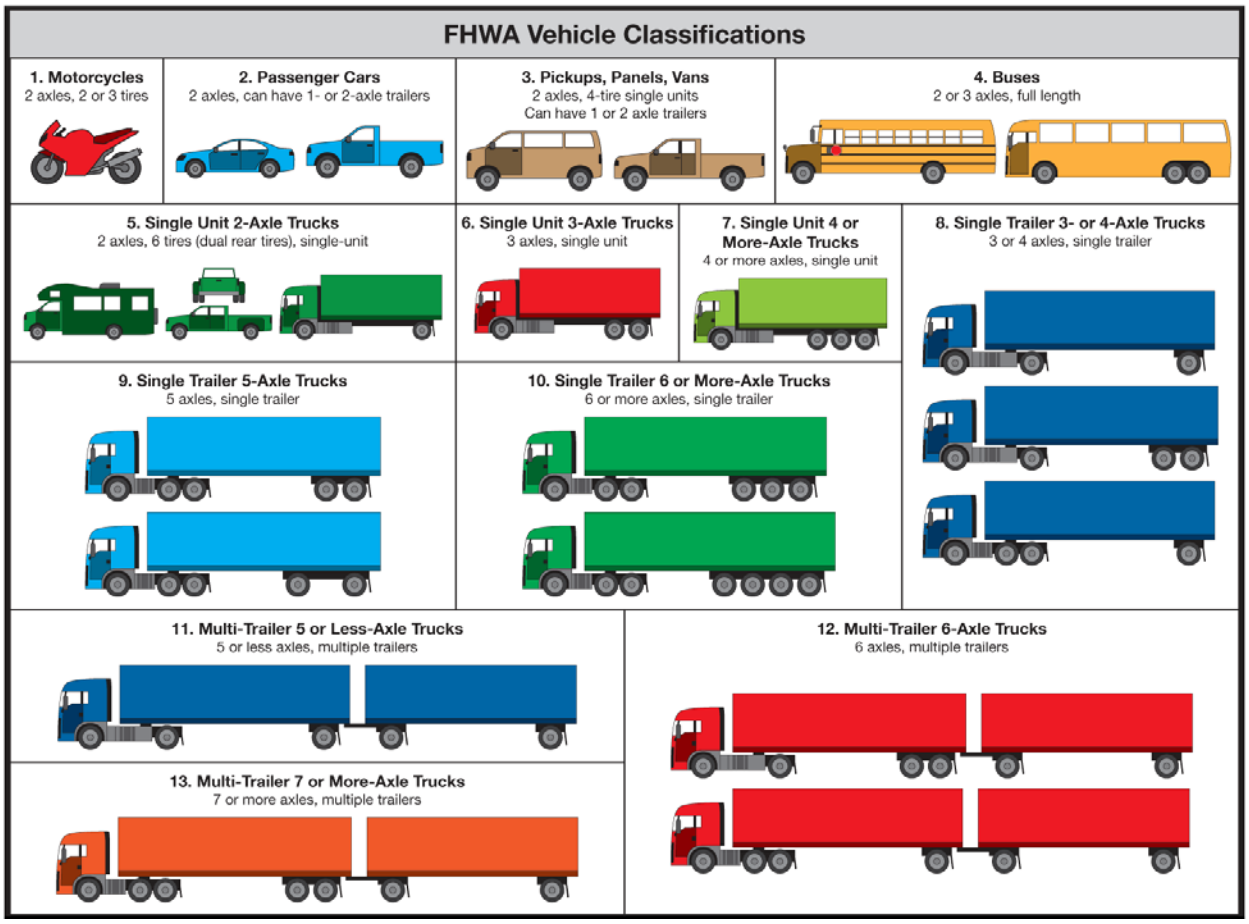


**Figure 6: FHWA Vehicle Classifications**

Based on the consultant's observations during the community walks, the majority of bicyclists using Reliez Station Road were highly experienced adults, and often riding or training in groups of similarly experienced bicyclists. The absence of bicycle lanes does not appear to deter the highly experienced adult bicyclists from using Reliez Station Road. However, it does appear that a portion of bicyclists come on or off Olympic Boulevard from the Lafayette / Moraga Regional Trail and do not use Reliez Station Road, and that is why the counted volumes were higher on Olympic Boulevard than Reliez Station Road.

Nonetheless, the bicycle volumes counted in the corridor were not high; they suggest that there are no more than five bicyclists per hour in any direction throughout the day on average. The numbers also did not indicate that there was a predominant direction of travel on Olympic Boulevard, except perhaps in the eastbound direction in the pm peak. It also appears that there are more southbound (uphill) bicyclists than northbound (downhill) bicyclists on Reliez Station Road in the morning peak.

Average Daily Traffic (ADT) Counts
October 1, 2014

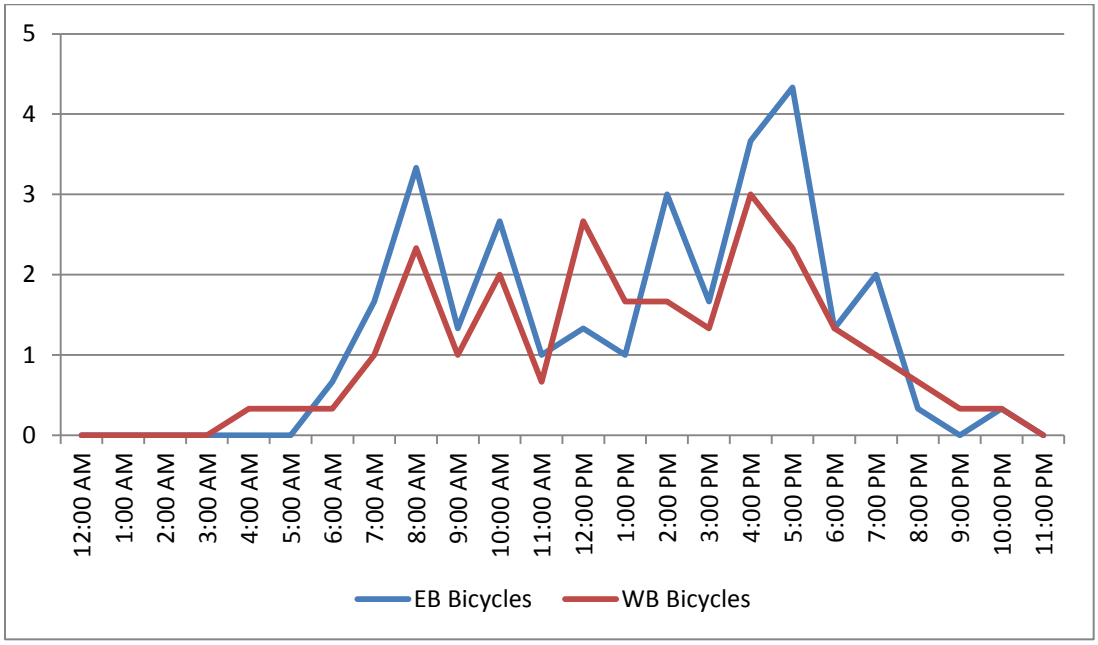


**Figure 7: Average Hourly Bicycles Volumes by Direction, Olympic Boulevard West of Pleasant Hill Road**

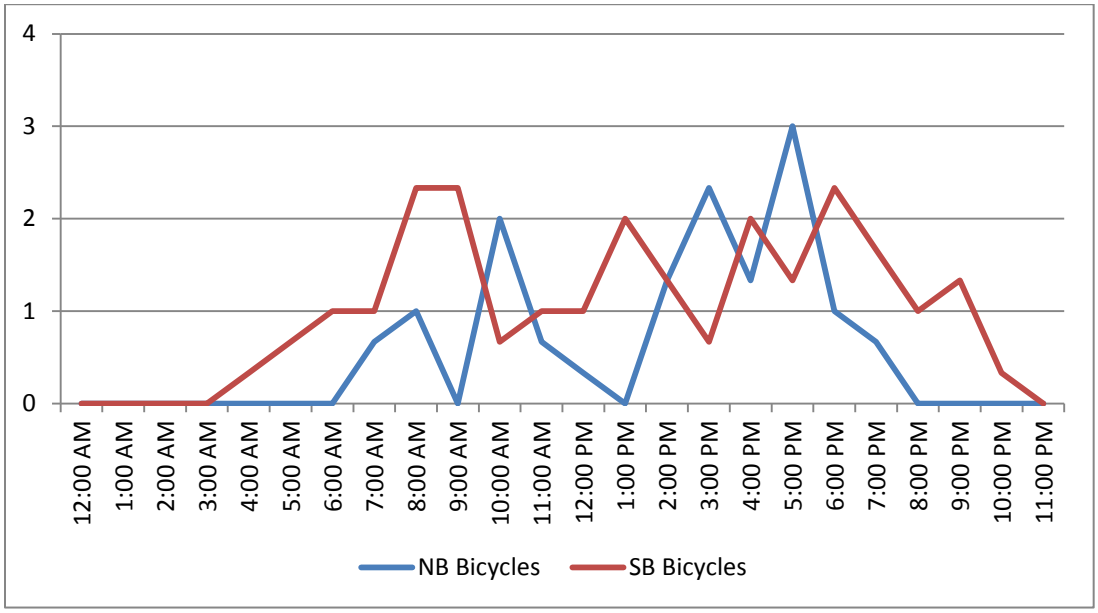


**Figure 8: Average Hourly Bicycle Volumes by Direction, Reliez Station Road North of Richelle Court**

The volume of passenger car travel on Olympic Boulevard is approximately the same in each direction throughout the day except during the morning peak period, when there appears to be more traffic in the eastbound direction on Olympic Boulevard than in the westbound direction. This is shown in **Figure 9**.

