

afternoon pick-up periods. The mitigation measures described below are recommended in order to address significant traffic impacts of the project.

### Study Intersection Improvements

The following study intersection improvements are recommended for implementation by the project:

- Washington Boulevard and Garfield Avenue – Install a traffic signal at this location. A traffic signal warrant analysis was performed based on information contained in the Manual on Uniform Traffic Control Devices (MUTCD), 2003 Edition and the MUTCD 2003 California Supplement, May 20, 2004. The analysis shows that traffic volumes at this two-way STOP sign-controlled intersection will warrant a traffic signal. Appendix E contains the traffic signal warrant worksheets for this location.
- Washington Boulevard and Los Robles Avenue – Participate in the funding of the Traffic Management System (TMS) that may include the following features:
  - Upgrade Transportation Management Center hardware, software, and monitoring equipment;
  - Expand Intelligent Transportation System (ITS) components, such as CCTV and Changeable Message Signs (CMS);
  - Expand the City's communication/fiber-optic backbone;
  - Install additional arterial loop detectors (system loops); and
  - Deploy traffic monitoring network in residential neighborhoods.

Implementation of the above mitigation measures would reduce the significant project traffic impacts at the two study intersections to a less than significant level.

### Street Segment Improvements

The following traffic mitigation measures are recommended in response to the project's street segment impacts:

- o No. 1 Howard St. between Garfield Ave. and Los Robles Ave. – PCS will implement a Transportation Demand Management (TDM) program to the satisfaction of the City of Pasadena.
- o No. 2 Garfield Ave. between Howard St. and Washington Blvd. – PCS will implement a Transportation Demand Management (TDM) program to the satisfaction of the City of Pasadena.

### Parking Management and Drop-off/Pick-up Procedure Improvements

In addition, due to the existing queuing of vehicles off-site on Garfield Avenue south of the Garfield lot driveway during the morning drop-off and afternoon pick-up periods, it is recommended that PCS implement a Parking and Drop-off/Pick-up Plan in order to provide adequate queuing capacity on the project site. The Parking and Drop-off/Pick-up Plan shall be prepared by one of the City's pre-qualified traffic consultants. Pasadena Christian School may retain services directly with this consultant. The preparer shall coordinate with the Department of Transportation for required information to be included into the submittals.

Project traffic impacts were also analyzed for Congestion Management Program (CMP) locations. No significant regional traffic impacts were determined for the CMP monitoring intersections or freeway locations.

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## **SECTION 1.0: INTRODUCTION**

The project under consideration is a Master Development Plan (MDP) for the Pasadena Christian School (PCS) located in the northern portion of the City of Pasadena. The project site is bounded by Los Robles Avenue to the east, Garfield Avenue to the west, Howard Street to the north, and existing multi-family residential uses to the south. The Foothill Freeway (I-210) is located less than one mile west of the project site.

The City of Pasadena has retained Crain & Associates to conduct a traffic study to assess the impacts of the project development on the surrounding street system. This report presents the results of an analysis of existing conditions as well as estimated future traffic conditions before and after completion of the project during the AM peak hour and afternoon school-peak hour.

## SECTION 2.0: PROJECT DESCRIPTION

The project is a Master Development Plan (MDP) for the re-development of the existing PCS site located at 1515 Los Robles Avenue in the northern portion of the City of Pasadena. The MDP proposes to upgrade and expand the existing PCS site (K-8 private school with a preschool) that involves the addition of approximately 46,240 square feet of classroom, library/media center, administrative, and multipurpose uses and the removal of approximately 16,309 square feet of existing building uses. Once completed, the proposed project will result in a total increase of 105 students. The MDP is scheduled for completion in three phases. These phases are described in detail below.

Phase 1 includes the addition of a new library/media center and one classroom within an approximately 6,600 square foot single-level structure. In order to accommodate this new construction, an existing house, garage, and storage shed located at 396 Howard Street will be demolished. Phase 1 of the project will not increase the student or staff population.

Phase 2, which includes the addition of 7 classrooms within 2 new single-story structures and a second-story addition to an existing building, will increase the student population capacity by 105 students as Kindergarten through grade 6 will each add a class and reduce the number of students per class from 30 to 25 students. Also, a new covered lunch area will be added to the elementary school, the rear of an existing house located at 1464 Garfield Avenue will be expanded to accommodate the relocation of the Maintenance and Operations department, an existing house at 1472 Garfield Avenue will be demolished in preparation for a new bus parking area for the three school-owned buses, and the existing Auditorium/Multi-Purpose building will be expanded to include a full-size (junior high

level) basketball court, a stage for musical and dramatic student productions, and support areas for these functions.

Phase 3 of the project will involve the demolition of the existing junior high classrooms and supporting facilities, as well as the existing administration offices. A new two-level structure will be built to house the junior high classrooms and a portion of the administrative offices. An addition to the rear of the houses located at 1533 and 1545 Los Robles Avenue, along with the renovation of these two houses will support the remainder of the administrative offices. In addition, a new campus main entrance and parking facility will be constructed. This new parking facility will replace the main parking lot and campus entrance at 1515 North Los Robles Avenue.

### **Environmental Settings**

The proposed project site is located in the northern portion of the City of Pasadena. The project site is bounded by Los Robles Avenue to the east, Garfield Avenue to the west, Howard Street to the north, and existing multi-family residential uses to the south as shown in Figure 1, Project Site Vicinity Map. The area surrounding the project site is primarily developed with single-family residential uses to the north and east and multi-family residential uses to the south and west. In addition, educational institution uses exists about one block west of the project site. In the project vicinity, the Foothill Freeway (I-210) is located less than one mile west of the project site. An overview of the project's effect on the site and surrounding area is described in Figure 2, Master Plan.



