



FINAL MEMORANDUM

Date: December 17, 2010

To: Los Altos City Council

Cc: Chief Tuck Younis and Sgt. Matt Hartley
City of Los Altos Police Department

Jim Gustafson and Tom Ho
City of Los Altos

From: Nikki Hervol, PE and Robert Eckols, PE

Subject: *Blach Neighborhood Traffic Study*

SJ10-1176

The purpose of this memorandum is to summarize the data collection efforts, analysis, and recommendations of the Blach Neighborhood Traffic Study. For this study, Fehr & Peers observed and analyzed the auto, pedestrian and bicycle activity around Blach Intermediate School in Los Altos, California.

Field observations, quantitative and qualitative data, community and key stakeholders' input, and the results of the traffic analysis were taken into consideration to develop a set of recommendations to improve multi-modal circulation in the study area. The following discussion presents the findings and conclusions of the study.

BACKGROUND

Blach Intermediate School is one of two middle schools within the City of Los Altos. Due to the size of the current enrollment (approximately 475 students as of 2009) and the area covered within the school boundaries, there is a high volume of vehicular traffic generated by the school during peak periods when parents drop off or pick up their children. Additionally, there are a large number of students that travel to Blach School by walking, biking or scooting. This combination of vehicles, pedestrians, and bicyclists, along with the rural roadway designs standard in the area, create potential areas where conflicts may occur. Over the past five years several changes have been implemented on the local roadways that were designed to enhance the pedestrian and bicycle visibility and manage driver behavior.

A timeline of these efforts is detailed in **Table 1** and a brief summary of how each affected the study area is included below:

- Eastwood Neighborhood Traffic Management (NTMP) Process – Initiated in 2003 by residents of Eastwood Drive to address cut-through traffic and speed on Eastwood Drive. Resulted in right-turn restriction of northbound right-turns from Miramonte Avenue onto Eastwood Drive during school drop-off times (7:00 AM to 10:00 AM).
- Grant/Levin Housing Traffic Study – Traffic study for the proposed residential development at Grant Road/Levin Avenue (Pumpkin Patch) completed in September

2008. Includes proposal to realign Levin Road to create a fourth leg to the Covington Road/Grant Road intersection.

- Altamead Drive/Carmel Terrace Neighborhood Traffic Management Process (NTMP) Process – Initiated in 2006 by Altamead Drive/Carmel Terrace residents to address vehicular circulation and pedestrian and bicycle safety during school drop off periods. Resulted in one-year trial of a residential parking permit program and no stopping restriction during the morning drop-off period (7:00 – 10:00 am). The no stopping trial began in December 2009, and was extended by the Los Altos City Council pending the results of this study.
- Miramonte School Traffic Study – Traffic study for the proposed expansion of Miramonte School completed in 2008. Includes proposal to realign Levin Road to create a fourth leg to the Covington Road/Grant Road intersection. (The expansion was later dropped.)
- Covington/Miramonte Intersection Striping Proposal – Recommended widening the northbound approach to the Covington Road/Miramonte Avenue intersection. This improvement was not installed due to its potential impacts on school children traveling through the intersection.

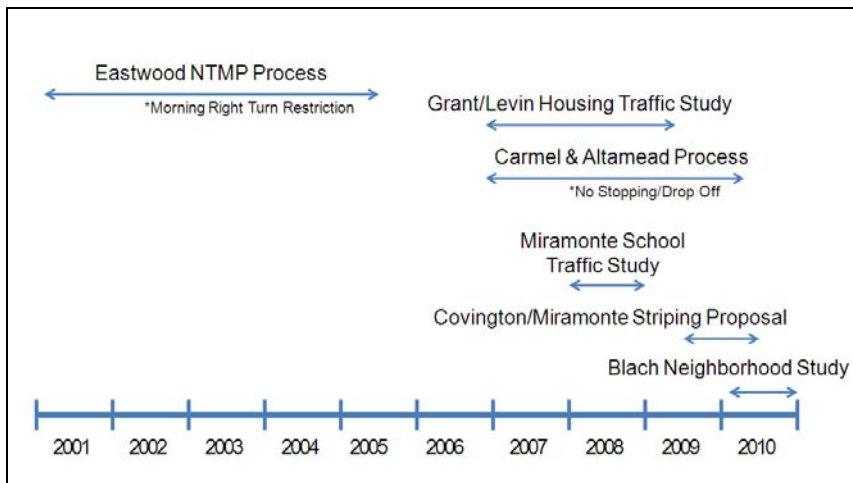


Table 1: Timeline of Prior Studies in Blach Neighborhood Area

Each of these studies and resulting changes were implemented independently; therefore, a comprehensive review of multi-modal school access to and from Blach Intermediate School was needed. In April 2010, the City Council indicated that they wanted to revisit the issue of mobility to and from Blach Intermediate School and the effects on the local traffic patterns, and initiated this project, the Blach School Neighborhood Traffic Study.

The project area for the Blach Neighborhood Traffic Study was defined to be generally bounded by Grant Road on the east, Springer Road on the west, Covington Road on the north, and Portland Avenue on the south. While the focus of the analysis is related to the access to Blach Intermediate School, there is also pedestrian and bicycle activity in the study area by students traveling to other local schools including Miramonte School, Loyola Elementary School, Mountain View High School and Saint Francis High School. The study area is presented on **Exhibit 1**.