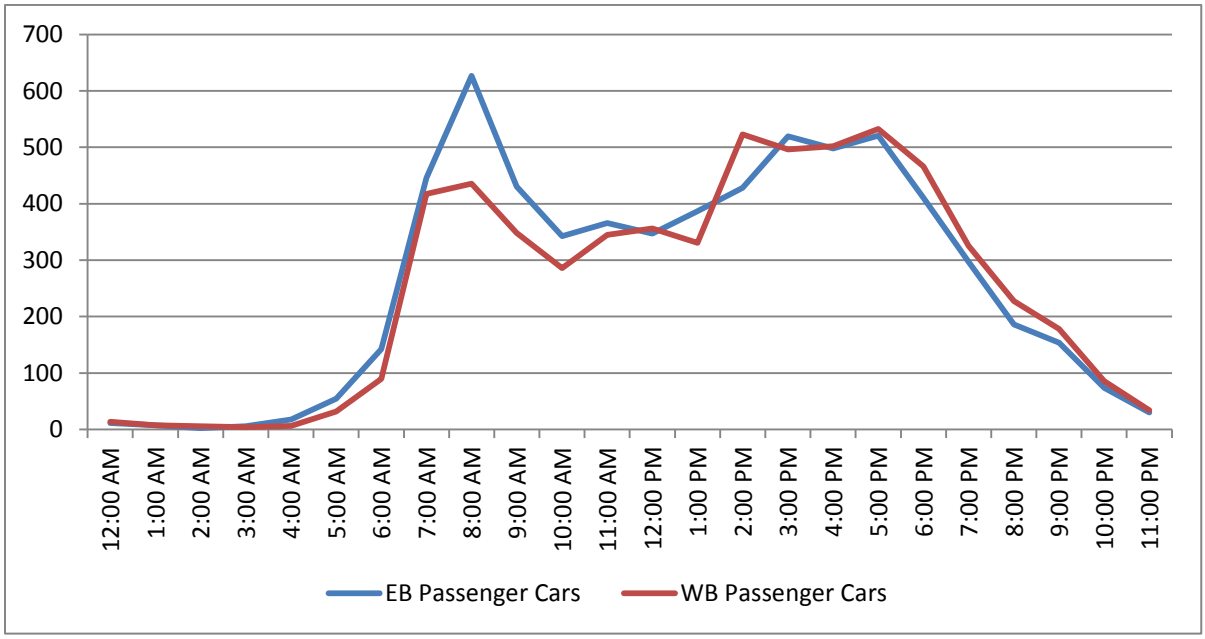


**Figure 9: Average Hourly Passenger Car Volumes, Olympic Boulevard West of Pleasant Hill Road**

The volume of passenger car travel on Reliez Station Road is approximately the same throughout the day except during the morning peak period, when there appears to be more traffic in the northbound direction on Reliez Station Road than in the southbound direction.

Speed Data
October 1, 2014

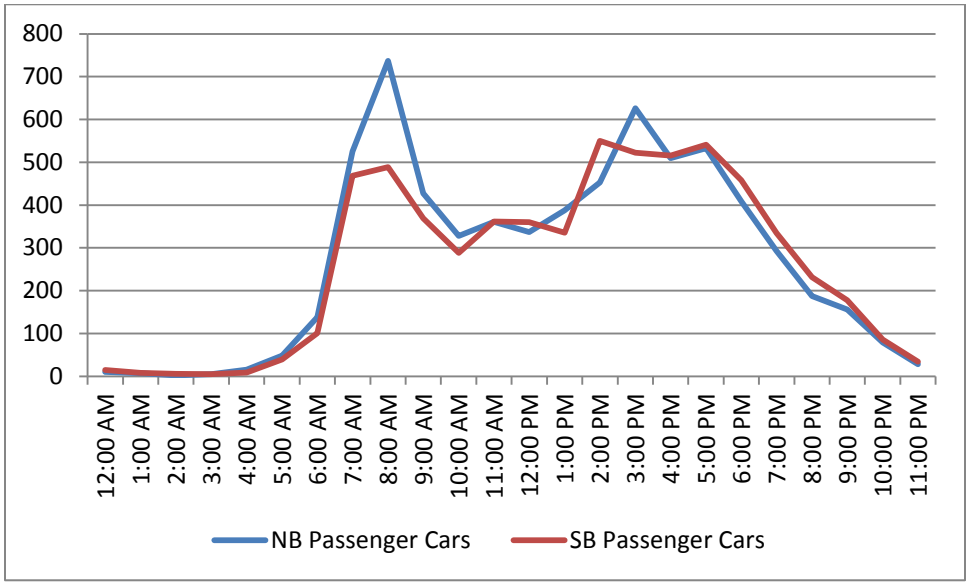


**Figure 10: Average Hourly Passenger Car Volumes, Reliez Station Road North of Richelle Court**

The bus counts shown in **Table 1** are consistent with the school bus routes. While a bus would typically travel north along Reliez Station Road and turn right onto Olympic Boulevard, there is at least one bus route serving Stanley Middle School that travels south on Pleasant Hill Road, turns right into Reliez Station Road, then turns left onto Olympic Boulevard. As a result, there were a higher number of buses counted on Olympic Boulevard than along Reliez Station Road.

As noted at the community meeting, residents believe there are an unusually high number of trucks using the study corridor considering that it is not a designated truck route. Based on the classification counts there appears to be a large number of long wheelbase vehicles using the corridor (12%) but the distinction between a pick-up truck and a single-unit truck is not clear from tube counters. Large trucks with three or more axles using the corridor are approximately 1% of the total traffic volume—a typical percentage for a collector or arterial street.

The volumes of 3+-axle trucks indicate that there are not abnormally high numbers of large trucks traveling in the corridor. It appears that between the times of 7am and 4pm, about five trucks per hour is typical. Trucks outside of these hours are rare.

Detailed summaries of the vehicle counts are provided in Appendix C.

# 6.0 SPEED DATA

Speed data were collected at two locations in the study area continuously over the course of three days (April 29, April 30, and May 1, 2014). The first location was on Olympic Boulevard west of Pleasant Hill Road and the second location was on Reliez Station Road north of Richelle Court. Speed data from April 29 and May 1 were considered as the most representative data sets, as

school times were slightly different on Wednesdays during the 2013-2014 school year, and so April 29 data was selected to assess speed in the corridor.