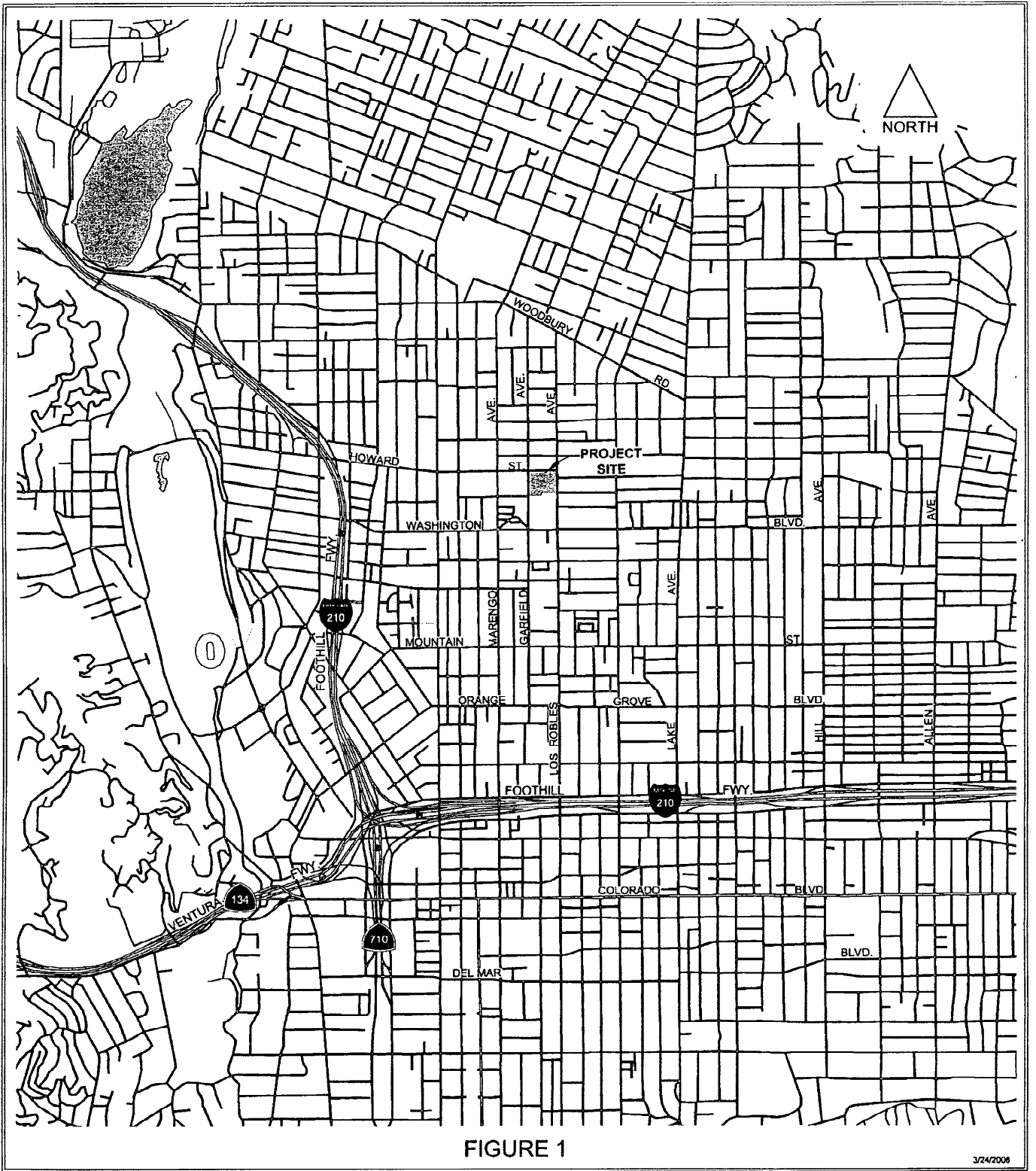


FIGURE 1

3/24/2008

FN-PASADENA CHRISTIAN SCHOOL 2008-03 SITE VINC

PROJECT SITE VICINITY MAP

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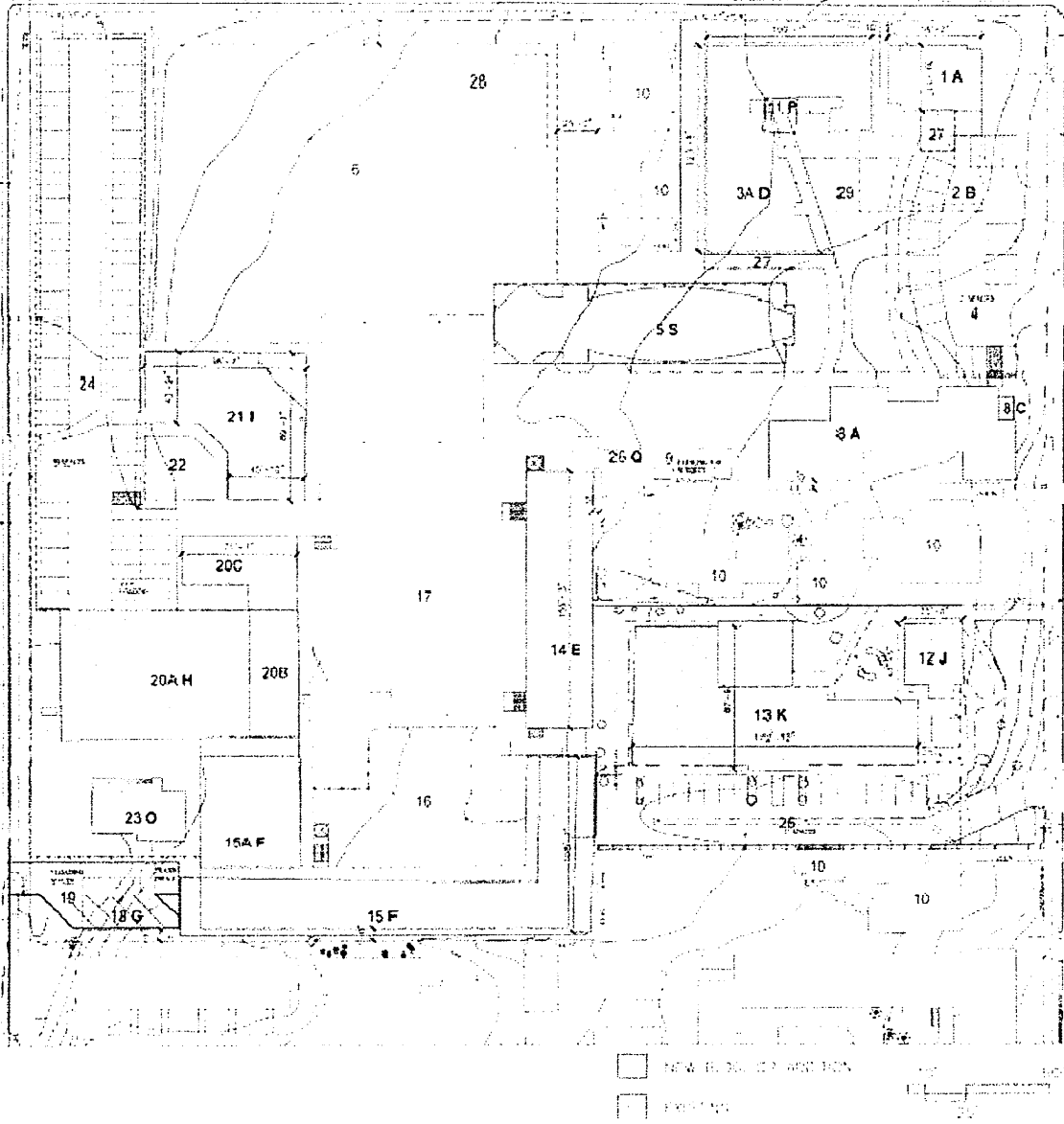


FIGURE 2

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PN PASADENA CHRISTIAN SCHOOL 2008-03 SITE PLAN

# PASADENA CHRISTIAN SCHOOL MASTER PLAN

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### **Study Intersections**

Crain & Associates, in conjunction with the City of Pasadena traffic engineering staff, identified eight intersections in the City of Pasadena to be analyzed with regard to the potential traffic impacts of the proposed project. These study intersections are within an area near the project site, and as such are expected to be most directly impacted by project-related traffic. The study intersections are listed below:

<b><u>No.</u></b>	<b><u>Intersection</u></b>
-------------------	----------------------------

- |   |  |
|---|--|
| 1 | Howard Street and Marengo Avenue [1]           |
| 2 | Howard Street and Garfield Avenue [2]          |
| 3 | Howard Street and Los Robles Avenue [3]        |
| 4 | Washington Boulevard and Marengo Avenue [3]    |
| 5 | Washington Boulevard and Garfield Avenue [2]   |
| 6 | Washington Boulevard and Los Robles Avenue [3] |
| 7 | Washington Boulevard and El Molino Avenue [3]  |
| 8 | Mountain Street and Los Robles Avenue [3]      |

- |     |   |
|-----|---|
| [1] | Four-way stop sign-controlled intersection. |
| [2] | Two-way stop sign-controlled intersection.  |
| [3] | Signalized intersection.                    |