Roadways

The following section provides a brief description of each of the key roadways within the study area. **Exhibit 2** presents a map of the study area roadways, and the suggested routes to schools within the area.

Grant Road is a north-south collector street that provides a key north-south connection between El Camino Real (as an extension of State Route 237) in the north to Foothill Expressway (where it becomes St. Joseph Avenue) in the south. North of Levin Avenue, Grant Road is a four-lane roadway, and south of Levin Avenue, it is a two-lane roadway that also forms the city-limit line between the cities of Mountain View and Los Altos. There are sidewalks and Class II bike lanes on both sides of Grant Road from El Camino Real to Levin Avenue. The City of Mountain View is currently completing a project to improve traffic signal coordination and traffic flow on Grant Road. The speed limit on Grant Road is 25 mph.

Miramonte Avenue is a north-south collector street that connects the residential neighborhoods in Los Altos and unincorporated Santa Clara County with the many commercial centers in Mountain View. Four-lanes exist on Miramonte Avenue north of Yardis Court and two-lanes to the south. Sidewalks exist along the east side of Miramonte Avenue and a Class III bike route is present in the vicinity of the study area. The speed limit on Miramonte Avenue is 25 mph.

Covington Road is a two-lane east-west collector street. Covington Road starts at El Monte Avenue in Los Altos and terminates at Grant Road. Blach Intermediate School is located on the south side of Covington Road between Miramonte Avenue and Grant Road. A Class III bike route exists along the entire length of the road. Sidewalks are present along the south side of the roadway within the study area. The sidewalks between Miramonte Avenue and the Blach School entry driveway are in poor condition with sections of asphalt and concrete construction. The speed limit on Covington Road is 25 mph. As part of Grant/Levin Housing Project (located on the Pumpkin Patch site), Levin Avenue will be realigned to connection to Covington Road at Grant Road eliminating the existing off-set intersections.

Portland Avenue is a two-lane east-west roadway that starts at Miramonte Avenue and terminates at Grant Road. A Class III bike route exists along the entire length of the road. The speed limit on Portland Avenue is 25 mph.

Carmel Terrace / Altamead Drive are two-lane roadways that provide access to the residential neighborhood and to both Blach Intermediate and Miramonte Elementary Schools. Carmel Terrace runs north-south, extending from Portland Avenue to Altamead Drive. Altamead Drive runs east-west, extending from Grant Road to Carmel Terrace. A pedestrian bridge is located where Carmel Terrace and Altamead Drive intersection, which provides a connection to the rear entrance of Blach Intermediate School. Sidewalks exist on both sides of Altamead Drive between Miramonte School and Carmel Terrace; no sidewalks are provided between Grant Road and Miramonte School. On the west side of



*Students arriving at Blach School from
Carmel Terrace/Altamead Drive*

Carmel Terrace, a sidewalk with an approximate five foot landscape buffer is provided between Altamead Drive and 1240 Carmel Terrace (approximately 550 feet). South of 1240 Carmel Terrace, a wide unpaved shoulder is provided; however vehicles are frequently parked along the shoulder which obstruct the use of the shoulder as a walking path. The speed limit on both Carmel Terrace and Altamead Drive is 25 mph.

Eastwood Drive is a two-lane north-south roadway that supports provides access to the adjacent neighborhood and carries some school traffic that can access the school from Muir Way. Eastwood Drive extends from Covington Road to Miramonte Avenue. No sidewalks or bike lanes are present along the roadway. The speed limit along Eastwood Drive is 25 mph.

Bicycle and Pedestrian Network

Bicycle facilities comprise bike (or multi-use) paths (Class I), bike lanes (Class II), bike routes (Class III), and bike boulevards. Bike routes are roadways designated for bicycle use with signs only. Bike boulevards are roadways where bicyclists are given priority through designated bike lanes, signage and pavement markings, and movement at intersections with side street stop signs.

Pedestrian access is provided via sidewalks along some sections of the collector streets in the study area, and on the shoulders of other roadways such as Eastwood Drive and the western side of Miramonte Avenue. Unsignalized pedestrian crossings are located on Covington Road in front of Blach School at Thatcher Avenue and Hayman Place, on Carmel Terrace/Altamead Drive at the rear of the school, and on Portland Avenue at Carmel Terrace. The Portland Avenue/Carmel Terrace location is enhanced with a raised crosswalk, high visibility striping and signing, and a crossing guard during school commute times. Controlled marked crosswalks are provided on the east, south, and west legs of Miramonte Avenue/Covington Road intersection and all legs of the Miramonte Avenue/Portland Avenue intersection. Pedestrian signals are provided across Grant Road at Bryant Street and Covington Road.

An informal part of the bicycle network is the short pedestrian and bicycle paths between cul-de-sacs and connecting to schools. These serve an essential commuter function by connecting dead-end roads and closing the gaps in the bikeway network. These connections are one of the most effective ways of increasing the convenience of biking and in some cases can make bicycling even more convenient than driving. The significant reduction in travel time and the ability to stay off higher volume and speed roadways make them attractive to bicyclists of all ages and abilities. Muir Way provides such a connection to Blach School. Bicycle parking at Blach School is placed conveniently near the Muir Way access point.

Each school within the study area has one or more bicycle cage where students' bikes can be parked. Blach Intermediate School has one (1) bike cage at the front of the school near Muir Way, and one (1) cage at the rear of the school near the pedestrian bridge to Carmel Terrace/Altamead Drive.