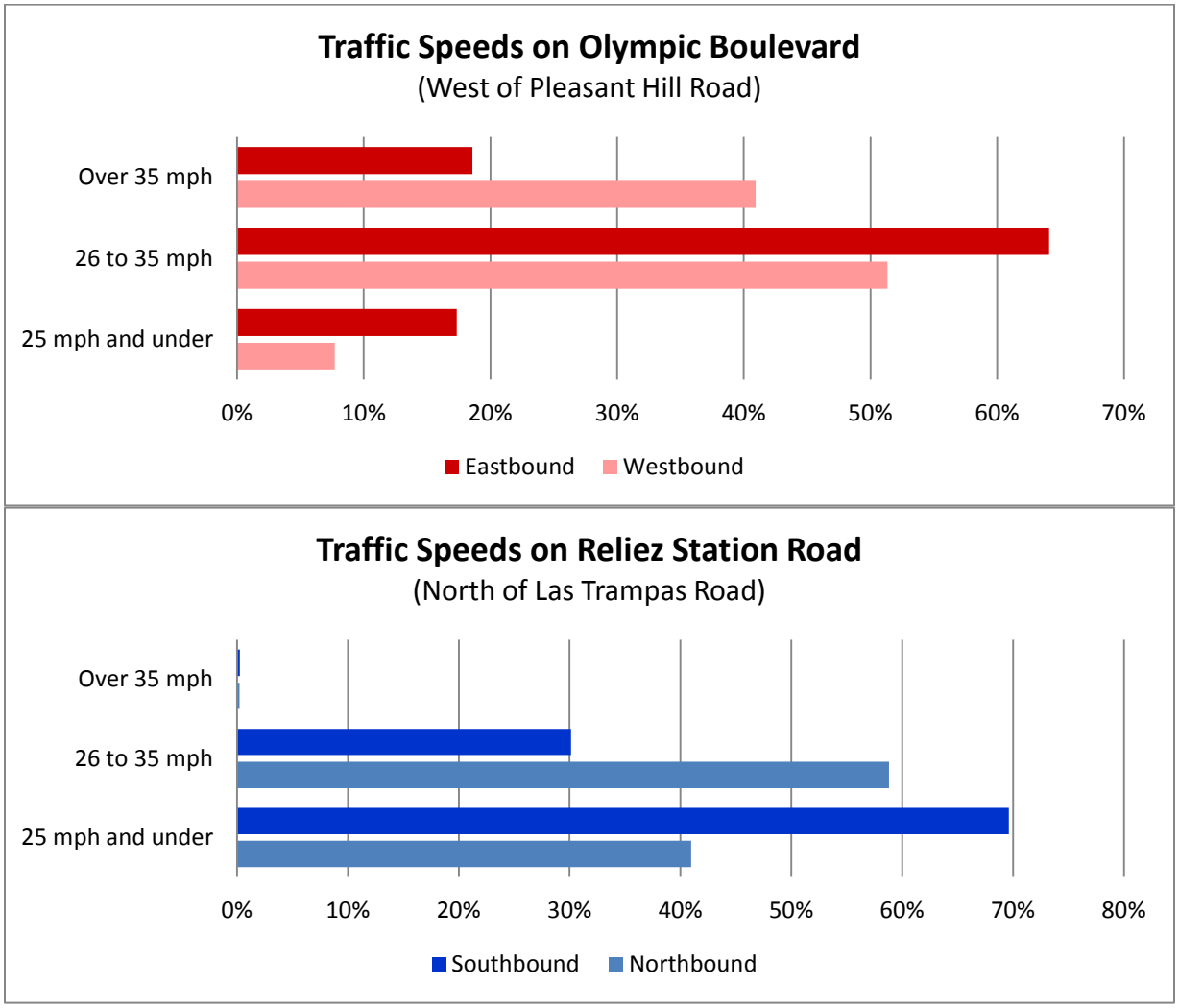


**Figure 11: Measured Traffic Speeds in Study Corridor, 24 Hours (April 29, 2014)**

**Figure 11** summarizes the percentage of drivers traveling within three categories of speed measured over a 24-hour period by direction at two locations. The majority of traffic on Reliez Station Road (70%) travels at or under the posted speed limit (25 mph) in the southbound or "uphill" direction. The opposite is true for the northbound or "downhill" direction in which 59% of vehicles travel more than 25 mph. It should be noted that the advisory speed limit in this section is 20 mph.

Speed Data
October 1, 2014

Traffic engineers typically use a measurement of speed called the 85th percentile speed to establish speed limits and to determine neighborhood impacts. It is a measure of the speed at which 85% of prudent driver are traveling at or below—"prudent" drivers will drive at a speed that is safe under the given roadway, topography, weather and visibility conditions. The speed data gathered for this type of study is usually collected from a radar gun applied to traffic in free flow conditions.

The 85th speed percentile speeds gathered for Reliez Station Road and Olympic Boulevard are used as the basis for sight distance requirements, but it is acknowledged that they might be suppressed by peak period speeds, which can be lower due to congestion.

See Appendix D for a more detailed description of vehicle speeds in the corridor.

**Table 2: Traffic Speeds as Measured in the Field**

| Roadway | Measurement Location | Direction of Travel | Posted Speed Limit (mph) [1] | Posted Advisory Speed (mph) | 85th Percentile Speed (mph) |
|---|---|---|---|---|---|
| Olympic Boulevard | West of Pleasant Hill Rd | WB | Not Posted | Not Posted | 40 |
| Olympic Boulevard | West of Pleasant Hill Rd | EB | Not Posted | Not Posted | 37 |
| Reliez Station Road | North of Richelle Ct | NB | 25 | 20 | 30 |
| Reliez Station Road | North of Richelle Ct | SB | 25 | 20 | 29 |

Notes:

[1] There are no speed limit signs posted on Olympic Boulevard west of Pleasant Hill Road, but east of Pleasant Hill Road, Olympic Boulevard is posted at 45 mph.

The speed limit signs on Reliez Station Road are posted in the northbound direction north of Richelle Court and in the southbound direction near Beechwood.

Source: Stantec, 2014.

In the online survey, many people identified speeding as an issue for this corridor. **Figure 12** shows speeds by time of day along Olympic Boulevard in the eastbound direction. There are spikes in the number of cars traveling under 25 mph in both the morning and afternoon peaks, and this corresponds with a drop (but not the total elimination) of cars traveling between 35 to 45 mph.

Speed Data
October 1, 2014

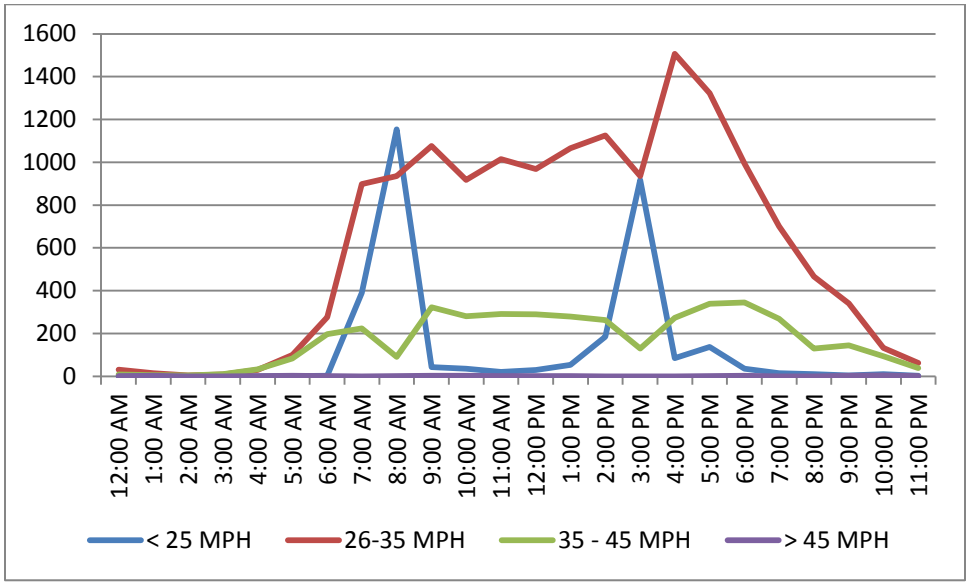


**Figure 12: Speeds by Time of Day on Olympic Boulevard, Eastbound**

**Figure 13** shows a similar correlation, with a drop in speeds in the morning peak only in the westbound direction. However, the westbound traffic exhibits a different pattern than the eastbound direction, with the number of vehicles traveling between 35 to 45 mph being similar to the number of vehicles traveling between 26 and 35 mph. These higher speeds may be due to the fact that cars are coming from higher speed roads and the fact that there are no speed limits posted to inform drivers that they need to slow down. It may also be that the close spacing of stop signs impels drivers to speed between them in order to make up time.

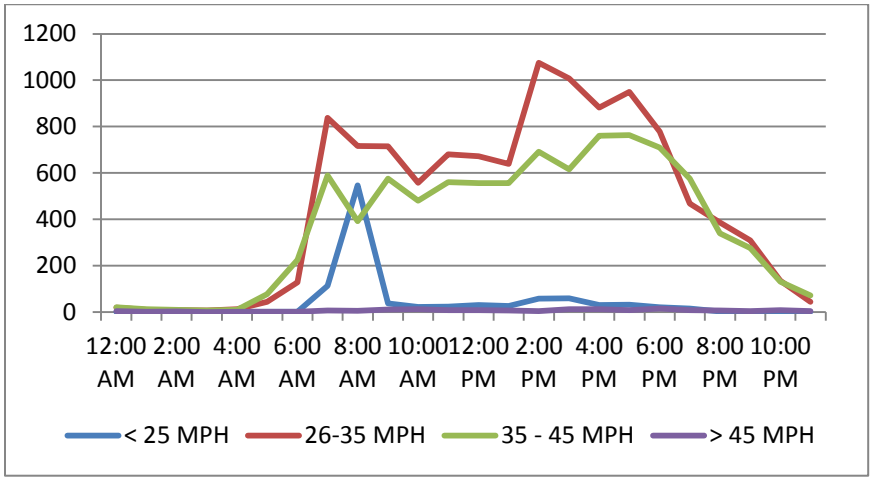


**Figure 13: Speeds by Time of Day on Olympic Boulevard, Westbound**

As shown in **Figure 14**, the travel speeds for Reliez Station Road indicate that more cars are traveling over the speed limit than under it in the northbound direction, except in the morning peak, when congestion likely limits the speeds of cars traveling downhill.

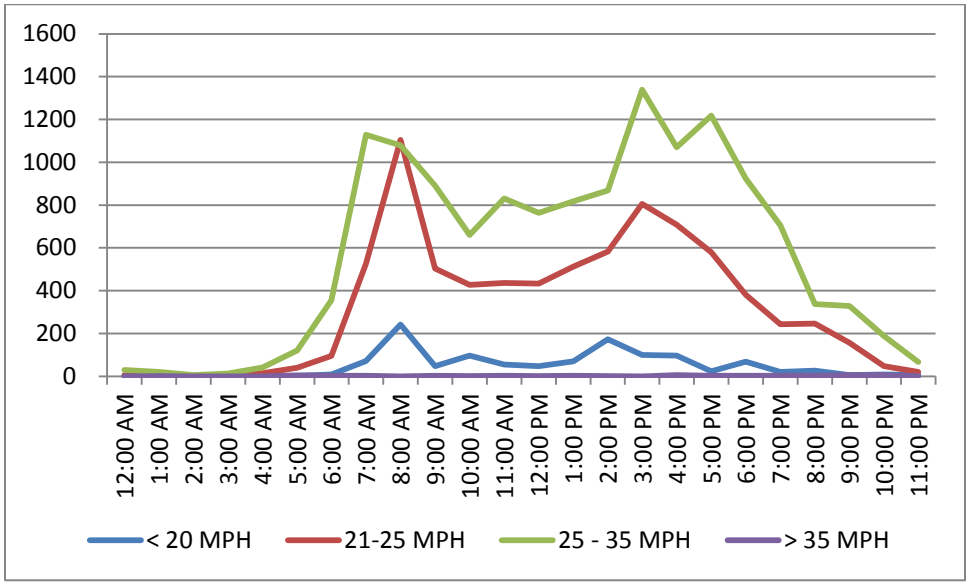


**Figure 14: Speeds by Time of Day on Reliez Station Road, Northbound**

A different pattern is illustrated in **Figure 15**, with speeds for most cars staying within the speed limit throughout the day, and speeds being particularly low in the morning peak period, likely due to congestion.

