Appendix K

Traffic Impact Analysis

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TRAFFIC IMPACT STUDY

FOR THE

1998 WHIPPLE ROAD GAS STATION AND CONVENIENCE STORE PROJECT

Union City, CA

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3666-001

1998 WHIPPLE ROAD GAS STATION AND CONVENIENCE STORE PROJECT
TRAFFIC IMPACT STUDY
Union City, CA

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EXECUTIVE SUMMARY

This *Executive Summary* is a brief overview of the analysis presented in this traffic impact study. It is not intended to be a comprehensive description of the analysis. For more details, the reader is referred to the full description presented in the traffic impact study.

This traffic impact study presents an analysis of the traffic-related effects of the 1998 Whipple Road Gas Station and Convenience Store Project. The project site is located on the southeast corner of the intersection of Whipple Road & Amaral Street in the City of Union City. The proposed project is an approximately 2,800 square feet gasoline station and 7-Eleven convenience store.

This traffic impact study includes analysis of six study intersections under the following four development scenarios:

- Existing Conditions,
- Existing Plus 1998 Whipple Road Project Conditions,
- Long-Term Future Cumulative Without 1998 Whipple Road Project Conditions, and
- Long-Term Future Cumulative Plus 1998 Whipple Road Project Conditions.

Under Existing conditions, all study intersections operate at conditions considered acceptable.

Under Existing Plus 1998 Whipple Road Project Conditions, all study intersections would experience operating conditions which are considered acceptable, and the impacts at these intersections are considered less than significant.

Under Cumulative Without 1998 Whipple Road Project conditions, one study intersection would experience operating conditions considered unacceptable. This traffic impact study presents potential improvements for this intersection.

Under Cumulative Plus 1998 Whipple Road Project conditions, five study intersections would experience operating conditions considered acceptable. One study intersection would experience operating conditions considered unacceptable. However, the project-related increase in vehicle delay at this intersection is considered less than significant.

In addition to presenting analysis of traffic operating conditions, this traffic impact study also presents analysis of project-related impacts on demand for public transit services, demand for bicycle and pedestrian facilities, and truck access and circulation. These impacts are considered less than significant and no mitigation measures are required.

INTRODUCTION

This study presents **KD Anderson & Associates'** analysis of the potential short-term and long-term traffic impacts associated with the 1998 Whipple Road Gas Station and Convenience Store Project (1998 Whipple Road Project, or proposed project) in the City of Union City, Alameda County, California.

PROJECT DESCRIPTION

The project site is located at 1998 Whipple Road, Union City, CA, at the southeast corner of the intersection of Whipple Road & Amaral Street. The project site is located approximately 2,000 feet east of Interstate 880. The project site is currently a vacant 26,000-square feet (sf) parcel.

The 0.55-acre project site is surrounded by industrial park and light industrial development to the north and west, respectively, and residential development to the south and east. The location of the project site within Union City is shown in **Figure 1**. The location within the study area is shown in **Figure 2**. An aerial photograph showing the adjacent land uses is shown in **Figure 3**.

Project Land Use

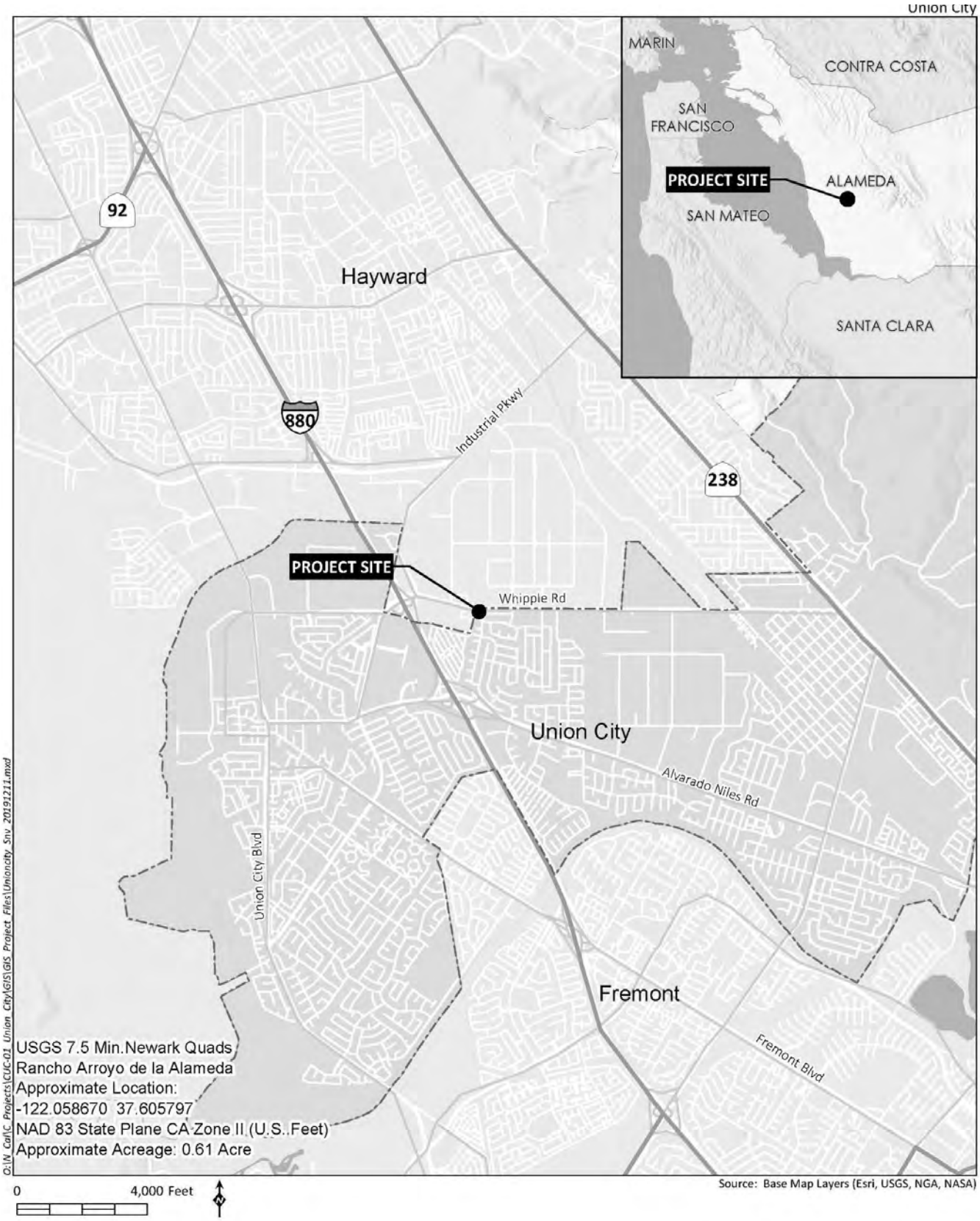
The project site plan is shown in **Figure 4**. The project applicant, TAIT & Associates, Inc. is proposing to develop an approximately 2,800 sf gasoline station and 7-Eleven convenience store. A total of three gasoline station islands with a 1,646-sf canopy would be constructed as part of the proposed project. The gasoline station islands would accommodate up to six vehicles at a time. The facility would operate 24-hours, seven days a week with two to three employees per eight-hour shift.

Access and Parking

New 35-foot-wide access driveways would be constructed off Whipple Road and Amaral Street. The driveway on Whipple Road would be right-in/right-out only, and a three-foot wide median island would be constructed on Whipple Road to prevent other turning movements. The driveway on Amaral Street would accommodate all vehicle turn movements.

The site would include 16 total parking spaces, including six spaces at the fuel islands and 10 parking spaces in front of the convenience store. This includes one Americans with Disabilities Act (ADA)/van accessible parking space in front of the convenience store.

On-road trucks would be used to deliver fuel, remove garbage and, if necessary, provide emergency services. **Figure 5** shows the access, egress and on-site routing that would be used by these trucks.