Bike cage at Blach School in May 2010 was observed to be nearly full

DATA COLLECTION

Data collection for the study consisted of historical data and documents including prior studies and staff reports, collision reports, memoranda, and data collected by the City of Los Altos; volume and speed counts; field observations; and other available data, such as school district boundaries, and key pedestrian generators (schools, parks, retail hubs, etc.). Traffic counts and observations were also provided by the Carmel/Altamead Neighborhood Association (CANA). New traffic data was collected in the study area on three (3) separate occasions during May, July, and October 2010 to review conditions during the school year and summer conditions.

The following section summarizes the data that was collected for this project. The raw traffic data is included as **Attachment A**. A detailed description of the traffic data collected during each period, as well as a summary of the seasonal variation observed and a comparison to historical data, is summarized in **Attachment B**.

Intersection Turning Movement Counts

Peak period intersection turning movement counts (including bicycle, pedestrian, and vehicle volumes) were conducted at three (3) study intersections during morning (7:00 – 9:00 am) and evening (4:00 – 6:00 pm) peak periods. The counts were tallied in 15-minute intervals during each peak period. The following study locations were identified as key inbound and outbound routes to and from Blach School.

- Covington Road / Miramonte Avenue
- Eastwood Drive / Miramonte Avenue
- Covington Road / Grant Avenue

The turning movement counts were conducted on the following dates:

- Wednesday and Thursday, May 19 and 20¹, 2010
- Wednesday, July 28, 2010
- Tuesday, October 19, 2010

In May, counts were conducted on two separate mid-week days (Wednesday and Thursday) to capture a normal start (8:00 am) and a late start (~9:00 am) at Blach School.

The 15-minute traffic data were then aggregated to summarize the volume over the peak one-hour period during the morning and evening survey periods. **Exhibit 3a** presents the May intersection turning movement peak-hour data, **Exhibit 3b** presents the summer (July) data, and **Exhibit 3c** presents the October data.

Average Daily Traffic Counts

Three-day average daily traffic (ADT) counts were collected at the following locations during May, July, and October, as noted:

1. Covington Road, west of Miramonte Avenue (May and July)

¹ Thursday, May 20, 2010 data included potentially abnormal travel patterns due to a field trip for students at Blach School. To ensure typical patterns and behavior were reviewed, traffic data was also collected in October 2010 for comparison purposes.

2. Covington Road, east of Miramonte Avenue (May and July)
3. Covington Road, west of Grant Road (May)
4. Miramonte Avenue, north of Covington Road (May and July)
5. Miramonte Avenue, south of Covington Road (May and July)
6. Portland Avenue, east of Miramonte Avenue (May and July)
7. Portland Avenue, west of Grant Road (May)
8. Eastwood Drive (May and July)
9. Altamead Drive (May and July)
10. Carmel Terrace (July and October)

The locations were identified to capture traffic entering the study area from each of the major gateways; summer data was collected in July to compare school year to summer traffic conditions. The Carmel Terrace location (number 10) was added to the list of study locations in July and October to ensure that any drop-off traffic still occurring on Carmel was accounted for.

Speed data was also collected along with the traffic volumes. **Exhibits 4a** through **4c** present the ADT volumes and 85th percentile speeds on the study roadway segments for the May, July, and October periods, respectively. The 85th percentile speed represents the speed at which 85 percent of vehicles are traveling at or under (i.e., 15 percent of vehicles travel over this speed).

School Year to Summer Traffic Count Comparison

By comparing the counts that were made during the school year (May and October 2010) and the summer (July 2010), the effects of school traffic in the study area can be readily seen. On Covington Road, Miramonte Avenue, and Portland Road, the summer traffic data show a drop in daily traffic of between 21 percent and 35 percent. The absolute drop in traffic was between 1,193 and 1,967 daily trips. These drops reflect the combined effects of summer recess at all the area schools and other vacations that may reduce normal commute traffic. At the intersection of Covington Road/Miramonte Avenue, the reduction in vehicle traffic observed was 56 percent in the morning peak hour, 34 percent during the afternoon (school dismissal period), and 19 percent in the evening peak hour.

On the local residential streets of Eastwood Drive, Carmel Terrace, and Altamead Drive, the percent decreases in traffic were higher than that observed on Covington Road, Miramonte Avenue, and Portland Road. The decrease in traffic between school year and summer conditions ranged between 37 percent and 69 percent. The absolute drop in traffic was between 186 and 641 daily trips. The more dramatic differences observed on the local residential streets indicate the strong influence that the schools have on the travel patterns within the area.

More detail on the traffic data comparison between the school year and summer data, as well as a comparison to historical data, is included in **Attachment B**.

Pedestrian & Bicycle Counts

Manual pedestrian, bicycle, and vehicular drop-off counts were conducted at the locations below during May and October 2010 to capture the number of students arriving at each location and to determine the time distribution of the arrivals. **Exhibit 5a** presents the bicycle/pedestrian counts from May and **Exhibit 5b** presents the bicycle/pedestrian/drop-off counts from October.