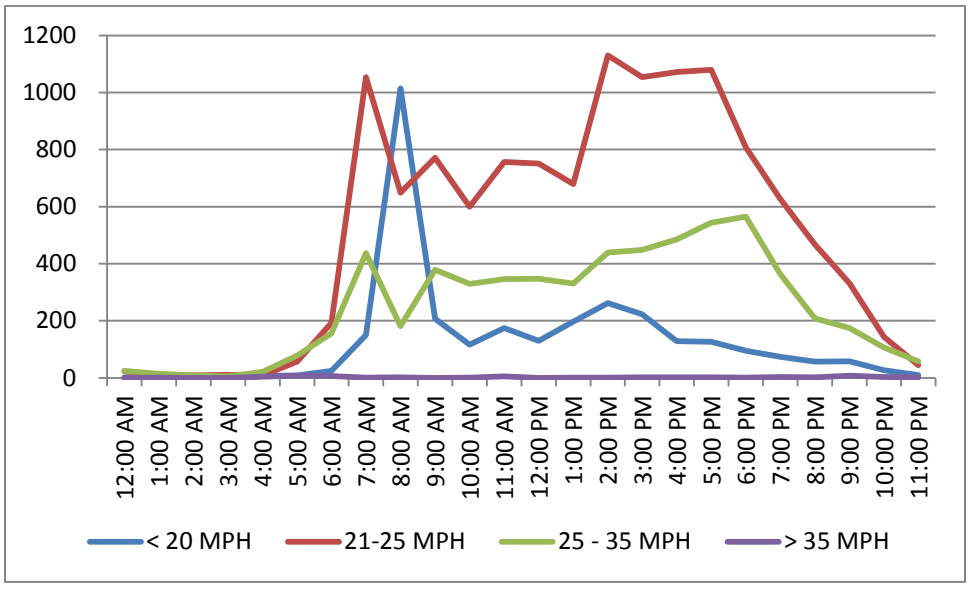


**Figure 15: Speeds by Time of Day on Reliez Station Road, Southbound**

# 7.0 Intersection Level of Service Analysis

Level of Service (LOS) is a standard method for measuring the performance of intersections for vehicles. As stated earlier in this summary, the City of Lafayette's General Plan identifies Level of Service as the primary transportation performance measure consistent with the Contra Costa Transportation Authority's mandatory methodology for evaluating Routes of Regional Significance and roads that are part of the County's Congestion Management Program.

**Table 3** explains how Level of Service is defined for stop-controlled and signalized intersections. In this study, average control delay was assessed using software {SYNCHRO) with input of turning counts collected by the consultant for this study. A summary of the turning counts used to evaluate current conditions are provided in Appendix E.

## 7.1 CURRENT CONDITIONS

Turning movement counts conducted on April 29, 2014, when schools were in session, were used as the basis for intersection LOS analysis. As shown in **Table 4**, during the AM Peak hour, all of the study intersections operate at LOS E or F, except for the Pleasant Hill Road/Olympic Boulevard intersection, which operates at "good" LOS D. In the PM Peak hour, the Olympic Boulevard /Reliez Station Road intersection operates at LOS F and the Reliez Station Road/Las Trampas/Beechwood intersection operates at "poor" LOS D, while the other intersections operate at LOS C or D. The analysis clearly shows the effects of the peak direction of travel.

**Table 3: Intersection Level of Service (LOS) Definitions**

| Level of Service (LOS) | Type of Intersection Control | |
|---|---|---|
| | Stop Controlled | Signalized |
| | Average Control Delay (sec/veh) | Control Delay per Vehicle (sec/veh) |
| A | ≤ 10 | ≤ 10 |
| B | > 10 – 15 | > 10 – 20 |
| C | > 15 – 25 | > 20 – 35 |
| D | > 25 – 35 | > 35 – 55 |
| E | > 35 – 50 | > 55 – 80 |
| F | > 50 | > 80 |

Source: Special Report 209: Highway Capacity Manual, 4th ed. (2000 update). TRB. National Research Council, Washington, D.C., 2000.

**Table 4: Level of Service at Intersections in the Study Area (Current Conditions)**

| Intersection | | Control Type | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|---|---|
| | | | Delay | LOS | Critical App. | Delay | LOS | Critical App. |
| 1 | Pleasant Hill Rd. / Olympic Blvd. | 4-Way Stop | 29.6 | Good D | EB | 23.2 | C | EB |
| 2 | Olympic Blvd. / Reliez Station Rd. | 3-Way Stop | **112.7** | **F** | WB+NB | **61.3** | **F** | WB+NB |
| 3 | Reliez Station Rd. / Beechwood Dr./ Andreason Ln. | 2-Way Stop | **40.7** | **E** | EB | 23.5 | C | EB |
| 4 | Reliez Station Rd. / Las Trampas Rd. / Richelle Ct. | 2-Way Stop | **61.1** | **F** | EB | **31.4** | **Poor D** | EB |
| 5 | Reliez Station Rd. / Glenside Dr. | 3-Way Stop | **86.4** | **F** | NB+SB | 24.3 | C | NB+SB |

Notes:
Delay is the average controlled delay for the intersection presented in seconds per vehicle (sec/veh) for All-Way Stop and average control delay for worse approach for 2-Way Stop.
Intersections operating at LOS E or F and highlighted in bold text are operating at generally unacceptable levels of service.
Stantec, 2014.

The Olympic Boulevard / Reliez Station Road intersection appears to be a bottleneck during peak periods in the peak direction. Note that this intersection operates with the highest average delay out of all of the stop controlled intersections regardless of the peak period. See Appendix F for the SYNCHRO outputs for current conditions at the five study intersections.

The turning movement counts provided some insight into the travel patterns in the study area. Community members noted that some drivers use Reliez Station Road north of Olympic Boulevard to bypass the intersection at Olympic Boulevard and Pleasant Hill Road. It was observed that in the morning peak, a larger number of vehicles travel south on Reliez Station Road just north of Olympic Boulevard than would be expected given the number of people who live in this area. With 91 homes and only two means of outlet (Reliez Station Road at Olympic Boulevard and Reliez Station Road at Pleasant Hill), one would expect no more than about 90 cars existing from the southern end in the morning peak. However, counts indicate that more than 130 cars are exiting from this point in the morning peak, confirming input from the community.

## 7.2 FUTURE CONDITIONS

As part of an update to the Lamorinda Transportation Mitigation Fee's Nexus Study, traffic volume growth has been forecasted to 2040. These forecasts were used as input to assess level of service at intersections in the study area under future conditions. The SYNCHRO analysis is shown in Appendix F.

As shown in **Table 5,** traffic growth is anticipated to significantly reduce the level of service at all of the study intersections, particularly in the morning peak hour. Although vacant land for new development in southern Lafayette and in the Town of Moraga is limited, there will still be background growth in traffic. The traffic generated by this growth will combine with traffic diverting to the study corridor in an attempt to avoid congestion in other corridors.

By this future date (2040), the intersections in the study corridor will be approaching their capacity—a point when the operation of intersection becomes unstable and even small increase in traffic can cause large swings in delay.

**Table 5: Level of Service at Intersections in the Study Area (Future Conditions)**

| Intersection | | Control Type | AM Peak Hour | | | PM Peak Hour | | |
|---|---|---|---|---|---|---|---|---|
| | | | Delay | LOS | Critical App. | Delay | LOS | Critical App. |
| 1 | Pleasant Hill Rd. / Olympic Blvd. | 4-Way Stop | **99.5** | **F** | WB | **45.5** | **E** | SB |
| 2 | Olympic Blvd. / Reliez Station Rd. | 3-Way Stop | **> 120** | **F** | WB+NB | **97.8** | **F** | WB+NB |
| 3 | Reliez Station Rd. / Beechwood Dr. | 2-Way Stop | **84.3** | **F** | EB | 30.8 | Good D | EB |
| 4 | Reliez Station Rd. / Las Trampas / Richelle Ct. | 2-Way Stop | **> 120** | **F** | EB | **43.5** | **Poor D** | EB |
| 5 | Reliez Station Rd. / Glenside Dr. | 3-Way Stop | **> 120** | **F** | NB+SB | **54.4** | **F** | NB+SB |

Notes:
Delay is the average controlled delay for the intersection presented in seconds per vehicle (sec/veh) for All-Way Stop and average control delay for worse approach for 2-Way Stop.
Intersections operating at LOS E or F and highlighted in bold text are operating at generally unacceptable levels of service.
Stantec, 2014.

# 8.0 COLLISION DATA

City collision records, which are based on the State Wide Integrated Traffic Records System (SWITRS), were reviewed for the last five years to assess the number and type of collisions reported in the study area. Collisions are typically reviewed to determine 1) if there is a discernable pattern of crash type that could be linked to a geometric, operational, or traffic control deficiency, and 2) if the rate of crashes significantly exceed the state wide average for crashes at a similar roadway or intersection.