### **Study Street Segments**

In addition, in conjunction with the City of Pasadena traffic engineering staff, Crain & Associates identified four study street segments to be analyzed with regard to the potential traffic impacts of the proposed project. These study street segments are located adjacent to or within an area near the project site, and as such are expected to be most directly impacted by project-related traffic. The study street segments are listed below. Figure 3 shows the locations of the study intersections and street segments.

**No.   Street Segment**

- 1   Howard Street between Garfield Avenue and Los Robles Avenue
- 2   Garfield Avenue between Howard Street and Washington Boulevard
- 3   Los Robles Avenue between Howard Street and Washington Boulevard
- 4   Washington Boulevard between Garfield Avenue and Los Robles Avenue

**Project Access and Circulation**

Vehicular access to the school parking facilities is currently provided via a driveway on Garfield Avenue, a driveway on Howard Street and two driveways on Los Robles Avenue. The driveways on Garfield Avenue and Howard Street provide access to the Garfield parking lot located on the northwestern portion of the school site. The Garfield lot is used by school employees who park in this facility and by parents who drop off and pick up the students in the lot during the morning 8:00 AM to 8:30 AM and afternoon 3:00 PM to 3:30 PM periods. School employees access the Garfield lot via the Howard Street driveway where an "Entrance for Employees Only" sign is posted at the driveway entrance. Full left- and right-turn access is allowed at this driveway. For student drop-off and pick-up on site, vehicles enter the gate via Garfield Avenue in the northbound direction only and must exit using the driveway on Howard Street. The school has monitors stationed in the parking lot and driveway entrance during the drop-off and pick-up periods to ensure that traffic circulation is controlled and orderly.