HELIX Environmental Planning

Vicinity Map

Figure 1

VICINITY MAP

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figure 1

LOCATION MAP

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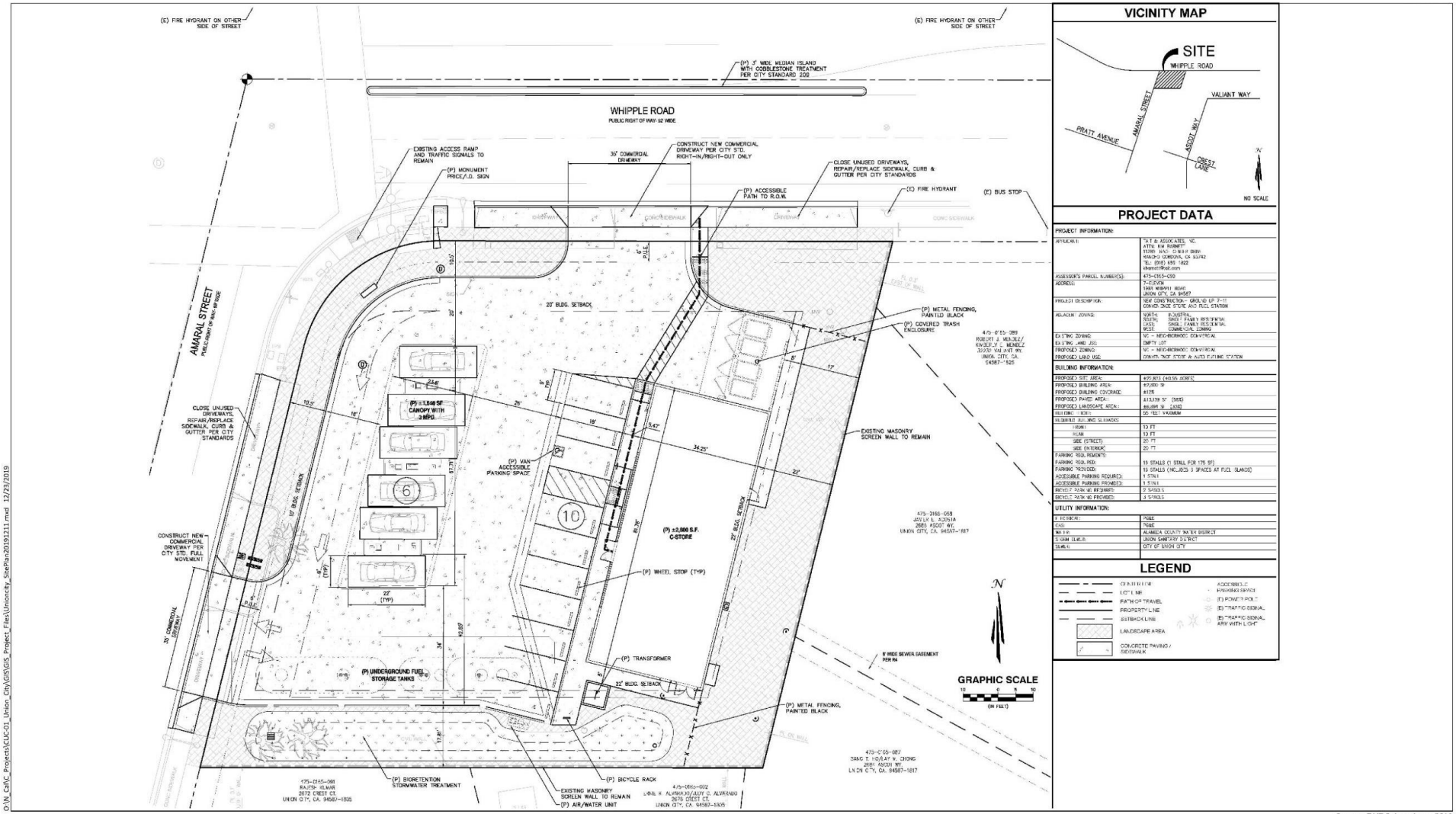
figure 2

AERIAL PHOTOGRAPH OF THE PROJECT SITE



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Source: TAIT & Associates, 2019

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SITE PLAN

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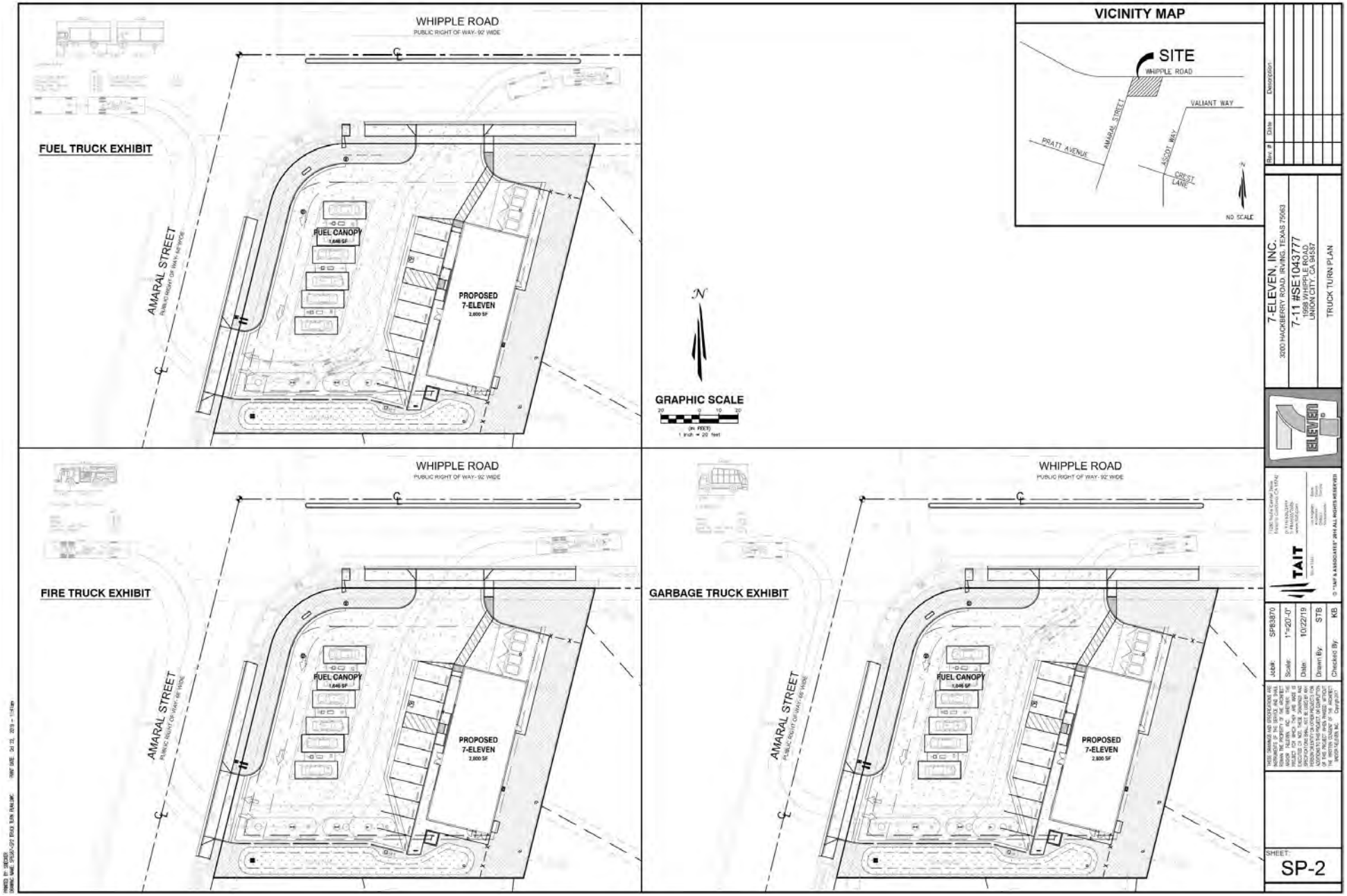
figure 4



TRUCK TURNING PLAN

ANALYSIS SCENARIOS

The analysis contained in this study follows the requirements of the City of Union City. Existing conditions in the study area have been described in terms of current traffic conditions occurring during a.m. and p.m. peak hours. The analysis also considers the impacts of the proposed project with a background of cumulative traffic conditions occurring in the year 2040 with planned future land use development and transportation networks (Alameda County Transportation Commission 2020).

The development scenarios analyzed for this study are:

- Existing Conditions,
- Existing Conditions Plus the 1998 Whipple Road Project,
- 2040 Cumulative Conditions without the 1998 Whipple Road Project, and
- 2040 Cumulative Conditions Plus the 1998 Whipple Road Project.

Comparison of these four scenarios allows identification of project-related impacts with both near-term and long-term background conditions. Near-term impacts are identified by assessing the effects of the project with existing background traffic volume conditions. Long-term impacts are identified by assessing the effects of the project with long-term future cumulative background traffic volume conditions.

As needed, this study also presents analysis of scenarios including potential roadway improvements and required mitigation measures.

LEVEL OF SERVICE SIGNIFICANCE THRESHOLDS

In this traffic impact study, project-related impacts and the need for improvements are based on minimum levels of service (LOS). The Union City *2040 General Plan* (City of Union City 2019) identifies LOS D as the goal for the City's signalized intersections during peak commute hours, with the exception of intersections on roadways that are part of the Alameda County *Congestion Management Program* (CMP) (Alameda County Transportation Commission 2019), where the standard is LOS E.

The General Plan states that if maintaining the LOS standards would, in the City's judgment, be infeasible and/or conflict with the achievement of other General Plan goals, LOS E or F conditions may be accepted provided that provisions are made to improve the overall system, promote non-vehicular transportation, and/or implement vehicle trip reduction measures as part of a development project or a City-initiated project.

Based on the Union City *2040 General Plan* and the CMP standards, and in consultation with City of Union City staff (Azim pers. comm.), the following significance thresholds are applied in this traffic impact study. The proposed project would be considered to have a significant traffic impact if it would result in at least one of the following:

- Cause LOS at a signalized intersection on a CMP roadway to degrade from LOS E or better to LOS F.

- Cause the average intersection delay at a signalized intersection on a CMP roadway to increase by five seconds or more at an intersection that operates at LOS F under without project conditions.

- Cause LOS at an unsignalized intersection on a CMP roadway to degrade from LOS E or better to LOS F and meet the *California Manual on Uniform Traffic Control Devices 2014 Edition* (MUTCD) (California Department of Transportation 2014) peak hour signal warrant.

- Cause LOS at an unsignalized intersection on a non-CMP roadway to degrade from LOS mid-D or better to LOS high-D, LOS E, or F and meet the MUTCD peak hour signal warrant.

- Cause LOS at an unsignalized intersection on a non-CMP roadway to degrade from LOS high-D to LOS E or F and meet the MUTCD peak hour signal warrant.

- Cause LOS at an unsignalized intersection on a non-CMP roadway to degrade from LOS E to LOS F and meet the MUTCD peak hour signal warrant.

Level of service and peak hour signal warrants are defined below in the *Level of Service Calculation* section of this traffic impact study.

EXISTING SETTING

This section of the study describes the transportation facilities available in the study area, current traffic volume levels, and traffic operations and LOS at the study intersections.

EXISTING STREET AND HIGHWAY SYSTEM

Various roadway facilities would be used to access the project site. The project site is served by roads that connect the site with other portions of Union City and with other communities in the region. The following provides a general overview of the study area roadway system, which is also shown in **Figure 1** and in **Figure 2**.