## 8.1 REVIEW OF CRASH DATA

The review showed that there had been nine collisions reported in the corridor between 2009 and 2013, a four-year period. The numbers of collisions by type and by their location are illustrated in **Figure 16** and **Figure 17** respectively. Interviews of frequent and regular users of the

study corridor indicated that the frequency of collisions in this corridor is much higher than what these public records indicate. It has been suggested that many property damage only accidents are unreported and that there are frequent “near misses”.

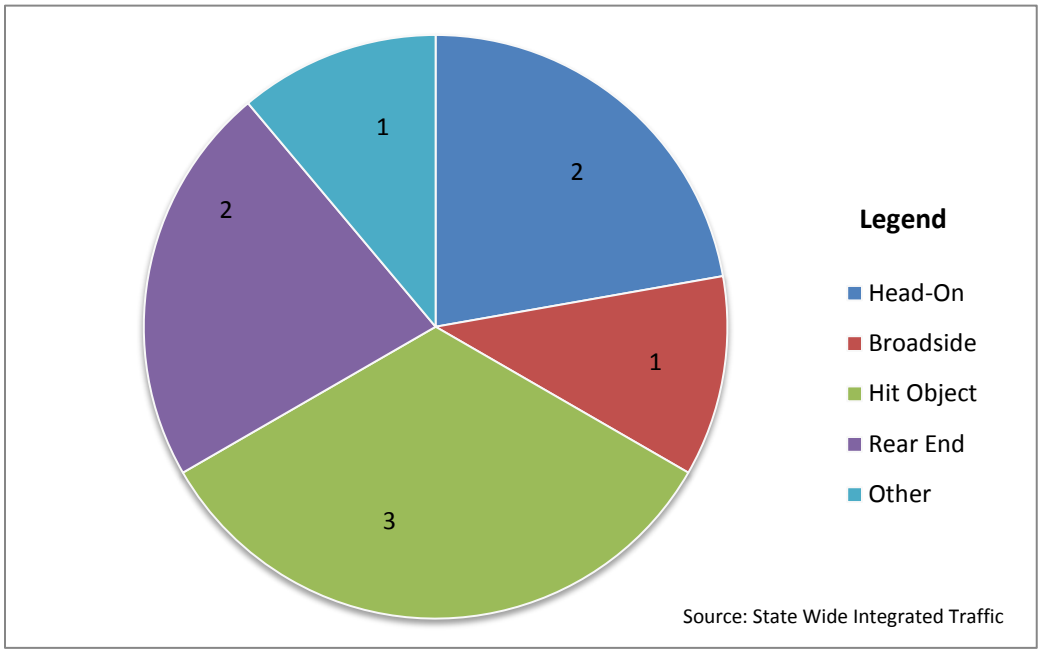


**Figure 16: Collisions by Type, 2009 to 2013**

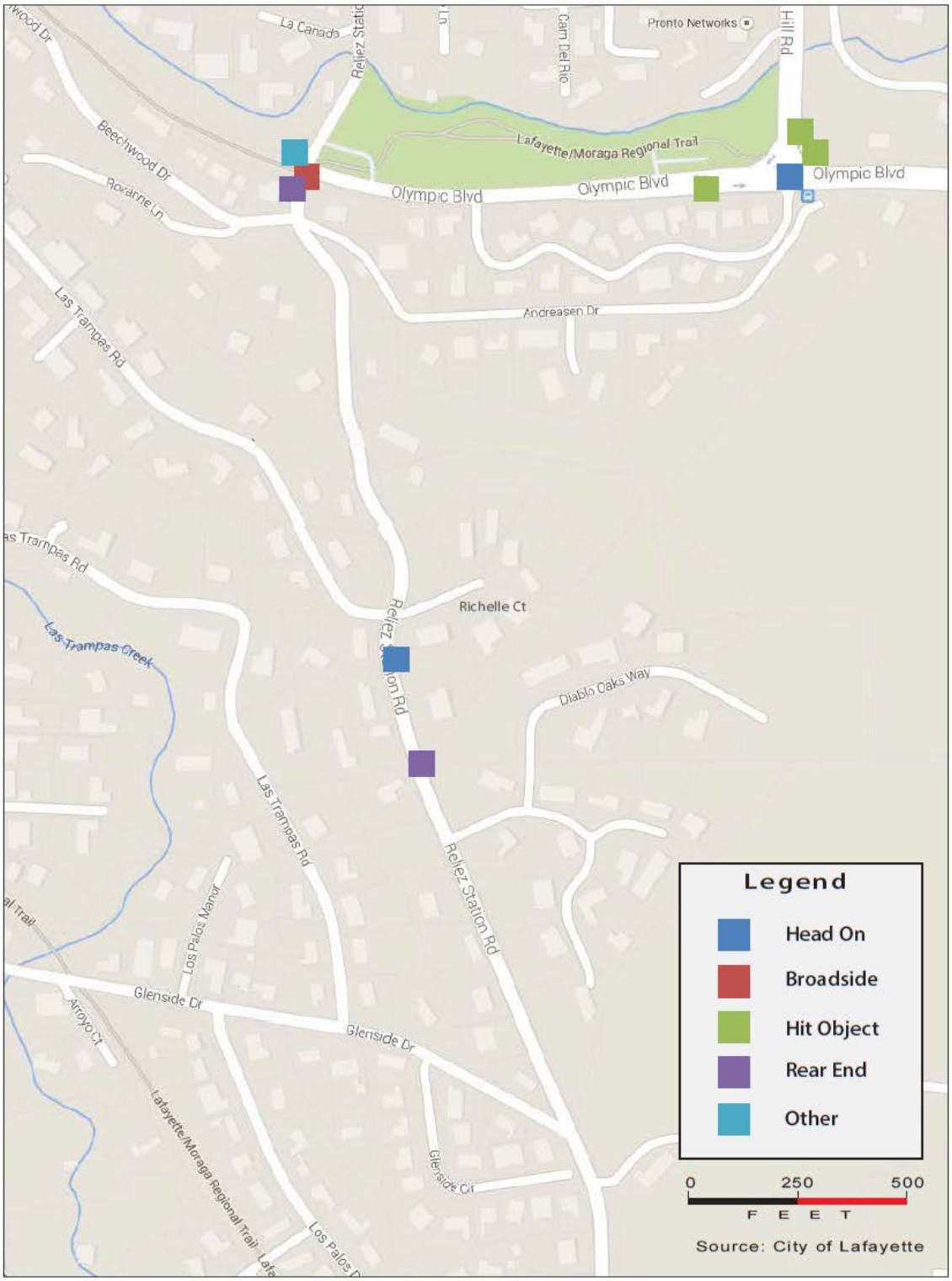


**Figure 17: Collision by Location and Type, 2009-2013**

According to the records, none of these reported collisions involved pedestrians or bicyclists.

### 8.2 SUMMARY OF FINDINGS

Without confidence in the accuracy in reporting of the number of collisions, it is meaningless to evaluate the causes of these crashes or the rate at which the crashes occur per million vehicle miles of travel or the ratio between night and day crashes—the standard ways of gauging whether the crash history of a location exceeds the average or typical rate of crashes at similar locations.

One noteworthy attribute about the reported crash types is that the type of crashes lack commonality or pattern. This means that there probably isn't a particular design feature of the corridor or movement that causes a recurrence in crashes of the same type in the same place.

Because of the lack of crash data, the assessment of safety in this corridor will assume that safety (and crash history) correlates with other features of the corridor, such as poor sight distance, excessive speeds, and sharp curves. The elimination of undesirable roadway features or driving behavior would, theoretically, reduce the type of crash that correlates with the feature.

## 9.0 SIGHT DISTANCE

### 9.1 INTRODUCTION

This section specifically assesses sight distance on Reliez Station Road at the two most constrained locations: Las Trampas Road / Richelle Court and Andreasen Drive / Beechwood Drive. Two types of sight distance are relevant to these locations:

1) Corner Sight Distance: The unobstructed view of the roadway from a stopped vehicle waiting to turn or proceed through an intersection where approaching traffic from both directions is uncontrolled. The most challenging maneuver is making a left turn from a stop. It requires the stopped driver to identify sufficient gaps in the traffic streams in two directions, turn left and reach a speed without dramatically affecting the speed of vehicles in either traffic stream.

2) Stopping Sight Distance: The unobstructed view of the roadway and approaching intersection that allows a driver to perceive a hazard, react by applying the vehicle's brakes, and bring the vehicle to a stop without locking the brakes. The distance required to stop is based on a multitude of factors such as time of day, weather, grade of the road, condition of the pavement, and many vehicular and driver factors. All things assumed equal, however, results in a matrix of minimum stopping sight distance as a function of speed which is commonly used to assess intersections and other roadway features.

Since avoiding a collision is the primary objective, for all intents and purposes, the stopping sight distance described above represents both the stopping sight distance and decision sight

distance. In the following analysis, the actual sight distance measured in the field is compared to the calculated minimum stopping sight distance (adjusted for grades) as well as the distance required to comfortably make a turn.

Lack of adequate sight distances is identified by residents as a major concern, especially by those who reside on Las Trampas Road, Richelle Court, Andreasen Drive, and Beechwood Drive who must navigate the intersections daily. The reasons for the inadequate sight distance are obvious—a combination of horizontal and vertical curvature of Reliez Station Road, and road and intersection topography, grade, and vegetation. Sight distance was brought up in all of the outreach activities (e.g. the resident survey, community walks, and community meeting), as an issue related to both safety and local access.