- Blach Intermediate School (at entry points on Covington Road east and west of the campus)
- Muir Way
- Pedestrian Bridge Entry from Carmel Terrace/Altamead Drive
- Thatcher Drive from South Drive
- Portland Avenue at Carmel Terrace and Concord Avenue

Collision Data Review

The reported vehicle, bicycle, and pedestrian collisions near the study area were obtained from Statewide Integrated Traffic Reporting System (SWITRS) for the last five (5) years available, January 1, 2005 through December 31, 2009. SWITRS is a database of reported collisions maintained by the California Highway Patrol in Sacramento. They record all reported collisions sent to them by local police departments. These collisions include all injury collisions and may include Property Damage Only (PDO) crashes if they are submitted by the local police departments. These records do not include near misses, over-the-counter reports of collisions, or collisions on private property.

Additionally, some more recent collision records were available from the Los Altos Police Department. These were reviewed as part of the analysis within the study area, but are not summarized in the following statistics, as all collision records are not yet available during the most recent months of 2010 and inclusion would represent an incomplete sample.

Collisions were analyzed by several factors, such as location, crash type, parties involved, age, time of day, and primary collision factor. These collisions were mapped within the study area, and are presented on **Exhibit 6**. Thirty-four collisions were reported within the study area during the analysis period, with the majority of these collisions (32) being vehicle-vehicle collisions. The remaining two (2) included vehicle-bicycle collisions, which occurred at the Covington Road/Hayman Place and Covington Road/Grant Road intersections:

- At Covington Road/Hayman Place, a 73-year old bicyclist was hit when a driver opened the door of a parked car at approximately 8:30am on a Saturday morning in September 2005. The bicyclist was injured, and the motorist was determined to be at fault in this collision.
- At Covington Road/Grant Road, a 12-year old bicyclist was hit by a vehicle making a right-turn at 3:00pm on a Monday afternoon in November 2005. No injuries were reported, and the motorist was determined to be at fault in this collision.

No pedestrian collisions were recorded during the analysis period. Twelve (12) injuries and no fatalities were reported.

A majority of collisions (10 of 32) occurred at the Covington Road/Miramonte Avenue intersection, including five (5) injury collisions. Eight (8) of these collisions were broadside collisions, where a motorist turning collided with a vehicle proceeding straight through the intersection.

Field Observations

Field observations were completed during the morning and evening peak commute periods in May, July, and October 2010. Field visits were focused to observe vehicle, bicycle, and

pedestrian travel patterns, interaction, and behavior. For example, observations are based on how motorists are behaving around pedestrians, and how pedestrians are behaving, especially at intersections or crossings (for example, if pedestrians are crossing at unmarked locations to avoid certain intersections, why might they feel the need to do so?).

Generally, the neighborhood is active: many people were observed walking, biking, and skateboarding. A greater number of bicyclists and pedestrians were observed during the morning school drop-off time than the afternoon school pick up time, but there are pedestrians/bikes present during all periods observed. Field observations are presented on **Exhibit 7** and are summarized below.

Bicycle/Pedestrian Observations

- Majority of students walking and bicycling to Blach Intermediate School use the sidewalk or bike lane to travel towards the school on the south side of Covington Road.



- A narrow sidewalk with poor pavement conditions is present to the east of Blach Intermediate School on the south side of Covington Road.



- Drivers were observed to be aggressive at the Covington Road/ Grant Road intersection during a red light with an adult bicyclist traveling southbound.



- Bike rack full when school is session: more bikes in the bike cage and the rack is overflowing.



- On Covington Road, approximately half of students walk in the street, approximately half walk on unpaved shoulder.



- During rainy days, many drop-offs on south side of Altamead between Carmel and Miramonte School. Some Blach students are dropped-off at Miramonte School to avoid the No Stopping Zone.



Vehicular Traffic Observations

- Heavy vehicle queues were observed at the Covington Road/Miramonte Avenue intersection during the morning peak period. Queues on the northbound approach were 21 or more vehicles; queues on the southbound approach were 20 or more vehicles; queues on the eastbound approach were 41 or more vehicles; and queues at the westbound approach were 15 or more vehicles.



Community Input

The following section summarizes the community input gathered as part of this study. **Attachment C** includes additional detail on the attendees at each meeting and comments provided.

Kick-off Meeting

A joint kick-off meeting with City staff, Blach School teachers and administrators, and neighborhood residents was held on June 2, 2010. The meeting enabled identification of any specific concerns at the School related to access; and review on-site data regarding street geometry, user behavior, parking, and circulation issues with school and City staff and other stakeholders.

A sign-in sheet as well as a summary of key issues discussed at the stakeholder kick-off meeting is presented in **Attachment C**.

Los Altos City Council Meeting

A Los Altos City Council study session was held on June 15, 2010 at the Los Altos High School Auditorium to present the traffic data collected for this study, as summarized in the preceding section. Approximately 100 residents, Blach School students, and teachers attended the meeting to voice their concerns and recommendations for improving access to and circulation around Blach School. Additionally, many residents who could not attend the meeting submitted written comments to the City Council and staff via email. A summary of the concerns described during the meeting and those submitted via email is provided in **Attachment C**. The Council recommendation at this meeting requested that that Blach School study collect summer traffic data (completed in July 2010), and review the entirety of the study area with a 'clean slate' to develop recommendations that would best improve students' safety traveling to and from the school.

Los Altos School Board Meeting

A presentation of the traffic data collected was also given to the Los Altos School Board on September 13, 2010. Residents, parents, and teachers were also given the opportunity to address the Board to voice concerns at this meeting. Approximately 15 attendees highlighted

issues related to traffic and student safety. A summary of the issues described is provided in **Attachment C**.