Interstate 880 (I–880) is a north-south freeway connecting the San Jose area in the south to Downtown Oakland and the Bay Bridge in the north. The speed limit is 65 miles per hour (mph) near the study area. In the vicinity of Union City, I-880 provides four to five lanes in each direction, including a high occupancy vehicle (HOV) lane. Access between I-880 and the study area is provided via an interchange at Whipple Road. The 2018 annual average daily traffic (AADT) volume on I-880 between Alvarado-Niles Road and Whipple Road was 240,000 vehicles per day.

Whipple Road is an east-west roadway which is designated an arterial in the City of Union City *2040 General Plan*. In the vicinity of the project site, the roadway is four lanes wide (two lanes in each direction). The roadway traverses residential, industrial and commercial land uses in the vicinity of the project site. Whipple Road provides access to I-880 west of the project site. The posted speed limit is 40 mph. Adjacent to the project site, parking is not permitted, a bicycle lane is present along the southern side of the street, and sidewalks are present and continuous on both sides of the street. Whipple Road is a designated CMP roadway in the Alameda County *Congestion Management Program*.

Amaral Street is a two-lane north-south collector roadway along the western edge of the project site. The northern terminus of the roadway is at Whipple Road. South of Almaden Boulevard/Amaral Court, Amaral Street enters a mobile home park and becomes Parkside Drive. Sidewalks are present along both side sides of the roadway. On-street parking is allowed along the large majority of both sides of the roadway. Parking is not allowed along the east side of Amaral Street adjacent to the project site, where an exclusive northbound-to-eastbound right-turn lane is present adjacent to the curb.

Huntwood Avenue is a north-south collector roadway with a southern terminus at Crest Lane. South of Whipple Road, it is a two-lane roadway that provides access to residential land uses. North of Whipple Road, it is a four-lane roadway with the majority having a center-two-way left-turn lane (CTWLTL). North of Whipple Road, Huntwood Avenue has a 30 mph speed limit and provides access to commercial, industrial and office land uses. Approximately 1.5 miles north of Whipple Road, the roadway continues to the northwest as Jupiter Street.

Almaden Boulevard is a collector roadway with an overall northwest-southeast alignment, approximately parallel to I-880. In the vicinity of the project site, the roadway has a 25 mph speed limit. West of the intersection of Amaral Street & Almaden Boulevard, the roadway is named Amaral Court, and the northwest terminus of the roadway is approximately 550 west of the intersection. East of the intersection of Amaral Street & Almaden Boulevard, the roadway has several curves and has a southeastern terminus as a public roadway just over a mile southeast of the project site, where the roadway enters a mobile home park.

Ascot Way is a north-south local collector roadway with a 25 mph speed limit. The roadway is two-lanes wide and provides access to adjacent residential land uses. The roadway has an unsignalized intersection with Almaden Boulevard, with the Ascot Way approaches controlled by stop signs. The roadway has a northern terminus approximately 700 feet north of Almaden Boulevard, and a southern terminus approximately 1,700 feet south of Almaden Boulevard.

STUDY INTERSECTIONS

The quality of flow of traffic is often governed by the operation of intersections, and the operation of the following four existing intersections was analyzed for this study:

1. Whipple Road & Amaral Street
2. Whipple Road & Huntwood Avenue
3. Almaden Boulevard & Amaral Street
4. Almaden Boulevard & Ascot Way

With implementation of the 1998 Whipple Road Project, two driveway intersections would be created and are also analyzed for this study:

5. Whipple Road & Project Site Driveway
6. Amaral Street & Project Site Driveway

The locations of the study intersections are presented in **Figure 6**. The numbers shown on **Figure 6** correspond to the numbers listed above.

EXISTING TRAFFIC VOLUMES

To quantify existing traffic conditions, a.m. and p.m. peak hour traffic count data were collected at the existing study area intersections. Data were collected on Thursday February 27, 2020, prior to reductions in traffic volumes due to COVID-19. The data were collected during the 7:00 a.m. to 9:00 a.m. period, and the 4:00 p.m. to 6:00 p.m. period. Traffic volumes for the highest one-hour periods within the two-hour a.m. and two-hour p.m. data collection periods are used in this study. The peak hour intersection traffic volume count data sheets are presented in the technical appendix and are summarized in **Figure 7**.

STUDY INTERSECTIONS

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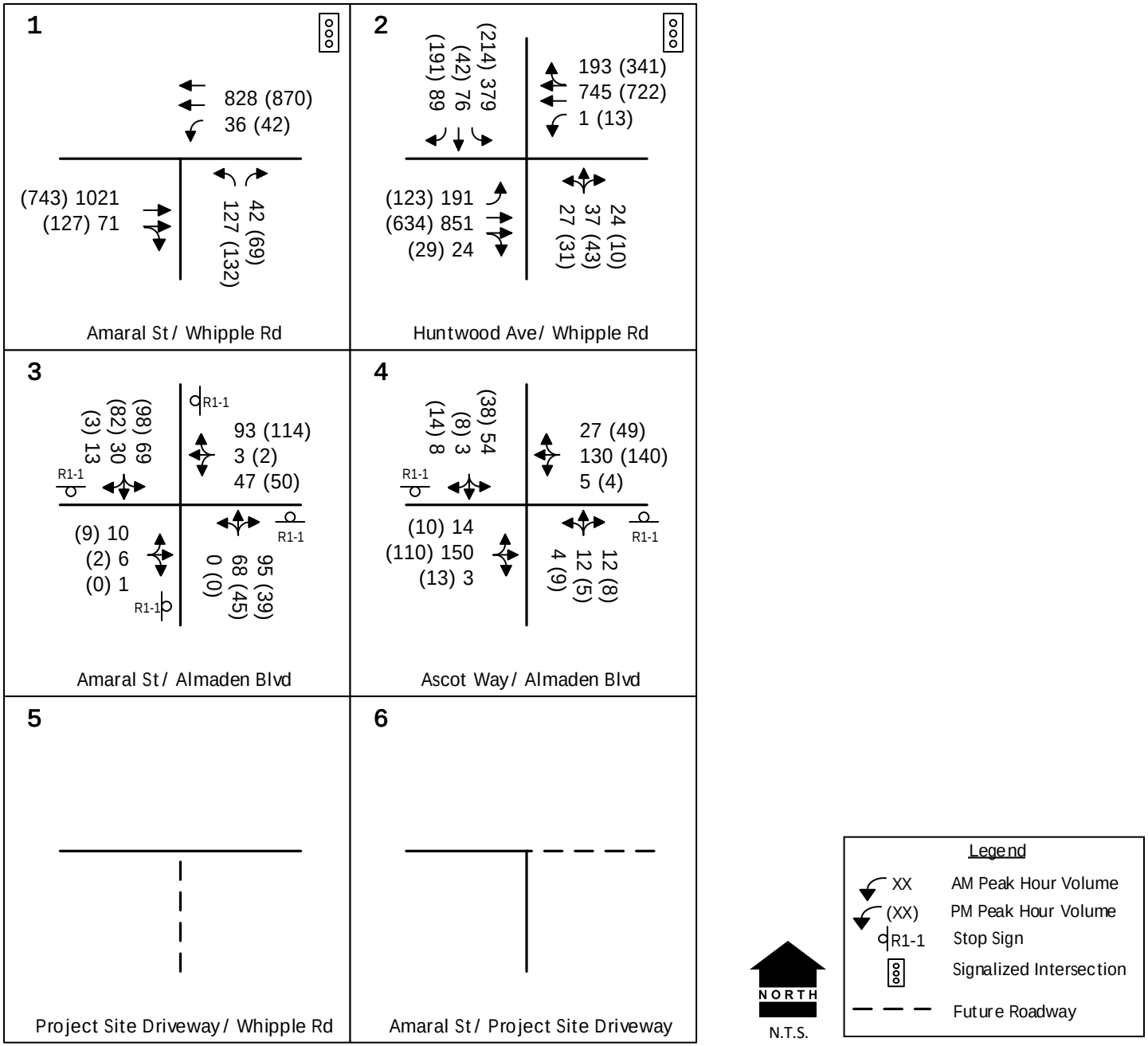
figure 6



EXISTING TRAFFIC VOLUMES AND LANE CONFIGURATIONS

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figure 7

LEVEL OF SERVICE CALCULATION

To evaluate traffic conditions and to provide a basis for comparison of operating conditions with and without project-generated traffic, LOS were determined at study area intersections. LOS is a quantitative measure of traffic operating conditions using a letter grade A through F. LOS A through F represents progressively worsening traffic conditions. The characteristics associated with the various LOS for intersections are presented in **Table 1**. As previously described in more detail in the *Level of Service Thresholds* section of this traffic impact study, the City of Union City designates LOS D as their minimum standard on most roadways, while LOS E is the minimum acceptable condition along designated CMP roadways. Because Whipple Road is designated a CMP roadway, LOS E is considered the minimum acceptable LOS at the following three study intersections.

- Whipple Road & Amaral Street
- Whipple Road & Huntwood Avenue
- Whipple Road & Project Site Driveway

LOS D is considered the minimum acceptable LOS at the following three study intersections:

- Almaden Boulevard & Amaral Street
- Almaden Boulevard & Ascot Way
- Amaral Street & Project Site Driveway

LOS were calculated for study intersections using the applicable methodology contained in the *Highway Capacity Manual 2010* (Transportation Research Board 2010). The text that follows summarizes these methodologies.

Signalized Intersections. The methods used for determining LOS at signalized intersections makes use of data describing traffic volume, intersection geometry and traffic signal timing to calculate the overall average delay per vehicle passing through the intersection. This average delay is compared to the prescribed thresholds to identify the applicable LOS. Study intersections were evaluated using SYNCHRO software (Trafficware 2020) for this traffic impact study. Traffic signal timing data from the *Program For Arterial System Synchronization - Cities of Union City and Hayward - 2014/15 Whipple Road and Dyer Street Signal Timing Project - Signal Grouping and Cycle Length Memorandum* (Kimley-Horn 2014) were applied for this traffic impact study.