Sight distances for eight traffic movements were evaluated on Reliez Station Road. These include:

- Andreasen Drive making a westbound left or right turn. Drivers egressing Andreasen Drive have limited sight distance looking uphill for fast moving traffic coming downhill on Reliez Station Road. This makes both right and left turns difficult. This left turn is made particularly difficult by the need to accelerate onto a steep upgrade and find an adequate gap in both directions of traffic. The 85$^{th}$ percentile speed on this segment is 30 mph in the northbound direction and 29 mph in the southbound direction. Note that these are approximations, as the closest speed measurements were taken at a point further south. These speeds may be higher than actual, given that some cars going downhill may be preparing to stop and cars going uphill may still be accelerating.

- Beechwood Drive making an eastbound left or right turn. Drivers egressing Beechwood Drive not only have a steady stream of traffic coming from Olympic Boulevard, but somewhat limited sight distance looking uphill for fast moving traffic coming downhill on Reliez Station Road. The 85$^{th}$ percentile speed on this segment is 30 mph in the northbound direction and 29 mph in the southbound direction. Note that these are approximations, as the closest speed measurements were taken at a point further south. These speeds may be higher than actual, given that some cars going downhill may be preparing to stop and cars going uphill may still be accelerating.

- Las Trampas Road making an eastbound left or right turn. Drivers making a left turn must find a gap in traffic in both directions. A mirror has been installed to improve this sight distance, however, it is only moderately effective at night and is not a reliable tool for side street drivers to measure gaps in traffic. Drivers looking at the sight line to their right need to judge the speed of vehicles traveling downhill at relatively fast speeds, but also from their left around a blind curve with vehicles accelerating to make the steep grade. The flashing beacons that turn on when vehicles are waiting to turn from Richelle Court or Las Trampas Road aid in the creation of the acceptable gap by slowing down traffic approaching the intersection. The 85$^{th}$ speed percentile of this segment of Reliez Station Road is 30 mph in the northbound direction and 29 mph in the southbound direction.

- Richelle Court making a westbound left or right turn. Like Las Trampas Road, a mirror has been installed to aide drivers turn from Richelle Court, but is only moderately effective. Drivers looking at this sight line from Richelle Court experience the "mirror image" of the view from Las Trampas Road. As with Las Trampas Road, the 85th speed percentile of this segment of Reliez Station Road is 30 mph in the northbound direction and 29 mph in the southbound direction.

## 9.2 SIGHT DISTANCE MEASUREMENTS

The figures on the following pages (**Figure 18** through **Figure 28**) demonstrate the measured sight distance as well as provide a photographic point of view from the side street approaches. Most of the photographs were taken from the perspective of drivers with the front of their car at the stop line, as this is the point from which sight distance is measured. However, it should be noted that drivers will place their cars closer to the roadway if it is safe to do so and it provides them with improved lines of sight.

## 9.3 ANALYSIS AND SUMMARY OF FINDINGS

Sight distances were assessed in two ways. The first is the minimum required stopping sight distance. For vehicles traveling at 30 mph, the recommended stopping sight distance is 200 feet using the California Department of Transportation (Caltrans) sight distance standards for design (generally conservative). The exception is when a roadway has a grade of 3% or more; in such cases, it is recommended that the sight distance be increased by 20% (240 feet for cars traveling at 30 mph). The second distance is based on the gap in time needed for a driver to choose to turn into traffic comfortably. **Table 6** compares sight distance from the above sources to those measured in the field on Reliez Station Road.

## Table 6: Comparison of Calculated and Measured Sight Distances

| Sight Line Location / Traffic Movement | Min. Stopping Sight Distance Recommended by Caltrans (ft.) [1] | Corner Sight Distance Recommended by Caltrans (ft.) [2] | Sight Distance Measured in Field (ft.) [3] | Does the Measured Distance Meet the Standard for Stopping Sight Distance? | Does the Measured Distance Meet the Standard for Corner Sight Distance? |
|---|---|---|---|---|---|
| Andreason Drive, Westbound Left (WBL) | 240 | 330 | 62 left<br>stop line right | No | No |
| Andreason Drive, Westbound Right (WBR) | 200 | 330 | 62 left | No | No |
| Beechwood Drive, Eastbound Left (EBL) | 240 | 330 | stop line left<br>158 right | No | No |
| Beechwood Drive, Eastbound Right (EBR) | 200 | 330 | stop line left | Yes | Yes |
| Las Trampas Road, Eastbound Left (EBL) | 200 | 330 | 139 left<br>426 right | No | No |
| Las Trampas Road, Eastbound Right (EBR) | 200 | 330 | 139 left | No | No |
| Richelle Court, Westbound Left (WBL) | 200 | 330 | 115 left<br>221 right | No | No |
| Richelle Court, Westbound Right (WBR) | 200 | 330 | 115 left | No | No |

Notes:

[1] Minimum required stopping distance based on Table 201.1 (Sight Distance Standards) found in the Highway Design Manual, California Department of Transportation dated March 7, 2014. With a design speed of 30 mph, the table identifies a stopping sight distance of 200 feet and at 25 mph a stopping sight distance of 150 feet. For sustained downgrades greater than 3%, the Highway Design Manual recommends stopping sight distances 20% longer than the values in Table 201.1.

[2] Per Table 405.1A in the Highway Capacity Manual, for 30 mph. This is based on the concept that drivers need at least 7.5 seconds to make a decision about whether to turn or not.

[3] See Figures 18 through 28 for actual measured sight distances.