Along Los Robles Avenue, the two site driveways serve the campus main entrance lot and preschool lot. The existing campus main entrance lot is for school employees and visitors. Vehicular access is located approximately 200 feet south of the Los Robles Avenue/Howard Street (west leg) intersection. The MDP will replace the campus main entrance lot with a new parking facility. Vehicular access for the new facility will be

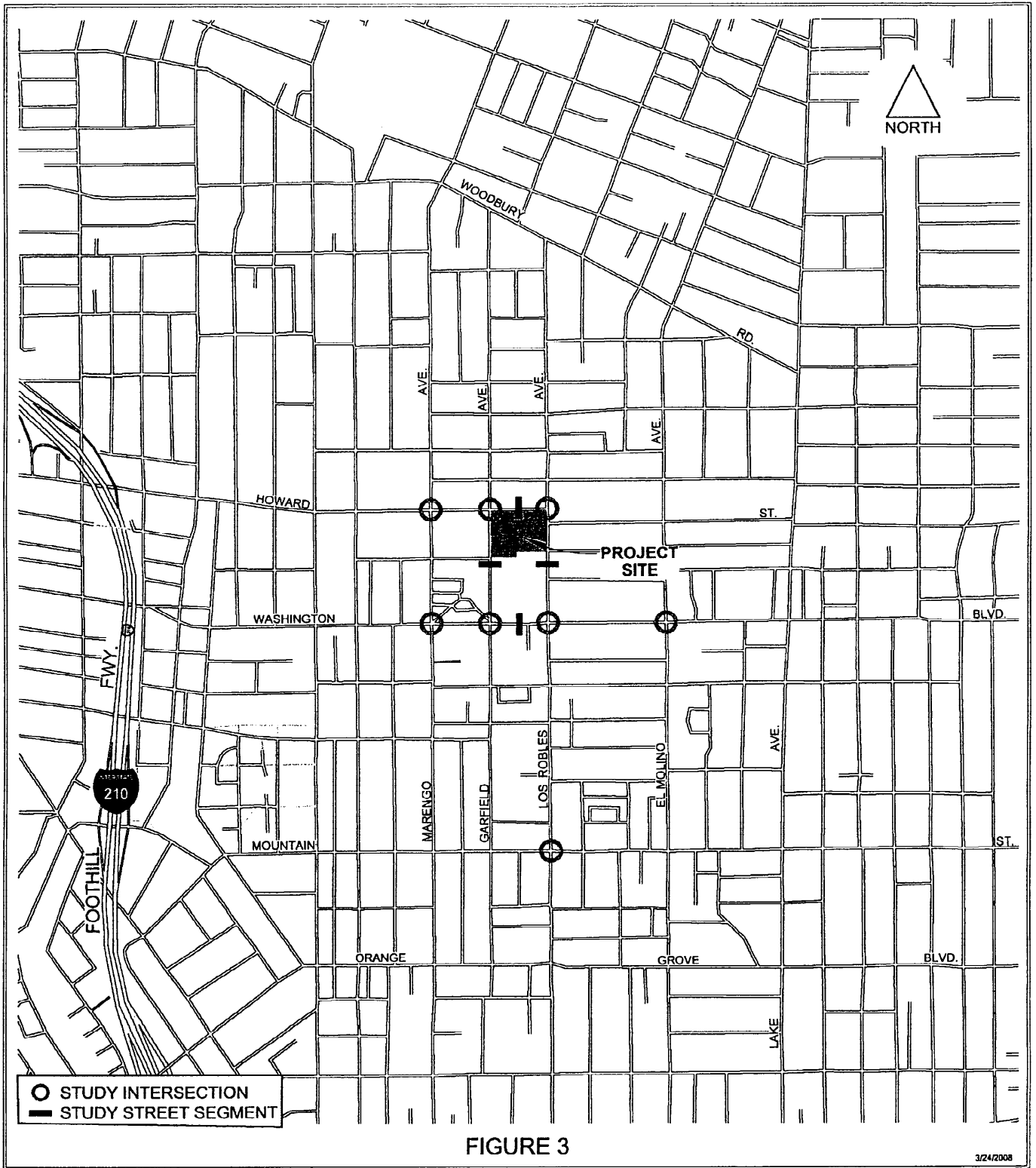


FIGURE 3

3/24/2008

FN-PASADENA CHRISTIAN SCHOOL 2008-03 STUDY-INTS

STUDY INTERSECTION AND STREET SEGMENT LOCATIONS

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**ASSOCIATES**

Transportation Planning  
 Traffic Engineering  
 2007 Sawtelle Boulevard  
 Los Angeles, California 90025  
 PH (310) 473 6500 F (310) 444 9771  
[www.crainandassociates.com](http://www.crainandassociates.com)

available via a driveway located approximately at the same location as the existing driveway and a second driveway located approximately 130 feet south of the Los Robles Avenue/Howard Street (west leg) intersection. The driveway that provides access to the preschool lot is located approximately 500 feet south of the Los Robles Avenue/Howard Street (west leg) intersection. The preschool lot is used by parents who are required to park and sign their children into the preschool. School access, with the exception of two driveways instead of one driveway for the new Campus main entrance lot, will not change as a result of the MDP. In addition, the MDP proposes a new parking facility containing five loading spaces. This parking facility will be located on the southwestern portion of the school site with access available via a new driveway on Garfield Avenue.