TRAFFIC ANALYSIS

The following section summarizes the analysis completed using the traffic data collected in the section above.

Intersection Analysis

The operations of the study intersections were evaluated using level of service (LOS) calculations based on the *Highway Capacity Manual* (Chapter 16, Transportation Research Board, 2000) and the Synchro analysis software. This method determines level of service rating based on the average control delay experienced at the intersection. The average delay for signalized and unsignalized (stop-controlled) intersections is correlated to level of service designations as summarized in Table 2.

TABLE 2 INTERSECTION LEVEL OF SERVICE DEFINITIONS			
Level of Service	Description	Signalized Intersection Average Control Delay Per Vehicle (Seconds)	Stop Control Average Control Delay Per Vehicle (Seconds)
A	Little or no delay.	≤ 10.0	≤ 10.0
B	Short traffic delays.	10.1 and ≤ 20.0	10.1 to 15.0
C	Average traffic delays.	20.1 and ≤ 35.0	15.1 to 25.0
D	Long traffic delays.	35.1 and ≤ 55.0	25.1 to 35.0
E	Very long traffic delays.	55.1 and ≤ 80.0	35.1 to 50.0
F	Extreme traffic delays with intersection capacity exceeded.	> 80.1	> 50.0

Source: *Highway Capacity Manual Chapters 16 and 17*, Transportation Research Board, 2000.

To evaluate existing operations, the existing traffic volumes, lane configurations, signal phasing and timings were used as inputs to the LOS calculations. **Exhibits 3a** through **3c** present the peak-hour vehicular, bicycle, and pedestrian volumes at the study intersections using data collected in May, July, and October 2010. The results of the LOS calculations are presented in Table 3, and calculation sheets are included in **Attachment D**.

As shown in Table 3, the Covington Road/Miramonte Avenue intersection operates at LOS E during the morning and LOS D during the evening peak hours during the school year (May and October). During the summer, the intersection operates at LOS B during the morning peak hour, due to reduced vehicle and pedestrian demand. Eastwood Drive/Miramonte Avenue and Covington Road/Grant Road operate at LOS C or better during the morning and evening peak hours during the school year.

TABLE 3 EXISTING INTERSECTION LEVELS OF SERVICE						
Intersection	Traffic Control	Peak Hour	May 2010		July 2010	October 2010
			Wednesday LOS ¹	Thursday LOS ¹	LOS ¹	LOS ¹
1. Covington Road/ Miramonte Avenue	All way stop	AM PM	D D	E D	B -	E -
2. Eastwood Drive/ Miramonte Avenue	Side-street stop	AM PM	B C	B C	- -	B -
3. Covington Road/ Grant Avenue	Signal	AM PM	C B	C C	- -	C -

Notes:
 1 LOS calculations performed using the 2000 *Highway Capacity Manual - Special Report 209* delay methods for signalized and unsignalized intersections using the Synchro software package.

Source: Fehr & Peers, 2010.

Signal Warrants

A signal warrant analysis was conducted for the Covington Road/Miramonte Avenue intersection using the traffic data summarized in the preceding section. This analysis applied the traffic signal warrants recommended in the Federal Highway Administration *Manual on Uniform Traffic Control Devices (MUTCD, 2003)* and associated State guidelines (2010).

Three of the warrants were met, as described below. The worksheets for warrants 1, 2, 3, and 4 and collision data are included in **Attachment E**. The warrant analysis, summarized in Table 4, shows that the four-hour, peak hour, and school crossing warrants are met. The pedestrian warrants from the 2010 California MUTCD, as well as the updated 2009 Federal Highway Administration MUTCD were not met.

TABLE 4 COVINGTON/MIRAMONTE INTERSECTION SIGNAL WARRANT SUMMARY	
Warrant	Met?
Warrant 1: Eight-Hour Volume	No
Warrant 2: Four-Hour Volume	Yes
Warrant 3: Peak-Hour Volume	Yes ¹
Warrant 4: Pedestrian Volume	No
Warrant 5: School Crossing	Yes
Warrant 6: Coordinated Signal System	N/A
Warrant 7: Crash Experience	No
Warrant 8: Roadway Network	N/A

Source: Fehr & Peers, 2010.
¹ Delay criterion for peak hour warrant only applicable to side-street stop controlled intersections. Volume criterion is met.

Walking Audit

In September 2010, a walking audit of the study area was completed by Fehr & Peers with Los Altos Traffic Commissioner Bill Crook. A walking audit serves the key purpose of assessing multi-modal access needs at key locations within the study area. The walking audit made note of pedestrian and bicycle-related facilities, opportunities, and constraints, including but not limited to the following: crosswalks, traffic signals, pedestrian signals, curb ramps, ADA non-compliant facilities, distance of separation between pedestrians and traffic, and signage. Parking patterns, occupancy, vehicle queues, driver behavior and other trends were also observed. The walking audit results are incorporated into the recommendations detailed in the following section.

RECOMMENDATIONS

Based on the traffic data, field observations, walking audit, intersection analysis, and community input, recommendations for improving the main routes to Blach Intermediate School were identified. Recommendations include vehicle, bicycle, and pedestrian improvements; however, an emphasis was placed on improvements that preserve or enhance bicycle and pedestrian access to the School. **Exhibit 8** presents the recommendations in the study area, and the following section summarizes the improvements.