**Figure 18: Sight Distance View from Beechwood to the Stop Line at Reliez Station Road and Olympic Boulevard**

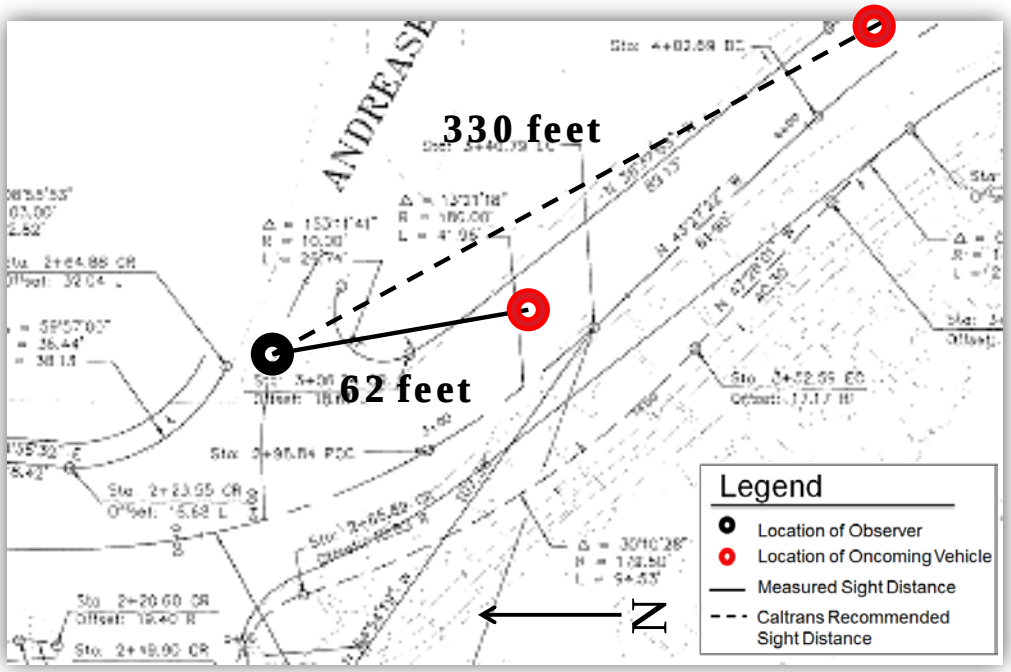


**Figure 19: Andreason Drive Sight Distance**

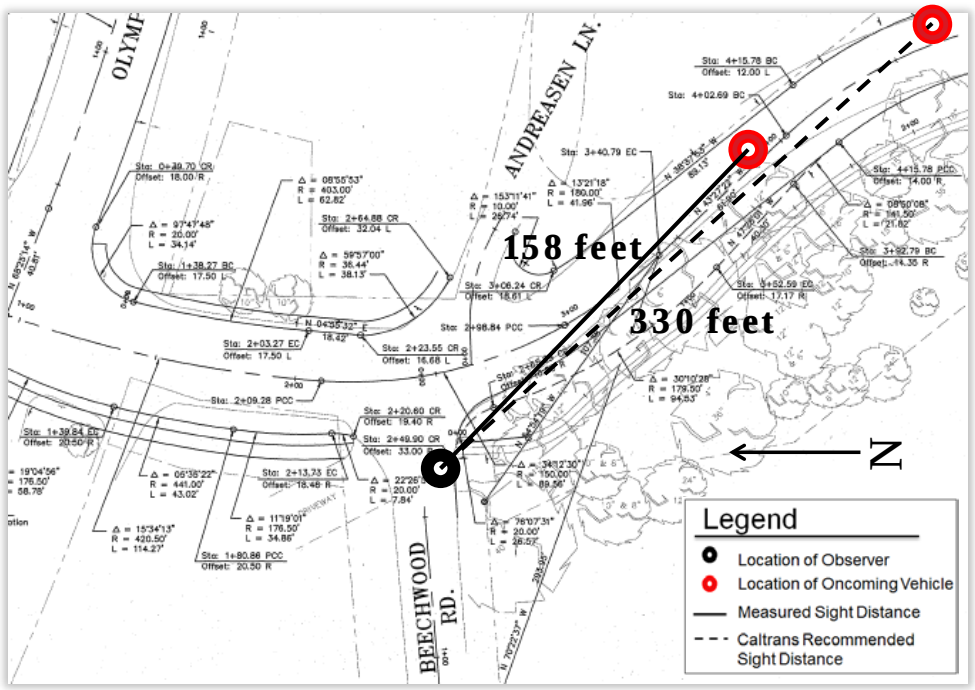


**Figure 20: Beechwood Drive Sight Distance**

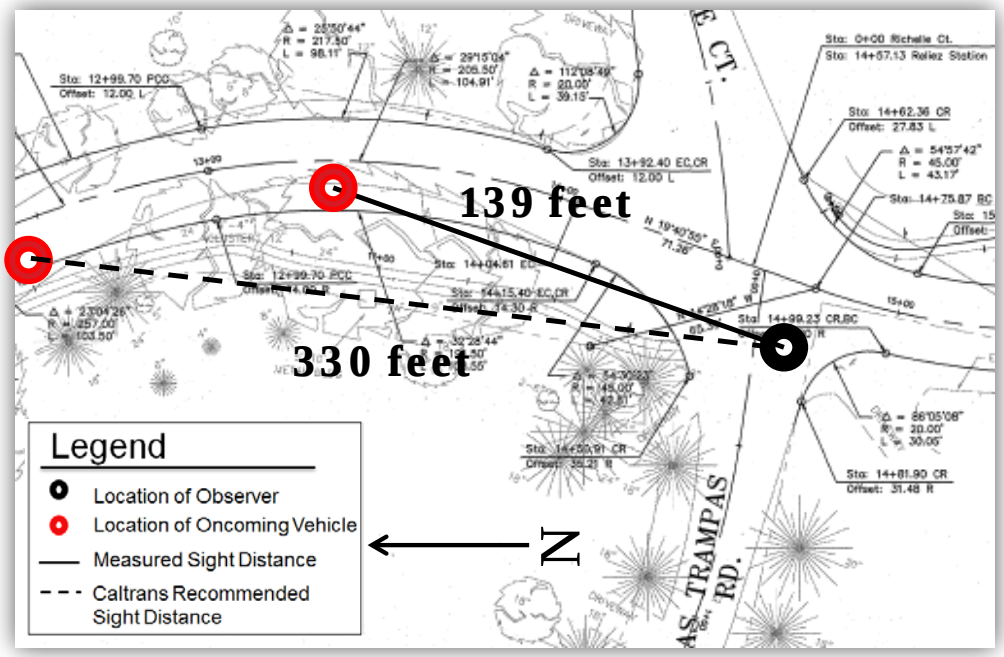


**Figure 21: Las Trampas Sight Distance #1**

**Figure 22: Sight Distance View from Las Trampas Road #1**

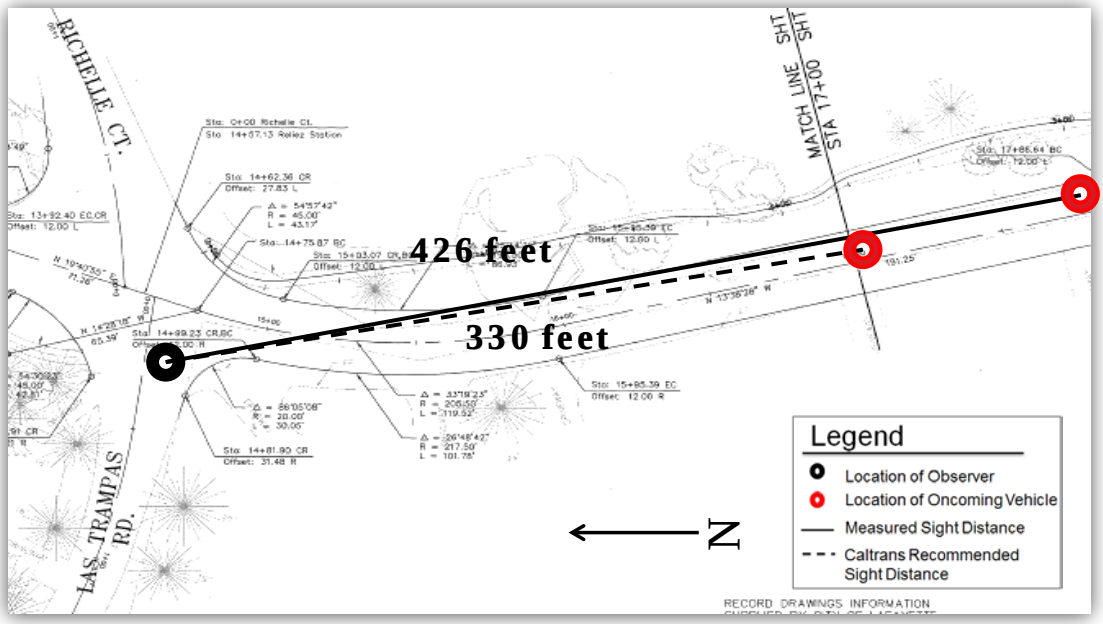


**Figure 23: Las Trampas Sight Distance #2**

While the sight distance looking right while egressing from Las Trampas Road is technically relatively long, it is partially obstructed by the hillside, as shown in **Figure 24**.

**Figure 24: Sight Distance View from Las Trampas Road #2**

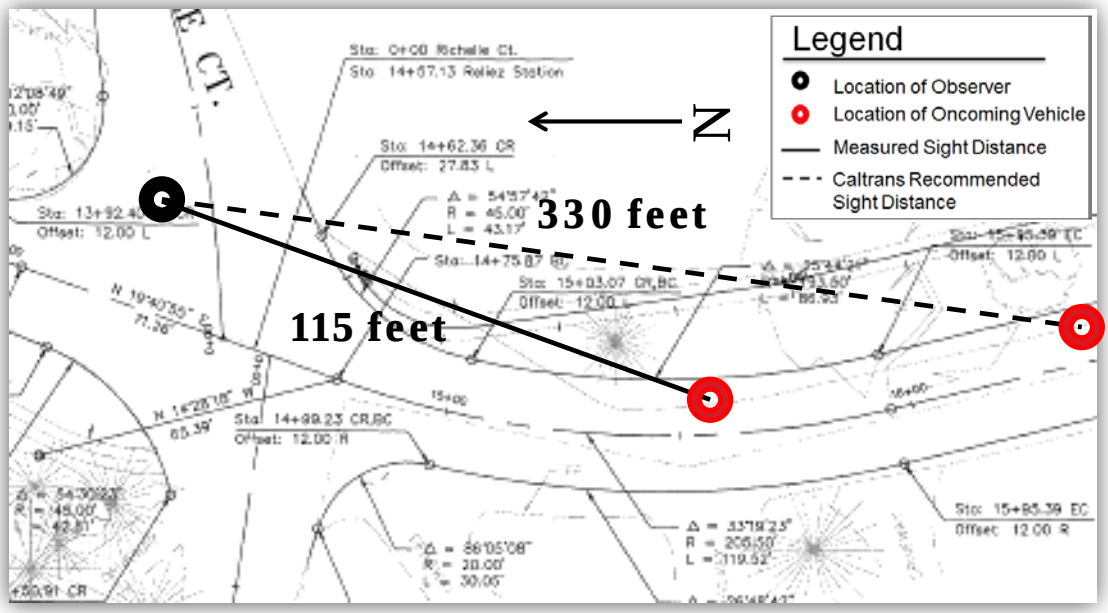


**Figure 25: Richelle Court Sight Distance #1**


**Figure 26: Sight Distance View from Richelle Court #1**

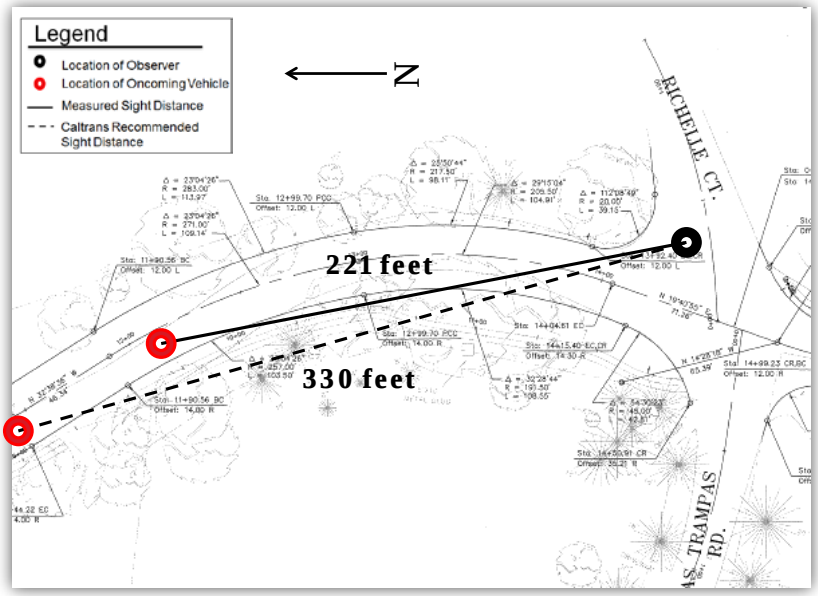


**Figure 27: Richelle Court Sight Distance #2**

**Figure 28: Sight Distance View from Richelle Court #2**

Based on the comparison in **Table 6** the intersections of Las Trampas Road / Richelle Court and Andreasen Drive with Reliez Station Road do not meet reasonable conservative standards for stopping or decision sight distance. This does not mean these intersections should be immediately barricaded and closed; it means that, until a permanent solution is implemented, drivers attempting to turn from any of the side streets need to use extreme caution and not accept gaps in traffic they ordinarily would at more conventional intersections. Some movements probably should be avoided altogether (except at times of the day when traffic is extremely light), specifically the westbound left turn from Andreasen Drive.