### SECTION 3.0: EXISTING SITE ACCESS AND CIRCULATION

The project site is served by a network of roadways that run both north/south and east/west. In the project area, primary north-south access to the project site is provided via Los Robles Avenue. Secondary north-south access is provided via Marengo Avenue, Garfield Avenue and El Molino Avenue. Primary east-west access to the project site includes Howard Street and Washington Boulevard, with secondary east-west access provided via Mountain Street.

Regional access to the project site is available via the Foothill (I-210) and the Ventura (SR-134) Freeways. A short segment of the Long Beach (SR-710) Freeway also serves the project vicinity. The interchange of the Foothill, Ventura and Long Beach Freeways is located approximately 1.5 miles southwest of the project site. The freeways and the primary and secondary access roadways are described below.

#### Freeways

- o The Foothill Freeway (I-210) extends easterly across the San Gabriel Valley to the City of Glendora where it continues easterly as the State Route 210 Freeway. The freeway also extends in the northwest direction to the San Fernando Valley. In the vicinity of the project, the Foothill Freeway generally provides four mainline lanes per direction west of the project site near Washington Boulevard and four to six mainline lanes plus one high-occupancy-vehicle (HOV) lane per direction east of the project site.
- o The Ventura Freeway (SR-134) extends in an east-west direction from its interchange with the Foothill and Long Beach Freeways to approximately 13.5 miles west of the project site where it continues westerly as U.S. Highway 101. It also provides an interchange with the Golden State Freeway (I-5) and the Glendale

Freeway (SR-2). The Ventura Freeway generally provides four mainline lanes per direction and one HOV lane per direction in the vicinity of the project.

- o The Long Beach Freeway (SR-710) provides a full interchange with the Foothill (I-210) and Ventura (SR-134) Freeways. This freeway terminates approximately 0.75 mile south of the I-210/SR-134/SR-710 freeway interchange where it connects with Saint John Avenue in the southbound direction and Pasadena Avenue in the northbound direction. The freeway resumes to the south as Interstate 710 at Valley Boulevard in the City of Alhambra. In the project area, the Long Beach Freeway generally provides two to three lanes per travel direction.

### **Streets and Highways**

- o Los Robles Avenue is a north-south principal arterial that forms the eastern boundary of the project site and is a "Multimodal Corridor" north of Del Mar Boulevard. Los Robles Avenue extends from Woodbury Road about 0.5 mile north of the project site to Huntington Drive where it becomes Atlantic Boulevard. In the vicinity of the project it has one vehicular travel lane per direction, a two-way left turn lane and an enhanced bike route that includes a 4" white edgeline and "Bike Route" signage in both directions. Parking is generally allowed.
- o Washington Boulevard is a designated east-west minor arterial in the project vicinity and a "De-emphasized Street" within the City of Pasadena. This roadway extends from about 1.5 mile west of the project site near the Rose Bowl to about 3.0 miles east of the project site where it terminates and aligns with Eaton Drive at Sierra Madre Boulevard. Within the project vicinity, Washington Boulevard generally accommodates two through traffic lanes in each direction and provides an enhanced bike route that includes a 4" white edgeline and "Bike Route" signage. Parking is generally allowed.



- o Marengo Avenue is a north-south minor arterial located about 0.1 mile west of the project site. Marengo Avenue extends southerly from the Altadena community to about 3.5 miles south of the project site where it bends southeasterly and intersects Los Robles Avenue. In the project area, Marengo Avenue provides one travel lane per direction, except between Washington Boulevard and Crystal Lane where it is a one-way roadway in the northbound direction. Parking is generally allowed on the east side of the street but is restricted on the west side of the street north of Washington Boulevard.
- o El Molino Avenue is a north-south minor arterial that extends from the Altadena community on the north to Huntington Drive on the south. Within the City of Pasadena limits, El Molino Avenue is designated as a “De-emphasized Street.” In the project area, this roadway generally has one travel lane in each direction. However, at its intersection with Washington Boulevard, the southbound approach of El Molino Avenue south of Washington Boulevard is prohibited via a raised barrier. Parking is generally allowed on the west side of this street, but restricted on the east side of the street at Washington Boulevard.
- o Mountain Street is an east-west minor arterial and collector street west and east of Lake Avenue, respectively. This roadway is located about two-third mile south of the project site and extends from Lincoln Avenue to Altadena Drive. It has one travel lane per direction in the project area. At Los Robles Avenue, parking is generally allowed on the south side of the street only.
- o Howard Street is an east-west collector street and the northern boundary of the project site. To the west, through traffic is restricted on Howard Street by two gates located east of Raymond Avenue and west of Marengo Avenue where Washington Middle School is located. Speed humps are present between Marengo Avenue and

Garfield Avenue. Adjacent to the project site, Howard Street jogs at Los Robles Avenue. A traffic signal exists at the intersection of Los Robles Avenue and the west leg of Howard Street. Howard Street provides one vehicular travel lane per direction and is classified as a Class III Bike Route. Parking is generally allowed, except on the south side of Howard Street adjacent to the project site where it is prohibited on school days between 7:00 AM and 5:00 PM.

- o Garfield Avenue is a north-south local street that forms the western boundary of the project site. It provides one travel lane per direction. The intersection of Garfield Avenue and Howard Street is two-way stop sign-controlled. Parking is generally allowed, except on the east side of Garfield Avenue adjacent to the project site where it is prohibited on school days between 7:00 AM and 5:00 PM.

### **Public Transit**

The Los Angeles County Metropolitan Transportation Authority (Metro) serves the Pasadena area and has two transit routes that operate within the vicinity of the project site. This service is supplemented by the City of Pasadena's Area Rapid Transit System (ARTS), which links local residential neighborhoods to the Downtown area of Pasadena. Several of these transit routes currently provide either direct access to PCS, or are within short walking distance of the project site. These routes are described in further detail below.