Examples of the treatments are provided in **Attachment F**.

Create New Class 1 Paths

In order to enhance the bicycle and pedestrian safety of students accessing Blach Intermediate School provide two new Class I paths on Covington Road and Carmel Terrace. These paths would separate bicycle-pedestrian traffic from vehicular traffic, and help to reduce wrong-way on-street bicycling.

Covington Road

- Provide a Class I path on the south side of Covington Road between Miramonte Avenue and Blach Intermediate School.
- Tighten corner radius at Blach Intermediate School entrance to slow turning vehicles and widen the sidewalk as it enters the school grounds.
- Covington Road/Eastwood Drive intersection: Tighten corner radii to slow down turning vehicles that cross and conflict with the bicycle-pedestrian traffic.
- Potential impacts: need for additional right-of-way, possible parking restrictions or losses in some locations along route.

Carmel Terrace

- Provide Class I path on west side of Carmel Terrace from Portland Road to Altamead Road.

Covington Road/Miramonte Avenue Traffic Signal

- Build out corners to provide queuing area for students waiting to cross the intersection and preserve the southeast corner area for bicyclists to remount after walking bikes through crosswalk
- Add advanced stop bars to limit vehicle encroachment into the crosswalks
- Install a traffic signal with single-lane approaches and permitted phasing. A traffic signal at this intersection would improve right-of-way control and visibility for pedestrians/bicyclists and reduce delay to motorists. There would still be vehicle queuing at the intersection during the morning and evening peak hours, but overall delay to vehicles would be substantially reduced. The installation of a traffic signal at this intersection should be coordinated with any recommendations coming from the on-going traffic calming study.
 - With signalization, provide crosswalks on all four legs including across north leg (Miramonte Avenue)
 - Consider operating the signal in a rest in an all-red condition so that the current required stop is maintained during low-demand times of day

Eastwood Drive

- Tighten corner radius at Miramonte Avenue/Eastwood Drive intersection
- Add traffic circles at Muir Way and Eastwood Court intersections to slow vehicle traffic and encourage bicycle use
- Consider striping bike lanes or adding shoulder stripe to provide a delineated area to ride and narrow travel lanes to reduce vehicle speeds
- Encourage bicycle access to Blach Intermediate School via Eastwood Drive and Muir Way to reduce the conflicts at the main driveway to the school.
- With these traffic calming improvements and the signalization of Miramonte Avenue/Covington Road, consider lifting morning peak period right-turn restriction from Miramonte Avenue to Eastwood Drive

Altamead Drive

- Enhance existing crosswalk with high visibility crosswalk striping and signing, add refuge median, and provide ADA-compliant curb ramps
- Add bike lanes or shoulder stripe between Grant Road and Blach School entrance to provide delineated area to ride and narrow travel lanes to reduce vehicle speeds

Carmel Terrace/Altamead Drive

Along Carmel Terrace and Altamead Drive, we recommend that the current no stopping restriction be maintained until a Class I path on Carmel Terrace and Altamead Drive striping

improvements (as described above) are constructed and operational. Once these improvements have been installed, if student drop-off is reinstated, u-turn maneuvers will likely need to be addressed. We recommend that the City:

- Remove the no stopping restriction on a trial basis (3 to 6-month period) between the Carmel Terrace/Altamead Drive L-intersection and the edge of the Water District frontage on Altamead Drive (approximately 200 feet)
- Conduct before and after studies to document the changes in travel patterns with the construction of the improvements and removal of the no stopping restriction
- If access and circulation issues are observed in the study, consider the following:
 - Option A: Provide median island on Altamead Drive near rear school entry to delineate a formal drop-off area on either side of Altamead Drive just east of the existing crosswalk
 - Requires widening this section of Altamead Drive
 - Requires parking restriction in drop-off area
 - Consider student valet for drop-offs
 - Option B: Restore the no stopping restriction during the morning peak period
- Improvements noted in the Grant Road section below, including possible signalization of Grant Road/Portland Avenue, may also help alleviate focused traffic congestion on Carmel Terrace and Altamead Drive during the school peaks

Miramonte Avenue

- A sidewalk with landscape buffer currently exists on the eastern side of Miramonte Avenue between Portland Avenue and Eastwood Drive; however, north of Eastwood Drive, no sidewalk is provided, and in places, minimal shoulder width exists to provide a clear walking path. Extending the sidewalk on the east side of Miramonte Avenue from Eastwood Drive to Covington Road is recommended; at a minimum, the shoulder should be widened to provide a clear walking path outside the travel lane.
- At Berry Avenue, install a high visibility crosswalk with refuge median island, advanced pavement legends, advanced signage, and pole-mounted pedestrian-actuated flashing beacon. This crosswalk would provide a connection to Loyola Elementary School, and should tie in with the existing Class I path on the south side of Berry Avenue. This recommendation should be coordinated with the ongoing traffic calming study.
- At Portland Avenue, bulb out the southeastern corner to provide a queuing area for pedestrian traffic

Portland Avenue

- Runnymede Drive/Heritage Oaks Park

- Provide high visibility crosswalk to serve pedestrians accessing Heritage Oaks Park
- Extend existing median through the off-set Runnymede Drive/McKenzie Avenue intersection which will enhance pedestrian safety and provide a better visual queue for drivers approaching the tree located in the median.
- Buckingham Drive consider the following improvements to enhance pedestrian accommodation
 - Shift Buckingham Drive stop-bar back to behind pedestrian crossing
 - Consider reconfiguring intersection as noted in **Exhibit 8**