This analysis only confirms what past studies have concluded in regards to sight distance restrictions on Reliez Station Road. Subsequent efforts in this study will re-examine potential solutions that were previously raised and then rejected, as well as potential solutions using technologies that have been adopted since the last study of the corridor was prepared in 2005/06. As mentioned earlier in the report, mirrors and advanced vehicle detection systems have already been installed in the corridor in response to sight distance issues.

# 10.0 CONCLUSIONS OF THE EXISTING CONDITIONS ASSESSMENT

As stated in the introduction, the purpose of this assessment of existing conditions is to document and verify the issues facing the people who reside within the corridor. It also touches upon the broader regional connectivity and mobility pressures facing the City of Lafayette's leaders. This is an evidence-based study, meaning that the consultants analyzed empirical data to draw conclusions about the corridor. As an objective study, it cannot rely on anecdotal information, no matter how persuasively it is presented or convincing the arguments. Rather, it uses anecdotal input to develop hypotheses about the corridor that are then corroborated (or not) by data. Although this study may not directly address secondary issues (e.g. people using the study corridor to avoid school-related congestion on Moraga Road), they are frequently caused by, or indirectly related to, the primary issues (e.g. traffic back-ups). Resolution of the primary issue may also resolve secondary issues, and the consultant will attempt to identify this as a benefit when documenting the pros and cons of the alternative solutions.

Further, it is recognized that certain problems may only occur at certain times of day and that the problems do not equally impact all corridor users. In evaluating the solutions to address these issues, the consultant will take into consideration the potential impacts that any traffic operation modification may have on users who are not impacted by the current problem.

This study's focus is on the feasibility of traffic operation solutions and/or effective physical modifications to address throughput and safety for existing and future users. Feedback from the on-line survey and community meeting point to encouraging travel on alternative routes, carpooling, and use of alternative modes to reduce corridor automobile demand as the potential solution to the traffic problems in the Reliez Station Road and Olympic Boulevard corridor. Transportation demand management is an important tool that all municipalities should promote, but it is has been demonstrated less effective in suburban locations like the Lamorinda area due to low densities, segregation of land uses, socio-economics status and auto ownership, and a lack of transit options for the trips that are typically made in this corridor. This study is focused on investigating safety and operational improvements along the corridor. A separate study may be required to find Transportation Demand Management (TDM) solutions for the corridor that will work in conjunction with the improvements identified in this study.

The primary issues associated with the study corridor and its intersections are summarized in **Table 7** which documents a process to verify each issue identified by the community through the analysis of empirical data reviewed by the consultant. The table identifies, in the consultant's professional opinion after reviewing the data, whether the severity of an issue has been verified, disproven (demonstrated not to be of equal severity as expressed by the community) or the data are inconclusive so the issue remains neither verified nor disproven. The reason for verification is so that this study can focus on solving the known problems and not spend limited resources on perceived problems or issues with an undocumented and/or inconclusive impact on the community.

As shown in **Table 7**, the top concern expressed by the community at Olympic Boulevard at Pleasant Hill Road is traffic backups. However, the traffic count data suggested that this intersection actually meets the City of Lafayette's goals for intersection level of service, although it is expected that future traffic volumes will not. At the intersection of Olympic Boulevard and Reliez Station Road, the top concern, as expressed by the community as well as by the data, is also traffic backups. This may be exacerbated by the use of Reliez Station Road north of Olympic Boulevard as a bypass route. While bypass traffic would not add to the total number of vehicles traveling through the Olympic Boulevard and Reliez Station Road intersection, it would create a higher number of unexpected vehicle movements through the intersection, which in turn could contribute to uncertainty about who has the right of way and subsequent delay. Traffic backups were noted as a moderate issue at the Reliez Station Road / Beechwood Drive / Andreason Drive location, although the traffic volume data suggested that this intersection is operating at a failing level of service. Side street access was considered a severe issue by the community, and this was confirmed by the site distance analysis. Further south, at Reliez Station Road and Las Trampas Road / Richelle Court, the situation is very similar. While the community considered traffic back-ups here to be a moderate issue, the data suggested that this intersection is a failure in terms of throughput. There was consensus between the community input and the data; both pointed to side street access being a severe issue. The top concern, according to the data, at Reliez Station Road and Glenside Drive appears to be traffic back-ups, although the community considered this to be a moderate issue.

As indicated above, there were some inconsistencies between the community's perception of an issue and the data analysis. For example, the community considered traffic back-ups to be a top concern at the intersection of Olympic Boulevard and Pleasant Hill Road, but the data did not indicate that this was a failing intersection given existing conditions. On the other hand, the data analysis suggested that the traffic-backs up and congestion were severe concerns at the intersections along Reliez Station Road, but the community input was that were only a moderate concern at the intersections with Beechwood/Andreason, Las Trampas/Richelle, and Glenside.

In summary, the following have been identified as the most serious concerns in the corridor. Any safety and operational solutions for the corridor should be evaluated in terms of how well they can address them.

- Traffic back-ups at Reliez Station Road and Olympic Boulevard
- Traffic back-ups at Reliez Station Road and Beechwood/Andreason
- Side street accessibility, due to sight distance limitations, at Reliez Station Road and Beechwood/Andreason
- Traffic back-ups at Reliez Station Road and Las Trampas/Richell
- Side street accessibility, due to sight distance limitations, at Reliez Station Road and Las Trampas/Richelle
- Traffic back-ups at Reliez Station Road and Glenside

In addition, the following are considered moderate issues that should be addressed, if possible.

- Traffic back-ups at Pleasant Hill Road and Olympic Boulevard
- Speeds at Reliez Station Road and Las Trampas/Richelle

- Heavy truck volumes along Reliez Station Road between Olympic Boulevard and Glenside Drive
- Drivers using Reliez Station Road north of Olympic Boulevard as a bypass route
- Bicycle and pedestrian safety throughout the corridor

**Table 7: Verification of Residents' Top Concerns and Issues through Data Assessment**

| Intersection | | Issue Identified by Residents | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Excessive Speed / Traffic Violations | | Traffic Congestion (Ex. + Future) | | Safety at Intersections | | Side Street Accessibility | | Excessive Truck Traffic | | Traffic Routing/ RSR as a Bypass | | Pedestrian / Bicycle Safety | |
| Measures / Analysis Conducted for Verification | | Resident Input | Speed Data Assessment | Resident Input | Traffic Volume Data / Intersection LOS Assessment | Resident Input | Collision Data Assessment | Resident Input | Sight Distance Assessment | Resident Input | Classification Count Assessment | Resident Input | Traffic Volume Assessment | Resident Input | Traffic Volume / Speed / Collision Data/ Sight Distance Assessment |
| **Assessment Key: [Red = Severe, Yellow = Moderate, Green = Minor]** | | | | | | | | | | | | | | | |
| 1 | Pleasant Hill Rd. / Olympic Blvd. | | Inconclusive, As there is no posted speed limit | | Excessive eastbound queuing and poor LOS in the future | | Verified: four collisions in five years | | Not applicable; all-way stop | | The vehicle counts indicate that some larger trucks are violating the "trucks restricted" sign and using the corridor. However, large truck volume appears low and typical at 1% Single Unit truck volumes may be excessive at 12%. | n/a | Impact of bypassing is likely minimal | | Verified; auto volumes and speeds create potential issue |
| 2 | Olympic Blvd. / Reliez Station Rd. | | | | Verified; LOS F in AM Peak | | Verified; three collisions in five years | | Not applicable; all-way stop | | | | Verified; more trips observed than homes would generate | | Verified; potential issue as entry point to trail and observation that few drivers fully stop |
| 3 | Reliez Station Rd. / Beechwood Dr./ Andreason Ln. | | 85th percentile speed is less than 5 mph over the actual speed limit | | Verified; LOS E in the existing AM Peak and LOS F in the future AM Peak | | Verified; no collisions in five years | | Verified; does not meet Caltrans standards | | | n/a | Not applicable | | Not suitable for cyclists or a pedestrian crosswalk |
| 4 | Reliez Station Rd. / Las Trampas Rd. / Richelle Ln. | | Verified; 85th percentile speed is less than 5 mph over the speed limit | | Verified; LOS F in AM Peak | | Two collisions in five years | | Verified; does not meet Caltrans standards | | | n/a | Not applicable | | Verified; speeds, travel volumes, and grades make this intersection unsafe for pedestrians; limited visibility |
| 5 | Reliez Station Rd. / Glenside Dr. | | Inconclusive | | Verified; LOS F in AM Peak | | Verified; no collisions in five years | | Not applicable; all-way stop | | | n/a | Not applicable | | Verified; auto volumes and speeds create potential issue |

Notes:
[1] Resident Input corresponds to 1) how respondents to the on-line survey ranked issues at each intersection and 2) input gathered from the Community Walks and Community Meeting; "Traffic Routing/Reliez Station Road (RSR) as a Bypass" was not offered as an issue choice in the survey but was raised in the community meeting.