- o Metro Line 687 is a north-south route that operates between Altadena and the City of Pasadena. Line 687 operates along Los Robles Avenue in the project area. Adjacent the project site, this line stops at Howard Street and at Ladera Street (northbound service only). Further to the south, this line also stops at Washington Boulevard. The average headway is about 20 minutes during the peak hours and about 30 minutes during the off-peak hours.

- o Metro Line 268 operates in a east-west direction from the City of El Monte to the City of La Canada Flintridge. This bus route passes through the cities of Arcadia, Sierra Madre and Pasadena, and the Altadena community. Near the project site, the closest stops are located on Washington Boulevard at Los Robles Avenue and Marengo Avenue. This bus operates with an average headway of approximately 30-45 minutes during the peak hours and about 60 minutes during the off-peak hours.
- o Pasadena ARTS Route 31/32 is a community circulator bus operated by the City of Pasadena. These routes service between northwest Pasadena and the Sierra Madre Village Station. In the project area, these routes operate in an east-west direction on Washington Boulevard with the closest stops to the project site at Los Robles Avenue and Marengo Avenue. The hours of operation are between 6 AM and 8 PM on the weekdays, between 11 AM and 8 PM on Saturday, and between 11 AM and 5 PM on Sunday. The average headway is approximately 30 minutes.

Appendix C shows photographs of the bus stops for Metro Lines 268 and 687 and for the Pasadena ARTS Routes 31/32 that are closest to the project site. Bus stop amenities such as covered and non-covered benches and trashcans are depicted on the photographs.

In the project area, pedestrian access and amenities from the nearby bus stops to the project site are provided at the signalized intersections along Los Robles Avenue and Washington Boulevard. At the intersection of Los Robles Avenue and Howard Street (west leg), crosswalks are present on the south side crossing Los Robles Avenue and on the west side crossing Howard Street. Pedestrian push buttons are located at the crosswalks of this location. At the intersection of Washington Boulevard and Marengo Avenue, crosswalks are present on the east side crossing Washington Boulevard and on the north and south sides crossing Marengo Avenue. Pedestrian push buttons are

provided at the crosswalk on the east side crossing Washington Boulevard. For the intersection of Washington Boulevard and Los Robles Avenue, crosswalks are present on all four sides, but pedestrian push buttons are not available at this location. ADA compliant wheelchair ramps are provided at the crosswalks of these three signalized intersection locations.

In summary, there are currently several opportunities by which to reach the project and travel from the project to outside destinations via public transit. When transfer opportunities are considered, much of the Los Angeles metropolitan area is linked to the project via the bus routes that operate near the project site.

## SECTION 4.0: TRAFFIC IMPACT ANALYSIS METHODOLOGY

This section describes the methodology used to analyze the study intersection locations.

### **Impact Criteria and Thresholds**

The traffic analysis was performed through the use of a volume-to-capacity ratio calculation for signalized study intersections and control delay calculation for stop sign-controlled study intersections. Existing traffic volumes were used to report existing traffic flow conditions in the study area. Other data pertaining to intersection geometrics, on-street parking restrictions and traffic control operations were obtained through field surveys of the study locations. The study intersection lane configurations are shown in Appendix B.

The intersection volume-to-capacity ratio was calculated using the Intersection Capacity Utilization (ICU) methodology. In the discussion of ICU values for signalized intersections, guidelines have been developed for grading the operational quality of an intersection in terms of the "Level of Service" which describes different traffic flow characteristics. Levels of Service (LOS) grade A to C operate quite well. LOS D grade typically is the level for which a metropolitan area street system is designed. LOS E represents volumes at or near the capacity of the roadway that will result in stoppages of momentary duration and fairly unstable flow. LOS F occurs when a facility is overloaded and is characterized by stop-and-go traffic with stoppages of long duration. "Capacity" represents the maximum volume of vehicles in the critical lanes which has a reasonable expectation of passing through an intersection in one hour, under prevailing roadway and traffic conditions. For planning purposes, the theoretical capacity of an

intersection equates to the maximum LOS E conditions. The Level of Service corresponding to a range of ICU values is shown in Table 1.

For the ICU method of intersection analysis, the City of Pasadena has established a capacity of 1,600 vehicles per hour per lane (vphpl) for isolated intersections that are not connected to the City's Traffic Management Center (TMC), but instead operate independently. For signalized intersections along interconnected corridors controlled by the City's TMC, a capacity of 1,700 vphpl was recommended. For this analysis, a capacity of 1,700 vphpl was assumed for single through, left-turn and right-turn lanes at the three study intersections along Los Robles Avenue. A capacity of 1,600 vphpl was assumed for single through, left-turn and right-turn lanes for the other two signalized study intersections. A clearance interval of 0.10 is also included in the ICU calculations.

**Table 1**  
**Level of Service As a Function of ICU Values**  
**(For Signalized Intersections)**

<u>Level of Service (LOS)</u>	<u>Description of Operating Characteristics</u>	<u>Range of ICU Values</u>
A	Uncongested operations; all vehicles clear in a single cycle.	< 0.60
B	Same as above.	>0.60 < 0.70
C	Light congestion; occasional backups on critical approaches.	>0.70 < 0.80
D	Congestion on critical approaches, but intersection functional. Vehicles required to wait through more than one cycle during short peaks. No long-standing lines formed.	>0.80 < 0.90
E	Severe congestion with some long-standing lines on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements.	>0.90 < 1.00
F	Forced flow with stoppages of long duration.	> 1.00

For study intersections that are stop sign-controlled, a computerized transportation analysis that models (replicates) travel behavior for measured or projected traffic volumes was used. The transportation model utilized the latest version of the Highway Capacity Software (HCS+), a computer program based on the year 2000 update of the Highway Capacity Manual (HCM) published by the Transportation Research Board. The LOS criteria are measured by average vehicular delay in seconds per vehicle for the control turning movement or approach of an intersection. Total delay is defined as the elapsed time from when a vehicle stops at the end of a queue until the vehicle departs from the stop line. Table 2 displays the Level of Service criteria relating to stop sign-controlled intersections.