Grant Road

- Provide Class I path on west side between Altamead Drive and Bryant Avenue to accommodate bicyclists access Mountain View High School
- Portland Road/Grant Road – Work with the City of Mountain View to determine if this intersection could be signalized and added to the signal system on Grant Avenue. Signalizing this intersection would reduce the potential of traffic using Carmel Terrace and Altamead Road as an alternative route to Mountain View High School or bypass the congestion at Grant Road/Bryant Avenue during school peaks.
- At Covington Road, add advanced stop bars to discourage vehicle encroachment into crosswalks.

PRIORITIZATION AND COST

The previous section described each of the recommendations within the study area, to present the system-wide improvements and provide context for each individual improvement. However, all of the improvements together represent a large financial investment, as well as potentially extensive modifications to traffic behavior and patterns. We recommend that the improvements be phased to implement the highest priority improvements first, and implement later phases as needed within the study area. The following section details the relative prioritization and cost of each of the improvements recommended.

Improvements Included as Part of Other Projects

Several of the improvements recommended above are planned for implementation or further evaluation as part of other ongoing projects, including the City's Safe Routes to Schools program, the Citywide Traffic Calming Master Plan, and the Citywide Bicycle Master Plan Update. Table 5 below summarizes the improvements that have been identified as part of other ongoing projects. While some of the recommendations listed below are also identified in this study, others will further enhance the pedestrian and bicycle access to Blach Middle School.

TABLE 5 ONGOING PROJECTS SUMMARY		
LOCATION	RECOMMENDATION	STATUS
Grant Road	<ul style="list-style-type: none"> Provide Class I path on west side between Altamead Drive and Bryant Avenue 	<ul style="list-style-type: none"> Planned for implementation as part of Safe Routes to Schools program and identified as a long-term project in the City's Draft Bicycle Transportation Plan Update
Covington Road	<ul style="list-style-type: none"> Enhance existing crosswalks to raised Median between Miramonte Avenue and Hayman Place 	<ul style="list-style-type: none"> Proposed as part of the Draft Citywide Traffic Calming Master Plan project
Miramonte Avenue	<ul style="list-style-type: none"> Mini-roundabout at Eastwood Drive Raised intersection at Berry Avenue Class I path on east side between Fremont Avenue to northern City limit 	<ul style="list-style-type: none"> Proposed as part of the Draft Citywide Traffic Calming Master Plan project Proposed as part of the Draft Citywide Traffic Calming Master Plan project Proposed as a mid-term project in the City's Draft Bicycle Transportation Plan Update
Carmel Terrace	<ul style="list-style-type: none"> Class I Path 	<ul style="list-style-type: none"> Proposed as a long-term project in the City's Draft Bicycle Transportation Plan Update
Altamead Drive	<ul style="list-style-type: none"> Class III Bike Route 	<ul style="list-style-type: none"> Proposed as a long-term project in the City's Draft Bicycle Transportation Plan Update
Source: Compiled by Fehr & Peers, December 2010. Draft Citywide Traffic Calming Master Plan and Draft Bicycle Transportation Plan Update.		

Tier 1: High Priority Improvements

The first level of improvements, those that have the largest impact to student's safety and circulation, are recommended as part of Tier 1. These infrastructure improvements address the most critical circulation issues and concerns, as well as high-collision locations. Tier 1 improvements are detailed below.

TABLE 5 TIER ONE IMPROVEMENTS SUMMARY			
LOCATION	RECOMMENDATION	CONCERN ADDRESSED	COST ESTIMATE
Carmel Terrace	<ul style="list-style-type: none"> Provide Class I path on west side 	<ul style="list-style-type: none"> Separates bicycle and pedestrian traffic from vehicle traffic. Wrong way bicycle riding and scooting. 	\$292,000

**TABLE 5
 TIER ONE IMPROVEMENTS SUMMARY**

LOCATION	RECOMMENDATION	CONCERN ADDRESSED	COST ESTIMATE
Covington Road	<ul style="list-style-type: none"> Provide Class I path on south side 	<ul style="list-style-type: none"> Separates bicycle and pedestrian traffic from vehicle traffic. Wrong way bicycle riding and scooting. 	\$276,000
Covington Road/ Miramonte Avenue	<ul style="list-style-type: none"> Install 2-phase traffic signal. Add crosswalk across north leg. Add advanced stop bars. Build out corners to improve pedestrian and bicycle storage areas. Rest signal in all-red during off-peak times. 	<ul style="list-style-type: none"> Improve traffic flow and reduce vehicular delay. Improve intersection right-of-way control and driver yielding. Batch pedestrian crossings. Resting in all-red reduces potential for speeding through the intersection on major street approaches. 	\$150,000 for signal \$1,500 for crosswalk striping \$2,200 for advanced stop bars \$20,000 for corner improvements
Altamead Drive	<ul style="list-style-type: none"> Add shoulder stripe or bike lanes between Grant Road and Carmel Terrace 	<ul style="list-style-type: none"> Narrow travel way for vehicular traffic, encouraging reduced speeds. Delineate area for bicycle travel. Provide connection to Blach, MVHS, and Miramonte School. 	\$18,900
Portland Avenue/ Buckingham Drive	<ul style="list-style-type: none"> Relocate stop bar on Buckingham Drive to behind pedestrian crossing 	<ul style="list-style-type: none"> Vehicles currently travel through crossing area before stopping, creating a potential conflict with pedestrians 	\$400

Source: Fehr & Peers, December 2010.