Unsignalized Intersections. Unsignalized intersections were evaluated using the SYNCHRO software. The procedure for calculating the LOS at unsignalized intersections is based on the relative availability of gaps in traffic and the delay experienced for each movement that must yield the right-of-way. The number of gaps is a function of the volume and speed of conflicting traffic, type of control (stop or yield), and intersection geometrics. The length of average delays and LOS are calculated for each movement, and the worst movement is reported for this traffic impact study. An overall "weighted" LOS can also be calculated for the whole intersection and often results in a much better LOS.

Table 1. Level of Service Definitions - Highway Capacity Manual 2010

Level of Service	Signalized Intersections	Unsignalized Intersections
A	Vehicle progression is exceptionally favorable or the cycle length is very short. Delay ≤ 10.0 seconds/vehicle	Little or no delay. Delay ≤ 10 seconds/vehicle
B	Vehicle progression is highly favorable or the cycle length is short. Delay > 10 seconds/vehicle and ≤ 20 seconds/vehicle	Short traffic delays. Delay > 10 seconds/vehicle and ≤ 15 seconds/vehicle
C	Vehicle progression is favorable or the cycle length is moderate. Individual cycle failures may begin to appear at this level. Delay > 20 seconds/vehicle and ≤ 35 seconds/vehicle	Average traffic delays. Delay > 15 seconds/vehicle and ≤ 25 seconds/vehicle
D	Vehicle progression is ineffective or the cycle length is long. Many vehicles stop and the individual cycle failures are noticeable. Delay > 35 seconds/vehicle and ≤ 55 seconds/vehicle	Long traffic delays. Delay > 25 seconds/vehicle and ≤ 35 seconds/vehicle
E	Vehicle progression is unfavorable and the cycle length is long. Individual cycle failures are frequent. Delay > 55 seconds/vehicle and ≤ 80 seconds/vehicle	Very long traffic delays, failure, extreme congestion. Delay > 35 seconds/vehicle and ≤ 50 seconds/vehicle
F	Vehicle progression is very poor and the cycle length is long. Most cycles fail to clear the vehicle queue. Delay > 80 seconds/vehicle	Intersection blocked by external causes. Delay > 50 seconds/vehicle

Source: Transportation Research Board 2010.

Level of service at an unsignalized intersection controlled by side street stops indicate the magnitude of delay incurred by motorists turning at the intersection. However, because these calculations exclude the condition of through traffic flow (which is assumed to flow freely), poor LOS at an unsignalized intersection would not be considered a significant impact unless the volume of traffic also satisfies warrants for traffic signals.

While the unsignalized LOS may indicate very long delays (e.g., LOS E or F) traffic conditions are generally not assumed to be significant unless a significant number of motorists are delayed. For this analysis, the satisfaction of traffic signal warrants has been used to suggest the significance of impacts at an unsignalized intersection. Although satisfying signal warrants signifies that an intersection has unacceptable operating conditions, it does not mean that installation of a signal is the only way to mitigate those conditions. It is often possible to improve an intersection with additional lanes or improved geometrics so that signalization is not necessary. The peak hour signal warrant criteria employed for this study are those presented in the *California Manual on Uniform Traffic Control Devices* (California Department of Transportation 2014).

CURRENT LEVELS OF SERVICE

Peak hour LOS were calculated at the four existing study intersections under Existing Conditions. Intersection LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 2**. As shown, all four existing study intersections operate at acceptable LOS D or better during both the a.m. and p.m. peak hours. No improvements are recommended at these four intersections.

ALTERNATIVE TRANSPORTATION MODES

Public Transit

Public transit service in the immediate vicinity of the project site is provided by Union City (UC) Transit and by the Alameda-Contra Costa Transit District (AC Transit). The Bay Area Rapid Transit District (BART) provides public transit service on a regional level.

Union City Transit. UC Transit is a local, city-run transit system that serves Union City. UC Transit service scheduling is coordinated with BART train arrivals and departures at the Union City BART Station. UC Transit also provides connections with AC Transit and the Dumbarton Express for access to other transportation options in the Bay Area. (Union City Transit 2020)

Table 2. Level of Service - Existing Conditions

	Study Intersections	Inters. Control	Signal Warrant Met?	AM Peak LOS	AM Peak Delay	PM Peak LOS	PM Peak Delay
1	Whipple Road & Amaral Street	Signal		A	9.3	B	10.8
2	Whipple Road & Huntwood Avenue	Signal		C	26.3	C	23.1
3	Almaden Boulevard & Amaral Street	AWSC	No	A	8.3	A	8.6
4	Almaden Boulevard & Ascot Way	Unsig	No	B	12.0	B	11.3
5	Whipple Road & Project Site Driveway	- -		- -	- -	- -	- -
6	Amaral Street & Project Site Driveway	- -		- -	- -	- -	- -

by Type of Int

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Unsig" = Unsignalized stop-sign control. "AWSC" = All-way stop-sign control.
"Signal" = Signalized light control. Delay is measured in seconds per vehicle.
Dashes ("- -") indicate the intersection would not be present under this scenario.

Union City also provides Paratransit transportation services required under the Americans with Disabilities Act (ADA). Union City Paratransit offers ADA service within the city limits of Union City. Union City Paratransit also offers an additional service known as Paratransit Plus. Paratransit Plus offers limited service to southern Hayward, and northern Fremont and Newark.

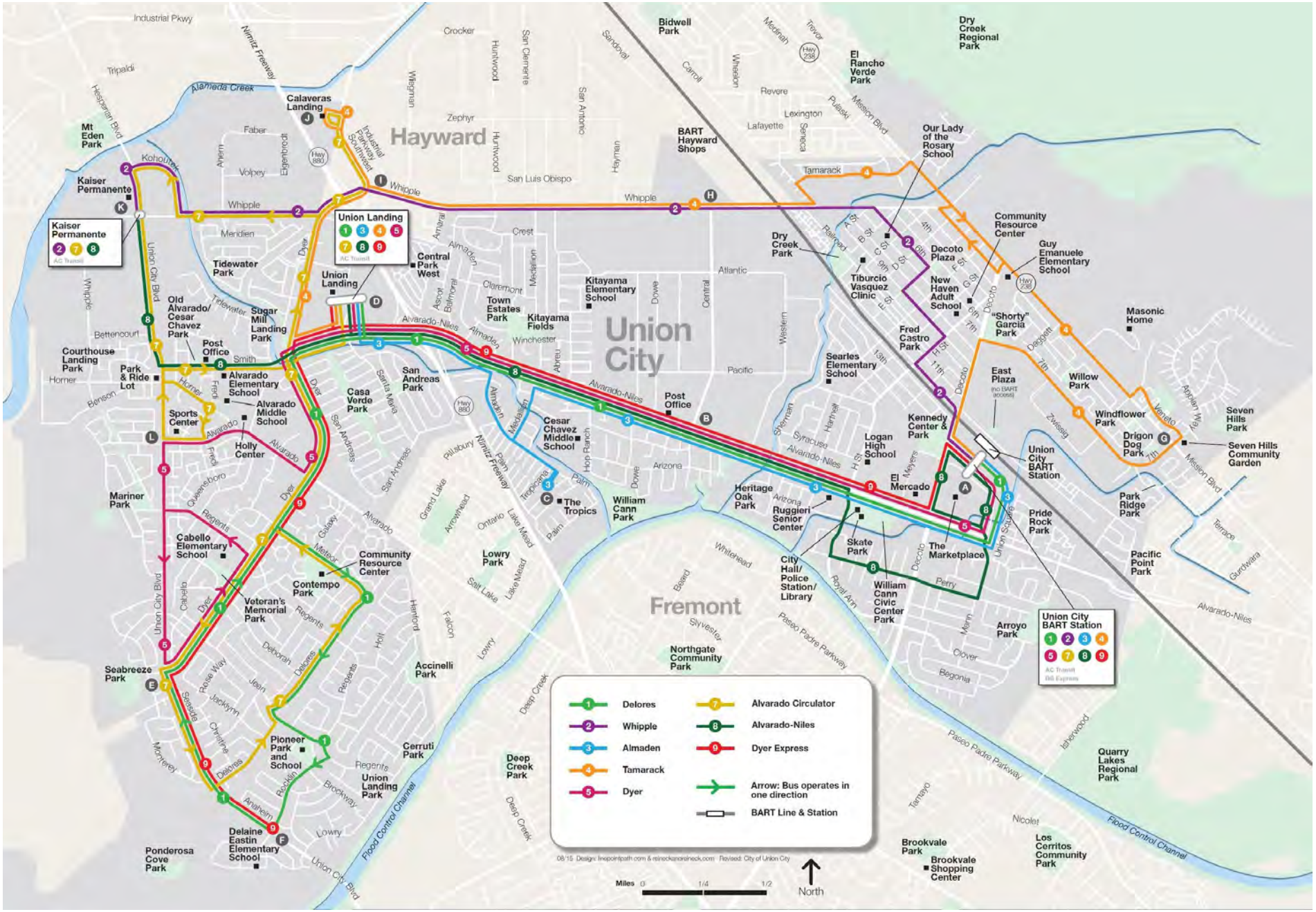
As shown in **Figure 8**, UC Transit routes 2 and 4 provide service along Whipple Road adjacent to the project site. UC Transit's main transfer points are located at the Union City BART Station and the Union Landing Transit Center. UC Transit routes 2 and 4 both provide access to the Union City BART Station and the Union Landing Transit Center.

Alameda-Contra Costa Transit District. AC Transit serves 13 cities and adjacent unincorporated areas in Alameda and Contra Costa counties. AC Transit also serves downtown San Francisco via the Bay Bridge, Foster City and San Mateo via the San Mateo Bridge, and Stanford and Palo Alto via the Dumbarton Bridge. AC Transit has provided service since 1960, taking over from the Key System and its predecessors. AC Transit provides 158 bus lines and has a weekday ridership of approximately 175,000 per day. (Alameda-Contra Costa Transit District 2020)

As shown in **Figure 9**, AC Transit routes 41 and 56 provide service along Whipple Road adjacent to the project site. AC Transit routes 41 and 56 both provide access to the Union Landing Transit Center and to the City of Hayward. AC Transit route 41 provides access to the South Hayward BART Station.