**Table 2**  
**Level of Service As a Function of Delay**  
**(For Stop Sign-Controlled Intersections)**

<u>Level of Service</u>	<u>Avg. Control Delay Per Vehicle (Sec)*</u>
A	0 – 10
B	> 10 – 15
C	> 15 – 25
D	> 25 – 35
E	> 35 – 50
F	> 50

\* From Exhibit 17-2 for two-way stop sign-controlled intersections and Exhibit 17-22 for all-way stop sign-controlled intersections of the Highway Capacity Manual (2000).

## SECTION 5.0: EXISTING TRAFFIC VOLUMES

Traffic count data for the eight study intersections were collected manually in 2007 for the AM peak period from 7:00 AM to 9:00 AM and for the afternoon school peak-period from 2:00 PM to 4:00 PM. Count personnel counted the number of vehicles at each of the eight study intersections making each possible turning movement. The peak hour volume for each intersection was then determined by finding the highest four consecutive 15-minute volumes for all movements combined. This method provides a "worst case" scenario, as it calculates the peak hour for each intersection independent of all other intersections. The peak hour counts were then growth factored by 1.5 percent to estimate 2008 traffic volume conditions. The AM and afternoon school peak-hour traffic volumes for the eight study intersections are shown in Figures 4(a) and 4(b), respectively.

Daily traffic volumes for the four study roadway segments were obtained from 24-hour automated counts, which were also conducted in 2007. These counts were growth factored by 1.5 percent to estimate 2008 traffic volume conditions. Table 3 shows the daily traffic volumes on the study street segments. The intersection and street segment count sheets are found in Appendix A.

**Table 3**  
**Existing (2008) Daily Traffic Volumes on Study Street Segments**

<b><u>No.</u></b>	<b><u>Street Segment</u></b>	<b><u>Daily Volume</u></b>
1	Howard St. betw. Garfield Ave. and Los Robles Ave.	1,199
2	Garfield Ave. betw. Howard St. and Washington Blvd.	1,939
3	Los Robles Ave. betw. Howard St. and Washington Blvd.	12,542
4	Washington Blvd. betw. Garfield Ave. and Los Robles Ave.	18,317