Cost estimates include 40% markup for design, traffic control and mobilization, and contingencies.

Tier 2: Medium-Priority Improvements

The second level of improvements, those that have a mid-range impact on student safety and circulation, are recommended as part of Tier 2. These infrastructure improvements address the next level of circulation issues and concerns, and complement the improvements identified in Tier 1. Before Tier 2 improvements are implemented, it is recommended that the City assess the efficacy of the Tier 1 improvements, and consider reprioritizing the Tier 2 and Tier 3 improvements. Tier 2 improvements are detailed below.

**TABLE 6
 TIER TWO IMPROVEMENTS SUMMARY**

LOCATION	RECOMMENDATION	CONCERN ADDRESSED	COST ESTIMATE
Miramonte Avenue	<ul style="list-style-type: none"> Extend east side sidewalk from Eastwood Drive to Covington Road At Portland Avenue, bulb out the southeast corner and add advanced stop bars 	<ul style="list-style-type: none"> Provide space for pedestrians to walk Provide queuing area for pedestrian traffic 	\$89,000 for sidewalk \$21,000 for corner improvements
Eastwood Drive	<ul style="list-style-type: none"> Tighten corner radii at Miramonte Avenue and Covington Road Add shoulder stripe or bike lanes 	<ul style="list-style-type: none"> Slows vehicle speeds entering Eastwood Drive Provide space for bicyclists, slow vehicle speeds 	\$50,000 for corner improvements \$14,600 for striping
Blach Intermediate School Entrance	<ul style="list-style-type: none"> Tighten corner radius at western driveway on Covington Road Widen sidewalk on west side of parking lot 	<ul style="list-style-type: none"> Slow vehicles turning onto school property Improve circulation for students walking onto campus 	\$21,000 for corner improvements \$24,900 for sidewalk
Altamead Drive	<ul style="list-style-type: none"> Enhance existing crosswalk at Miramonte School with high visibility striping and signing, add refuge island, and provide ADA-compliant curb ramps 	<ul style="list-style-type: none"> Improves visibility of existing crosswalk Median serves dual purpose of pedestrian refuge and traffic calming device Curb ramps provide accessible crossing 	\$7,600 for crosswalk \$17,500 for median \$8,700 for ramps
Covington Road/ Grant Road	<ul style="list-style-type: none"> Add advanced stop bars 	<ul style="list-style-type: none"> Discourages vehicle encroachment into crosswalk 	\$1,100
Portland Avenue/ Runnymede Drive	<ul style="list-style-type: none"> Install high visibility crosswalk Extend median through Runnymede/McKenzie 	<ul style="list-style-type: none"> Provide crossing opportunity serving Heritage Oaks Park Median serves dual purpose of pedestrian refuge and traffic calming device, improves visibility of /protection of tree 	\$7,600 for crosswalk \$21,700 for median

Source: Fehr & Peers, December 2010.

Cost estimates include 40% markup for design, traffic control and mobilization, and contingencies.

Tier 3: Low-Priority Improvements

The third level of improvements includes those that have a long-range impact on student safety and circulation. These infrastructure improvements address the next level of circulation issues

and concerns, and installation of the improvements identified in Tiers 1 and 2. Before Tier 3 improvements are implemented, it is recommended that the City assess the efficacy of the prior improvements, and consider reprioritizing those remaining. Tier 3 improvements are detailed below.

TABLE 7 TIER THREE IMPROVEMENTS SUMMARY			
LOCATION	RECOMMENDATION	CONCERN ADDRESSED	COST ESTIMATE
Miramonte Avenue	<ul style="list-style-type: none"> • At Berry Avenue, install high visibility crosswalk with: <ul style="list-style-type: none"> ○ Median refuge island ○ Advanced pavement legends and signage ○ Pole-mounted pedestrian-actuated flashing beacon 	<ul style="list-style-type: none"> • Channels pedestrians from Berry to east side of Miramonte Avenue, with existing sidewalk • Median provides traffic calming benefits • Provides connection to Class I path on Berry Avenue 	\$10,800 for striping \$17,500 for median \$3,800 for advance signs and markings \$8,700 for beacon
Portland Avenue/ Buckingham Drive	<ul style="list-style-type: none"> • Consider reconfiguring the intersection per Exhibit 8 	<ul style="list-style-type: none"> • Vehicles traveling through pedestrian path 	\$8,400
Eastwood Drive	<ul style="list-style-type: none"> • Add traffic circles at Muir Way and Eastwood Court 	<ul style="list-style-type: none"> • Slow vehicle traffic to minimize conflicts with bicycles 	\$33,600
Grant Road/ Portland Road	<ul style="list-style-type: none"> • Work with Mountain View to evaluate potential signalization 	<ul style="list-style-type: none"> • Reduce cut through traffic on Carmel Terrace/ Altamead Drive 	\$15,000 for study
Source: Fehr & Peers, December 2010. Cost estimates include 40% markup for design, traffic control and mobilization, and contingencies.			