UC Transit and AC Transit stops are co-located in the vicinity of the project site. In the eastbound direction, a co-located stop is 60 feet east of the eastern edge of the project site. In the westbound direction, co-located stops are 800 feet both west of, and east of, the project site.

Bay Area Rapid Transit District. The BART system provides regional rail transit service connecting San Francisco, Alameda County, Contra Costa County, and parts of San Mateo County. The project site is approximately two miles from the South Hayward BART Station and approximately two and a half miles from the Union City BART Station. These stations are served by two BART routes: the Richmond-Warm Springs/South Fremont and the Daly City-Warm Springs/South Fremont lines. The Richmond-Warm Springs/South Fremont line operates at a 15-minute frequency from 4:00 a.m. to 7:00 p.m. on weekdays, and a 20-minute frequency from 7:00 p.m. to 1:00 a.m. on weekdays, 6:00 a.m. to 1:00 a.m. on Saturdays, and 8:00 a.m. to 1:00 a.m. on Sundays. The Daly City-Warm Springs/South Fremont line operates at a frequency of 15 minutes from 5:00 a.m. to 7:00 p.m. on weekdays, and at a frequency of 20 minutes from 9:00 a.m. to 7:00 p.m. on Saturdays. The Daly City-Warm Springs/South Fremont line does not operate on Sundays.



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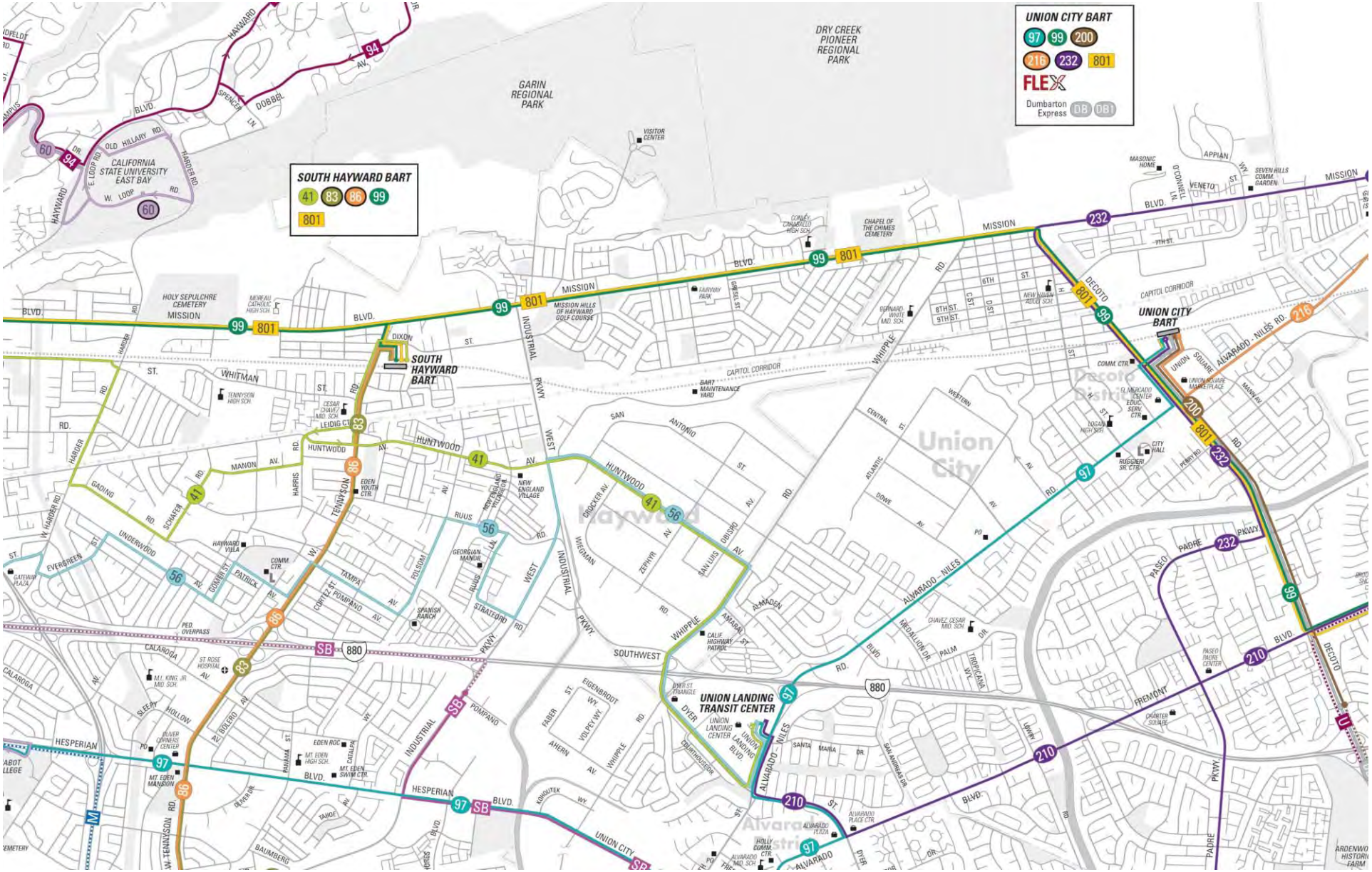
UNION CITY TRANSIT SYSTEM MAP

figure 8



AC TRANSIT - UNION CITY AREA

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figure 9

Bicycle and Pedestrian Facilities. According to Caltrans guidelines, bicycle facilities are generally divided into four categories:

- Class I Bikeway (Bike Path). A completely separate facility designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized.

- Class II Bikeway (Bike Lane). A striped lane designated for the use of bicycles on a street or highway. Vehicle parking and vehicle/pedestrian cross-flow are permitted at designated locations.

- Class III Bikeway (Bike Route). A route designated by signs or pavement markings for bicyclists within the vehicular travel lane (i.e., shared use) of a roadway.

- Class IV Bikeway (Separated Bikeway). A bikeway for the exclusive use of bicycles and includes a separation required between the separated bikeway and the through vehicular traffic. The separation may include, but is not limited to, grade separation, flexible posts, inflexible posts, inflexible barriers, or on-street parking.

In the vicinity of the project site, Class II bike lanes are present on:

- the north side of Whipple Road between Huntwood Avenue and Central Avenue, and
- the south side of Whipple Road between Amaral Street and Hayman Street.

In the vicinity of the project site, sidewalks are present on both sides of:

- Whipple Road,
- Amaral Street,
- Huntwood Avenue, and
- Almaden Boulevard.

In the vicinity of the project site, the *City of Union City Pedestrian and Bicycle Master Plan* (City of Union City 2012) shows a "Proposed Bicycle Network Class I, II or III" facility on:

- Whipple Road east of Amaral Street,
- Amaral Street between Whipple Road and Almaden Boulevard, and
- Almaden Boulevard between Amaral Street and Alvarado Niles Road.

Existing bicycle and pedestrian travel in the immediately vicinity of the project site is low. Bicycle and pedestrian travel data at the intersection of Whipple Road & Amaral Street were collected for this traffic impact study for the a.m. peak hour and p.m. peak hour. During the a.m. peak hour, one pedestrian and two bicycles were recorded. During the p.m. peak hour, two pedestrians and three bicycles were recorded. Bicycle and pedestrian travel data collection worksheets are presented in the technical appendix.

PROJECT CHARACTERISTICS

The following is a description of characteristics of the 1998 Whipple Road Project used in the assessment of project-related impacts on traffic operations.

The development of the proposed project would result in vehicle traffic to and from the project site. The amount of additional traffic on a particular section of the street network depends on three factors:

- Trip Generation, the number of new trips generated by the project,
- Trip Distribution, the direction of travel for the new traffic, and
- Trip Assignment, the specific routes used by the new traffic.

TRIP GENERATION

Development of the 1998 Whipple Road Project would generate new vehicle trips and potentially affect traffic operations at study intersections. The number of vehicle trips expected to be generated by the proposed project has been estimated using typical trip generation rates that have been developed based on the nature and size of project land uses. Data compiled by the Institute of Transportation Engineers (ITE) and presented in the industry-standard publication *Trip Generation Manual, 10th Edition* (Institute of Transportation Engineers 2017) is the source of trip generation rates.

The trip generation rates used in this traffic impact study are presented in **Table 3**. The trip generation rates are applied to the amount of project-related land uses. The resulting trip generation estimates are presented in **Table 4**. As shown in **Table 4**, the trip generation estimate has been adjusted to reflect pass-by trips to the project, drawn from the flow of background (not project-related) traffic. The pass-by trip adjustment was made using methods specified in the ITE *Trip Generation Manual, 10th Edition*. This document specifies the assumptions and methods used in applying pass-by trip adjustments.

As shown in **Table 4**, the proposed project would generate an unadjusted 125 trips during the a.m. peak hour and 138 trips during the p.m. peak hour. With the pass-by adjustments, the proposed project would generate a net 46 trips during the a.m. peak hour and 47 trips during the p.m. peak hour.

TRIP DISTRIBUTION

Trips that would be generated by the 1998 Whipple Road Project were geographically distributed over the roadway network. The geographic distribution pattern of project-related trips was estimated based on the existing geographic distribution of travel at study intersections. The trip distribution pattern is shown in **Table 5**.