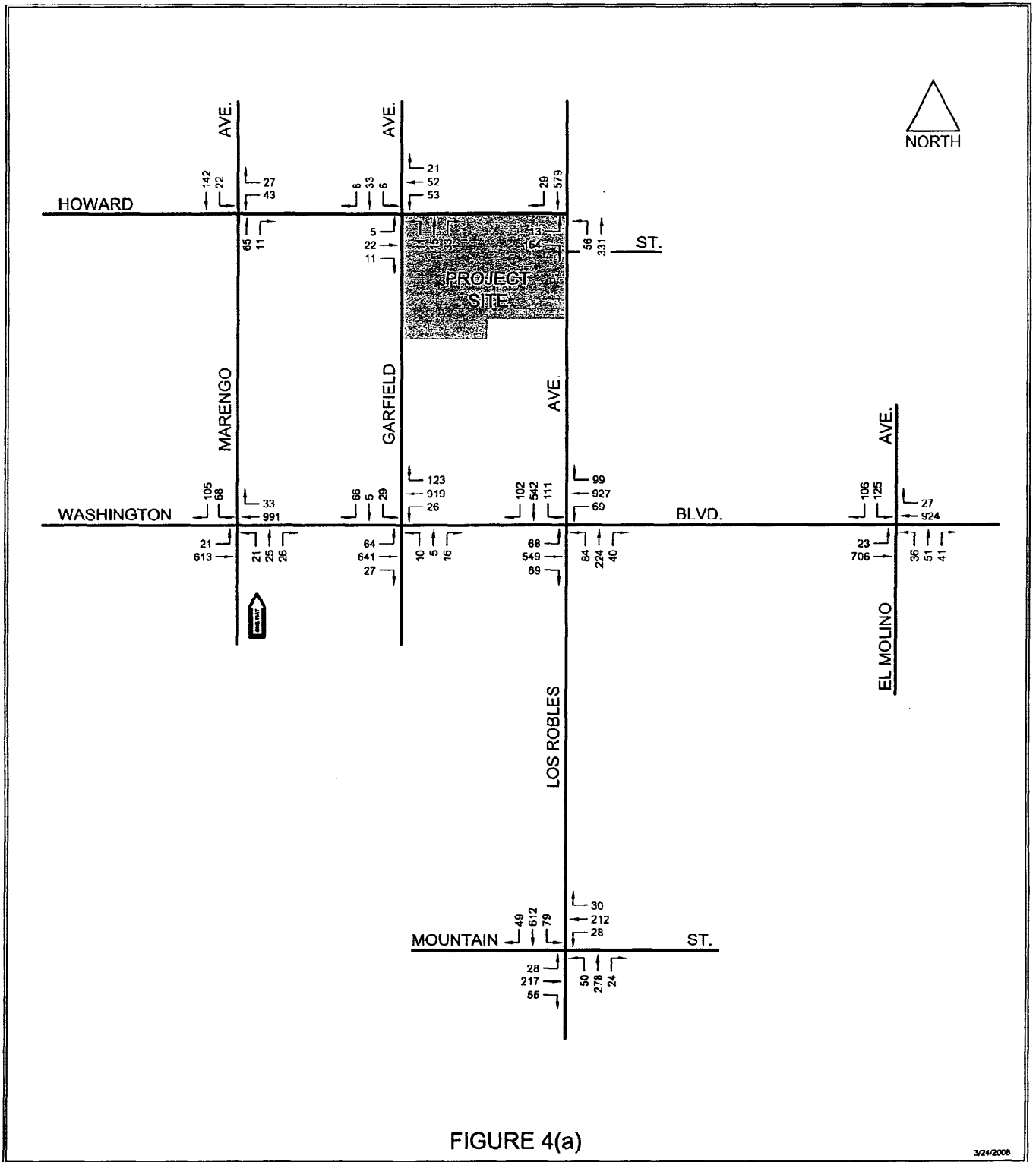


FIGURE 4(a)

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Pasadena Christian School 2008-03AM2008

**EXISTING (2008) TRAFFIC VOLUMES  
AM PEAK HOUR**



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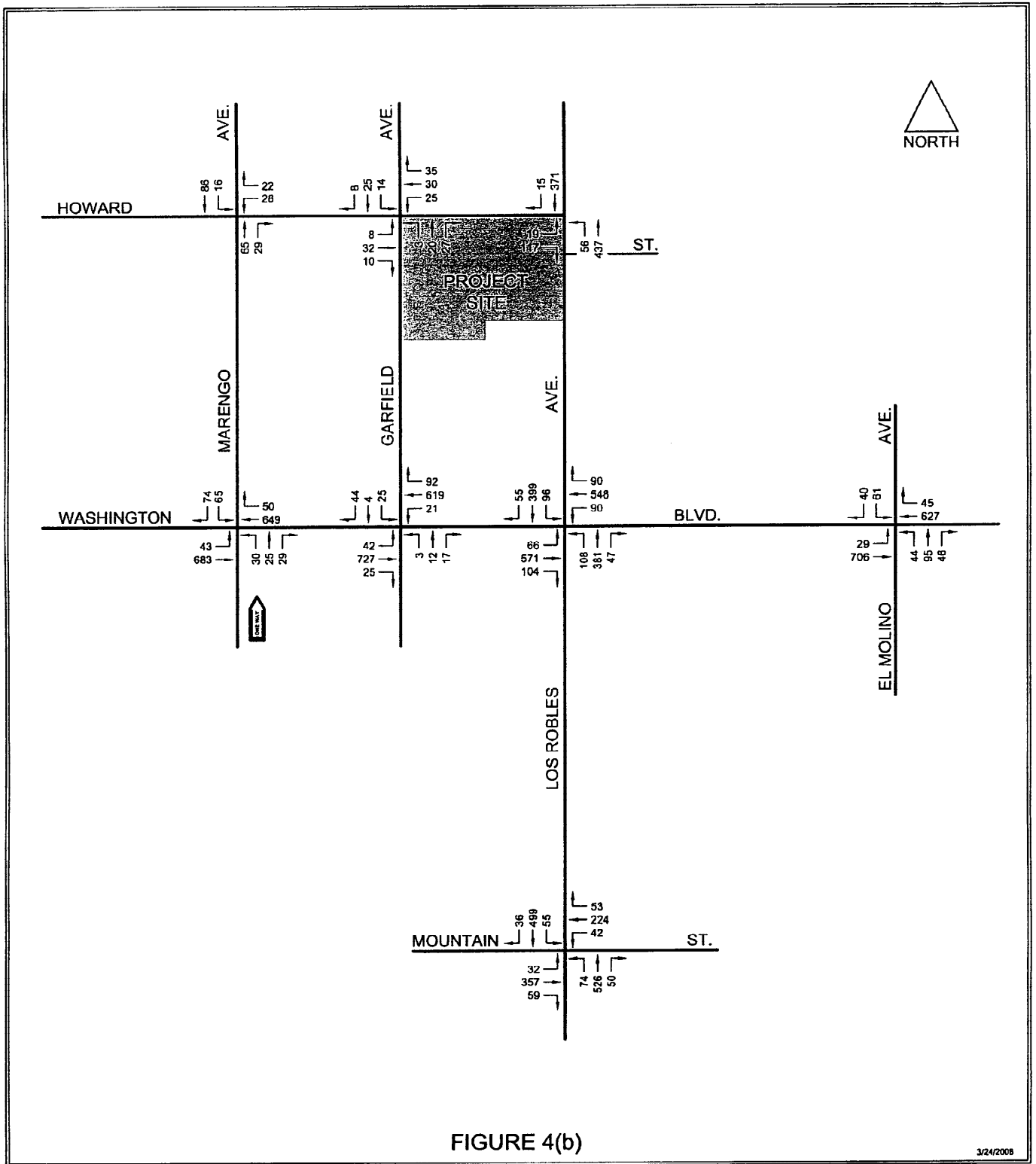


FIGURE 4(b)

3/24/2008

Pasadena Christian School/2008-03PM/2008

**EXISTING (2008) TRAFFIC VOLUMES  
SCHOOL PM PEAK HOUR**



Transportation Planning  
Traffic Engineering  
2007 Sawtelle Boulevard  
Los Angeles California 90025  
PH (310) 473 4508 F (310) 444 9771  
www.crainandassociates.com