Table 3. Trip Generation Rates for 1998 Whipple Road Project

Land Use Category and ITE Land Use Code	Independent Variable	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
7-Eleven Convenience Store (ITE 853 - Convenience Market with Gasoline Pumps	Vehicle Fueling Positions	10.38	10.38	20.76	11.52	11.52	23.04

Notes: Totals may not equal the sum of the components due to rounding.
Source: Institute of Transportation Engineers 2017.

Table 4. Trip Generation Estimates for 1998 Whipple Road Project

Land Use Category and ITE Land Use Code	Amount of Land Use	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Unadjusted Trips							
7-Eleven Convenience Store (ITE 853 - Convenience Market with Gasoline Pumps	6 Vehicle Fueling Positions	62	62	125	69	69	138
Trip Adjustments							
Pass-By Trips (63 percent in the a.m. peak hour and per day, and 66 percent in the p.m. peak hour)		-39	-39	-79	-46	-46	-91
Adjusted Total		23	23	46	23	23	47

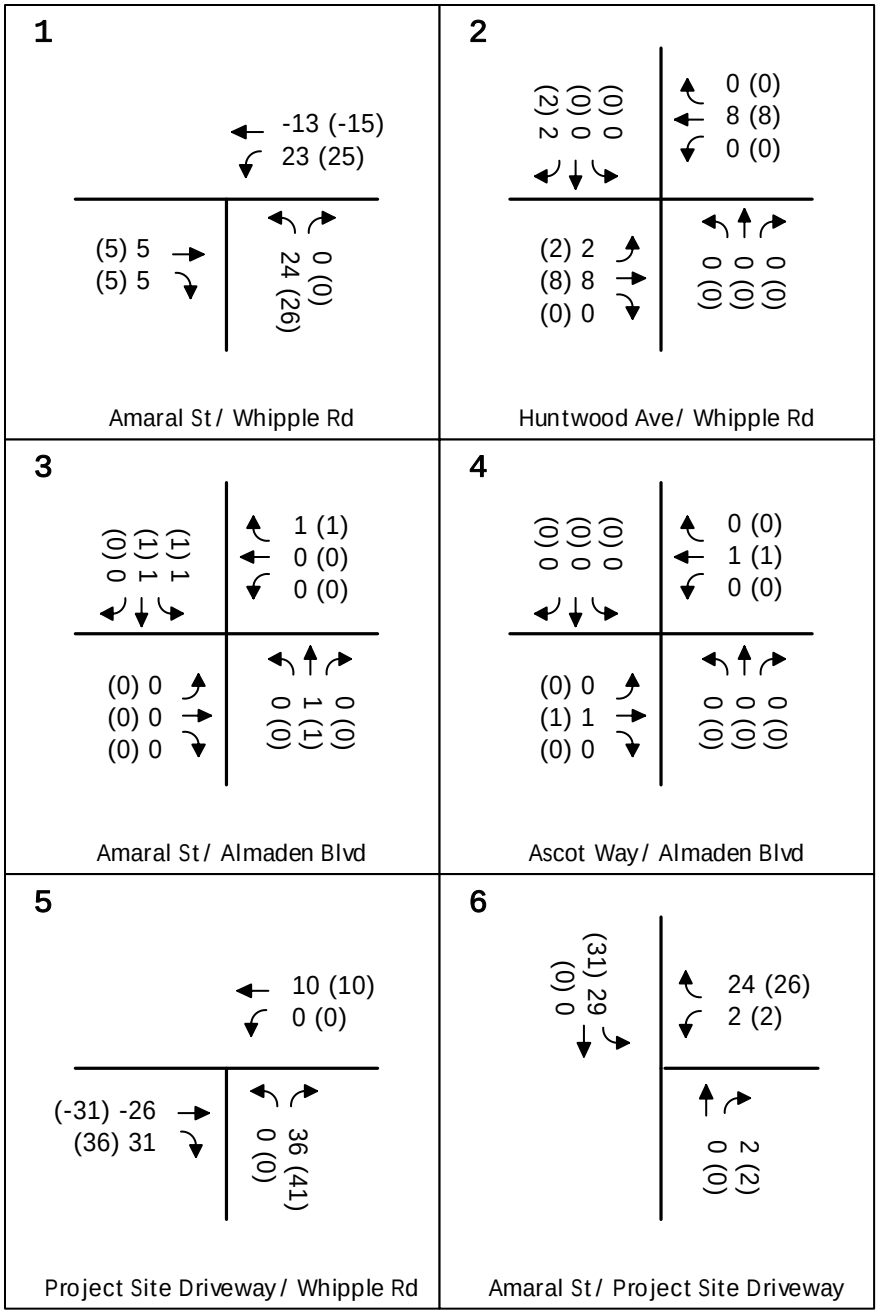
Notes: Totals may not equal the sum of the components due to rounding.
Pass-by percentages are from Institute of Transportation Engineers 2017.

Table 5. Project Trip Distribution Percentages

Direction of Travel or Destination	Percent of Project-Related Trips
West on Whipple Road	47.7%
North on Huntwood Avenue	7.1%
East on Whipple Road	36.0%
South on Huntwood Avenue	1.4%
West on Amaral Court	0.4%
South on Parkside Drive	2.8%
East on Almaden Boulevard	4.6%
TOTAL	100.0%

TRIP ASSIGNMENT

Project-related trips that would be generated by the project, shown in **Table 4**, were distributed over the roadway network using the trip distribution percentages shown in **Table 5**. Logical travel routes were used to assign trips to individual roadways. The resulting project-only trips at study intersections are shown in **Figure 10**.



PROJECT-RELATED TRIPS

EXISTING PLUS PROJECT CONDITIONS

This section of this traffic impact study describes the impacts of the 1998 Whipple Road Project with existing background conditions.

TRAFFIC OPERATIONS

The following describes the impacts of the proposed project on traffic operations.

Traffic Volumes

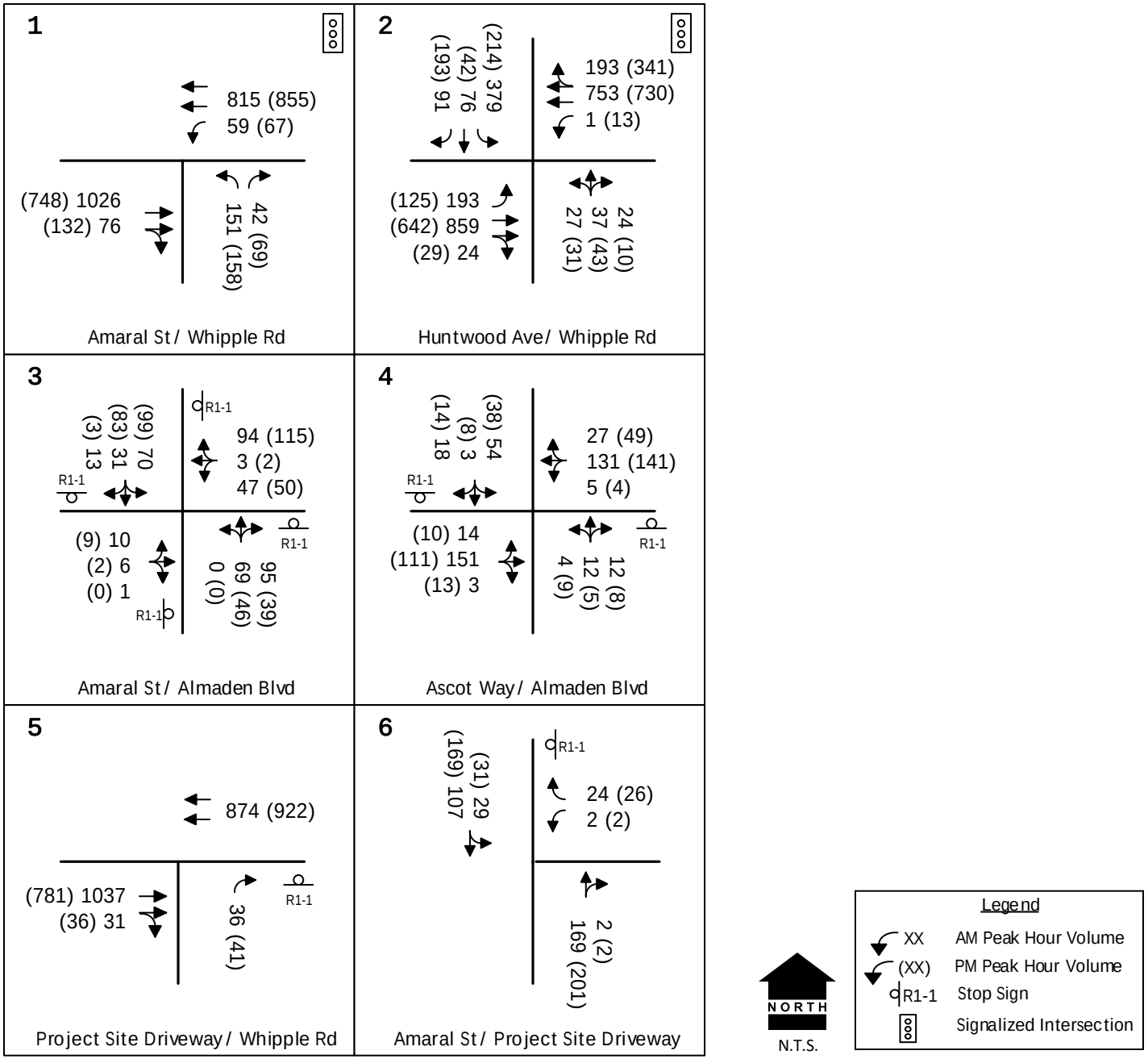
Traffic volumes at study intersections under Existing Plus Project conditions were calculated by adding project-related trips to existing background conditions traffic volumes. Project-related trips shown in **Figure 10** were added to existing traffic volumes shown in **Figure 7**. The resulting Existing Plus Project traffic volumes are shown in **Figure 11**.

Levels of Service

Peak hour LOS was calculated at the six study intersections under Existing Plus Project conditions. Intersection LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 6**. As shown, all six study intersections would operate at acceptable LOS C or better during both the a.m. and p.m. peak hours. The impact of the proposed project on these six intersections is considered less-than-significant and no mitigation measures are required.

INCREASE IN DEMAND FOR PUBLIC TRANSIT

Implementation of the proposed 1998 Whipple Road Project would result in an increase in demand for public transit service. As described earlier in the *Public Transit* section of this traffic impact study, both UC Transit and AC Transit provide public transit service along Whipple Road adjacent to the project site. As noted in the Alternative Transportation Modes section of this traffic impact study, both UC Transit and AC Transit stops are co-located close to the project site. As a result, it is possible some number of people would use public transit to travel to and from the project site. The number of people would not be expected to be large. Because the frequency and proximity of future transit service is not known at this time, demand for transit cannot be quantified. However, it is expected that both UC Transit and AC Transit can accommodate the additional passengers the proposed project would generate. This is considered a less-than-significant impact. No mitigation measures are required



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EXISTING PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

figure 11

Table 6. Level of Service - Existing Plus Project Conditions

	Study Intersections	Inters. Control	Signal Warrant Met?	AM Peak		PM Peak		by Type of Int
				LOS	Delay	LOS	Delay	
1	Whipple Road & Amaral Street	Signal		B	11.1	B	12.8	
2	Whipple Road & Huntwood Avenue	Signal		C	26.4	C	23.2	
3	Almaden Boulevard & Amaral Street	AWSC	No	A	8.3	A	8.7	
4	Almaden Boulevard & Ascot Way	Unsig	No	B	12.0	B	11.3	
5	Whipple Road & Project Site Driveway	Unsig	No	B	13.6	B	12.0	
6	Amaral Street & Project Site Driveway	Unsig	No	A	9.5	A	9.7	

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Unsig" = Unsignalized stop-sign control. "AWSC" = All-way stop-sign control.
"Signal" = Signalized light control. Delay is measured in seconds per vehicle.

INCREASE IN DEMAND FOR BICYCLE AND PEDESTRIAN FACILITIES

Implementation of the 1998 Whipple Road Project would result in an increase in demand for bicycle and pedestrian facilities. As noted earlier in the *Bicycle and Pedestrian Facilities* section of this traffic impact study, Class II bicycle lanes are present along the south side of Whipple Road east of the project site. In addition, in the vicinity of the project site, sidewalks are present on both sides of:

- Whipple Road,
- Amaral Street,
- Huntwood Avenue, and
- Almaden Boulevard.

As a result of the presence of bicycle and pedestrian facilities listed above, the increase in demand for bicycle and pedestrian facilities is considered a less-than-significant impact. No mitigation measures would be required.

TRUCK TURNING PATH RADII

As noted in the *Project Description* section of this traffic impact study, on-road trucks would be used to deliver fuel to, remove garbage from and, if necessary provide emergency services to the 1998 Whipple Road Project. The proposed project would not generate a large number of truck trips. However, because of their large turning radius, trucks may be unable to provide services without blocking access to and from project site driveways. Blocking project site driveways may cause queues of patron vehicles backing up onto Whipple Road or Amaral Street.

The *Truck Turning Plan* shown in **Figure 5** includes an assessment of the ability of trucks to enter and exit the project site without blocking access to patron vehicles. As shown in **Figure 5**, trucks would be able to:

- enter the project site at the project site driveway on Amaral Street,
- maneuver within the project site, and
- exit the project site at the project site driveway on Whipple Road.

Trucks would be able to make the movements described above without blocking project site driveways. As a result, this impact is considered less than significant. No mitigation measures are required.

CUMULATIVE NO PROJECT CONDITIONS

This section of this traffic impact study describes traffic operating conditions under long-term future cumulative conditions without the 1998 Whipple Road Project. This scenario describes long-term future background conditions and, in comparison with the Cumulative Plus Project condition, allows identification of project-related impacts under cumulative conditions.

TRAFFIC VOLUME FORECASTS

Future cumulative traffic volume forecasts were prepared for this traffic impact study using the Alameda County Transportation Commission *Alameda Countywide Travel Demand Model* (Alameda County Transportation Commission 2020). The model uses a digitized description of the future roadway network, and a description of future land use disaggregated to traffic analysis zones (TAZs).

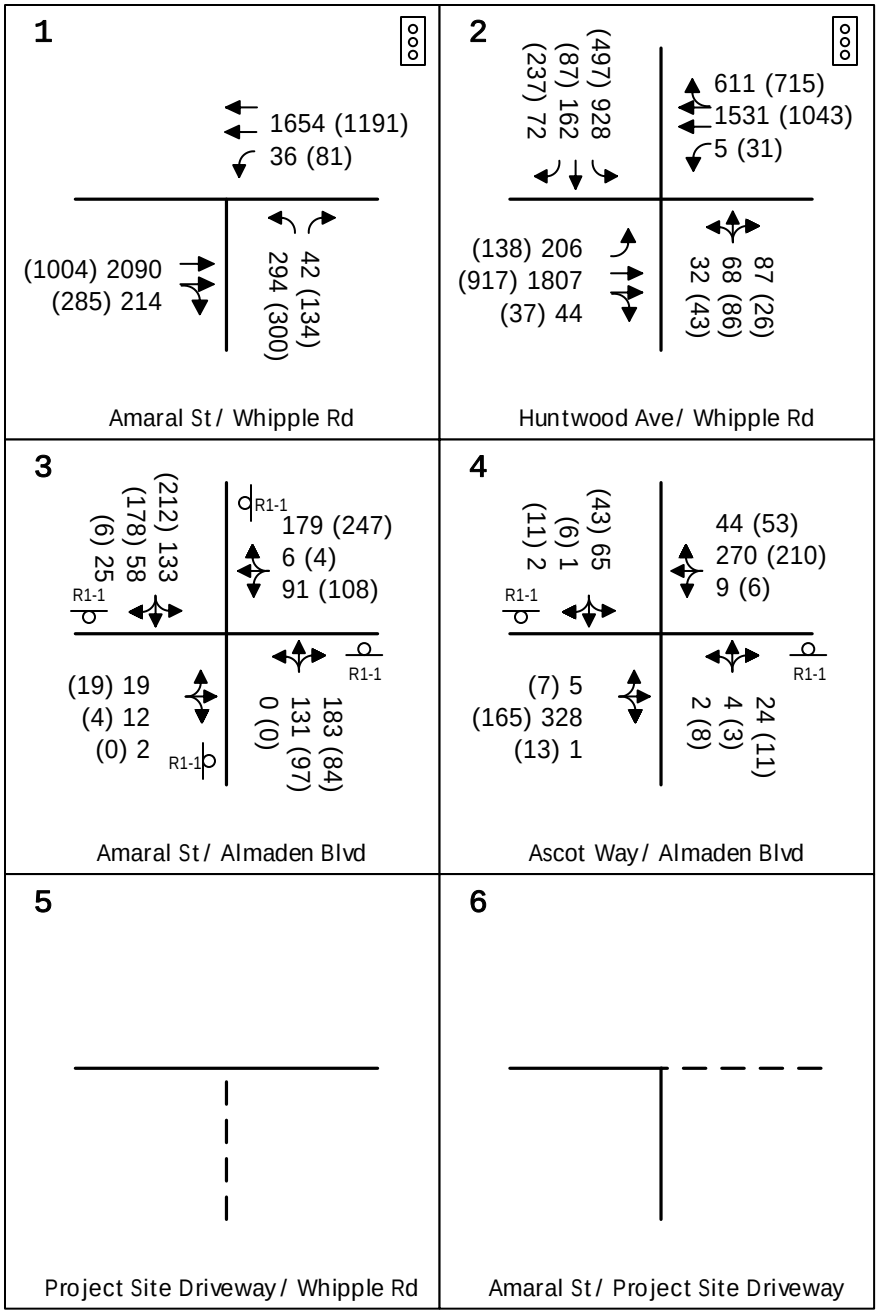
For this traffic impact study, 2020 and 2040 travel demand model results for both the a.m. peak hour and p.m. peak hour were used. The future 2040 roadway network includes planned roadway improvements. Future land use includes planned development forecasted for 2040.

Traffic volume forecasts from the travel demand model were used to generate growth factors. These growth factors were applied to existing peak hour intersection turning movement traffic volumes. The development of future year intersection turning movement traffic volumes requires that the turning movements at each intersection "balance". To achieve the balance, inbound traffic volumes must equal the outbound traffic volumes, and the volumes must be distributed among the various left-turn, through, and right-turn movements at each intersection. The "balancing" of future year intersection turning movement traffic volumes was conducted using methods described in the Transportation Research Board's (TRB's) National Cooperative Highway Research Program (NCHRP) Report 255, *Highway Traffic Data for Urbanized Area Project Planning and Design* (Transportation Research Board 1982). The NCHRP 255 method applies the desired peak hour directional volumes to the intersection turning movement volumes, using an iterative process to balance and adjust the resulting forecasts to match the desired peak hour directional volumes.

Application of the methods described above results in long-term future Cumulative No Project peak hour traffic volumes presented in **Figure 12**.

ROADWAY IMPROVEMENTS

In consultation with City of Union City staff (Azim pers. comm.), it was determined that no improvements are planned at the study facilities analyzed in this traffic impact study. Therefore, no roadway improvements are assumed in the analysis of Cumulative conditions. The intersection lane geometrics assumed for Cumulative No Project conditions are shown in **Figure 12**.



CUMULATIVE NO PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

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figure 12

LEVELS OF SERVICE

Peak hour LOS were calculated at the four study intersections present under Cumulative No Project Conditions. Intersection LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 7**. As shown, the following three of the four study intersections would operate at acceptable LOS D or better during both the a.m. and p.m. peak hours:

- Whipple Road & Amaral Street
- Almaden Boulevard & Amaral Street
- Almaden Boulevard & Ascot Way

No improvements are recommended at these three intersections.

Whipple Road & Huntwood Avenue

Under Cumulative No Project conditions, the intersection of Whipple Road & Huntwood Avenue would operate at LOS F with 306.3 seconds of delay during the a.m. peak hour and LOS F with 102.2 seconds of delay during the p.m. peak hour. LOS F is considered unacceptable. To improve LOS to an acceptable level, the following potential improvements would be required.

Potential Improvements. At the intersection of Whipple Road & Huntwood Avenue, the following improvements would result in acceptable LOS under Cumulative No Project conditions:

- Change the signal control on the north-south approaches from permitted phasing to protected phasing.
- Change the westbound combined through/right-turn lane to an exclusive westbound through lane and an exclusive westbound-to-northbound right-turn lane.
- Split the northbound single lane approach to an exclusive left-turn lane and a combined through/right-turn lane.
- Change the southbound approach to be composed of two exclusive southbound-to-eastbound left-turn lanes and a combined through/right-turn lane.

As shown in **Table 7**, with implementation of these improvements this intersection would operate at LOS E with 68.4 seconds of delay during the a.m. peak hour and LOS C with 30.7 seconds of delay during the p.m. peak hour. LOS E and C are considered acceptable.

The signal at this intersection is operated and maintained by the City of Hayward. The City of Hayward would be responsible for these improvements under Cumulative No Project conditions. However, it should be noted that these improvements would require substantial utility relocation and, as a result, may be considered infeasible.

Table 7. Level of Service - Cumulative No Project Conditions

	Study Intersections	Inters. Control	Signal Warrant Met?	AM Peak LOS	AM Peak Delay	PM Peak LOS	PM Peak Delay
1	Whipple Road & Amaral Street	Signal		D	40.7	B	18.8
2	Whipple Road & Huntwood Avenue	Signal		F	306.3	F	102.2
	With Potential Improvement	*Signal*		*E*	*68.4*	*C*	*30.7*
3	Almaden Boulevard & Amaral Street	AWSC	No	B	11.7	C	15.9
4	Almaden Boulevard & Ascot Way	Unsig	No	C	19.1	B	13.0
5	Whipple Road & Project Site Driveway	- -		- -	- -	- -	- -
6	Amaral Street & Project Site Driveway	- -		- -	- -	- -	- -

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Unsig" = Unsignalized stop-sign control. "AWSC" = All-way stop-sign control.
"Signal" = Signalized light control. Delay is measured in seconds per vehicle.
Italicized text indicates condition with potential improvement.
Dashes ("- -") indicate the intersection would not be present under this scenario.

CUMULATIVE PLUS PROJECT CONDITIONS

This section of this traffic impact study describes the impacts of the 1998 Whipple Road Project with long-term future cumulative background conditions.

TRAFFIC VOLUMES

Traffic volumes under Cumulative Plus Project conditions were calculated by adding project-related trips to Cumulative No Project background conditions traffic volumes. At study intersections, project-related trips shown in **Figure 10** were added to cumulative background traffic volumes shown in **Figure 12**. The resulting Cumulative Plus Project traffic volumes at study intersections are shown in **Figure 13**.

LEVELS OF SERVICE

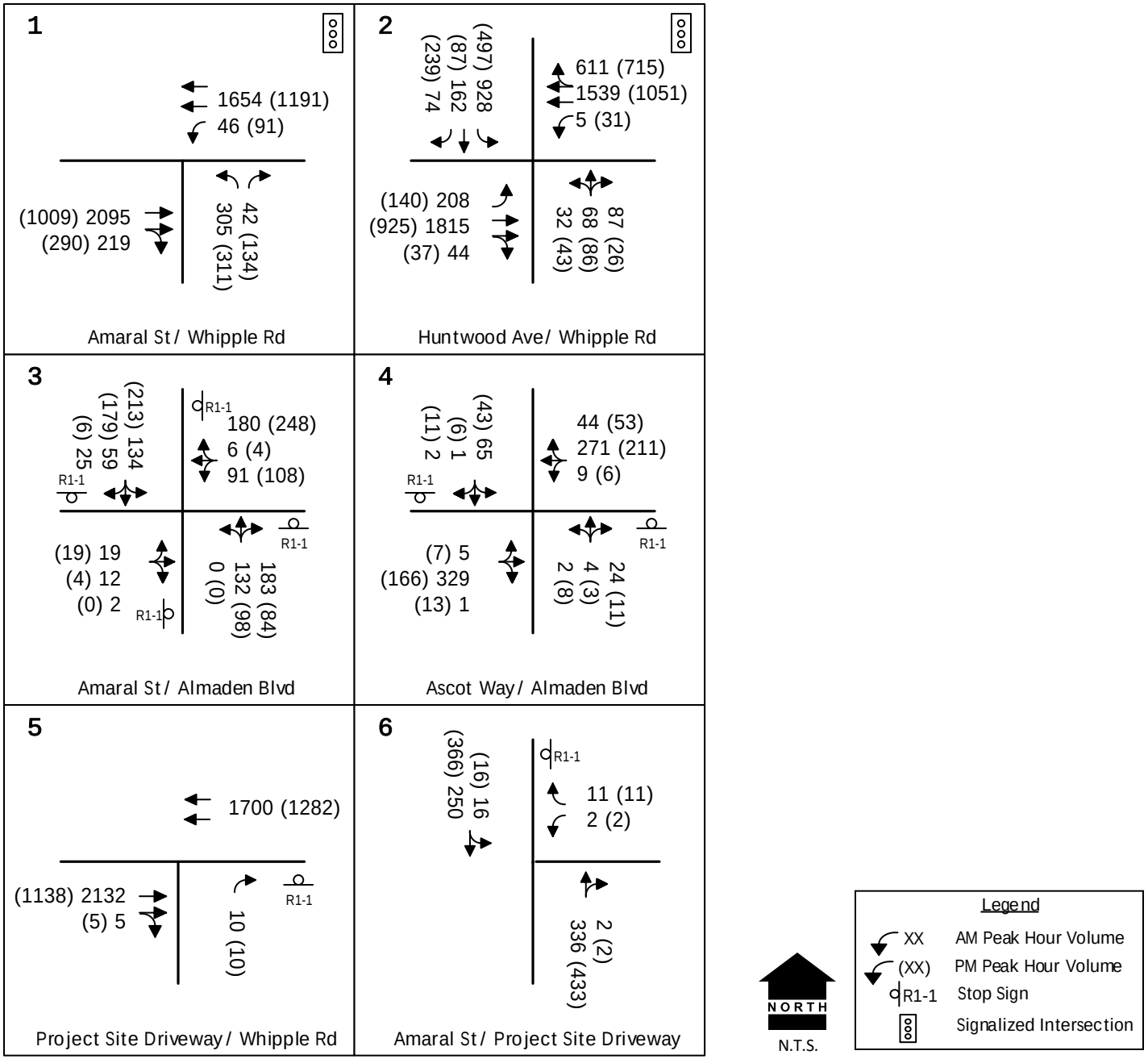
The following describes the impacts of the proposed project on study intersections. Peak hour LOS was calculated at the six study intersections under Cumulative Plus Project conditions. Intersection LOS calculation worksheets for this and all other scenarios are presented in the technical appendix. The results of these calculations are presented on **Table 8**. As shown, the following five of the six study intersections would operate at acceptable LOS D or better during both the a.m. and p.m. peak hours.

- Whipple Road & Amaral Street
- Almaden Boulevard & Amaral Street
- Almaden Boulevard & Ascot Way
- Whipple Road & Project Site Driveway
- Amaral Street & Project Site Driveway

The impact of the proposed project on these five intersections is considered less-than-significant and no mitigation measures are required at these five intersections.

Whipple Road & Huntwood Avenue

Under Cumulative Plus Project conditions, the intersection of Whipple Road & Huntwood Avenue would operate at LOS F with 308.4 seconds of delay during the a.m. peak hour and LOS F with 103.2 seconds of delay during the p.m. peak hour. LOS F is considered unacceptable. However, under Cumulative No Project conditions this intersection would operate at LOS F with 306.3 seconds of delay during the a.m. peak hour and LOS F with 102.2 seconds of delay during the p.m. peak hour. The project-related change in vehicle delay would not be five seconds or greater. Therefore, based on criteria presented in the *Level of Service Significance Thresholds* section of this traffic impact study, this impact is considered less than significant, and no mitigation measures are required.



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CUMULATIVE PLUS PROJECT TRAFFIC VOLUMES AND LANE CONFIGURATIONS

figure 13

Table 8. Level of Service - Cumulative Plus Project Conditions

	Study Intersections	Inters. Control	Signal Warrant Met?	AM Peak		PM Peak		by Type of Int
				LOS	Delay	LOS	Delay	
1	Whipple Road & Amaral Street	Signal		D	43.5	C	20.3	
2	Whipple Road & Huntwood Avenue	Signal		F	308.4	F	103.3	
3	Almaden Boulevard & Amaral Street	AWSC	No	B	11.8	C	16.0	
4	Almaden Boulevard & Ascot Way	Unsig	No	C	19.1	B	13.0	
5	Whipple Road & Project Site Driveway	Unsig	No	D	25.3	B	13.6	
6	Amaral Street & Project Site Driveway	Unsig	No	B	11.0	B	12.2	

Notes: "LOS" = Level of Service. "Inters. Control" = Type of intersection control.
"Unsig" = Unsignalized stop-sign control. "AWSC" = All-way stop-sign control.
"Signal" = Signalized light control. Delay is measured in seconds per vehicle.

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PERSONAL COMMUNICATIONS

Azim, Farooq. City Engineer. City of Union City. February 25, 2020 E-mail message to Wayne Shijo, KD Anderson & Associates.

TECHNICAL APPENDIX

(in separate electronic file)